Ministry of Health of the Republic of Uzbekistan Bukhara State Medical Institute named after Abu Ali ibn Sino Department of Faculty and Hospital Therapy

Vice-rektor for eduocational affairs

Associate professor-------- G.J. Jarilkasinova

«---------» ----------2021

EDUCATIONAL-METHODICAL COMPLEX

FOR STUDENTS FOUR COURSE OF MEDICAL AND MEDICAL PEDAGOGICAL FACULTY ON SUBJECT OF INTERNAL DISEASES

Knowledge Area - 510000 "Healthcare"
The direction of education:
5510100 - Medical Practice
5111000 - Vocational education (5510100 - Medical practice)

Bukhara 2021

Ismatova M.N. - Assistant of the Department of Faculty and Hospital Therapy

Reviewers:
Nurboev F.E. candidate of medical sciences, dotsent . of
People's medicine and proffesional diseases

Badriddinova M.N. candidate of medical sciences, dotsent. Chair of
Internal Diseases and Endocrinology

The educational methodical complex is compiled on the basis of the Model Program on Internal Diseases for students of higher medical institutions and the state educational standard

The educational-methodical complex was discussed at the meeting of the department of faculty and hospital therapy. Protocol No. 1 of " " August 2021

The educational methodical complex was discussed and approved at the Scientific Methodological Council of the BUKHMI. Protocol No. 1 dated
2021

CONTENT

Introduction

Systemic changes in Uzbekistan, with emphasis on the priority development of outpatient care, dictate the need for appropriate restructuring in the professional training of a doctor in accordance with the model of a GP (General Practitioner) or family doctor.

The primary responsibility of GPs should be to provide primary health care to family members, regardless of their age. It is assumed that the therapeutic pathology of adult family members will occupy a central place in the professional practice of a general practitioner. in the published list of diseases, knowledge of which is necessary for GPs, the share of internal diseases accounts for about 100 nosological forms, i.e. several times more than any other specialty.

The realization of the tasks of studying discipline is achieved by studying specific nosological forms of diseases (especially those that are most often encountered in the practice of an internist) and the development of practical medical skills. Students constantly master the methodology of clinical thinking and the logical structure of the clinical diagnosis. The ability to apply theoretical knowledge in practice evolves by training in practical exercises in the clinical analysis of patients that are mandatory for students to attend each topic of the class during the whole academic year, in the process of curating patients in the clinic. The same task is subject to registration of the medical history, compiled and protected by each student studying at the department, drafting epicrisis, keeping a diary of the patient.

Discipline is studied in the volume of 138 hours with lectures (18 hours), practical lessons (26 hours) and clinical practice (44 hours) of self-study (50 hours).

For IV students of the faculty
medical business and medical
pedagogy in the subject

INTERNAL DISEASES

LECTURE CLASS MATERIALS

Lecture number 1.

Subject of the lecture: Pneumonia. Pleurisy

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1. Control for the purity of the audience 2. Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work	Listens Write off

	3.Has homework	Write off
Total:90minutes,2 h		

Theoretical part:

Theoretical part:

Pneumonia is an inflammatory condition of the lung affecting primarily the small air sacs known as alveoli. Typically symptoms include some combination of productive or dry cough, chest pain, fever, and trouble breathing. Severity is variable.

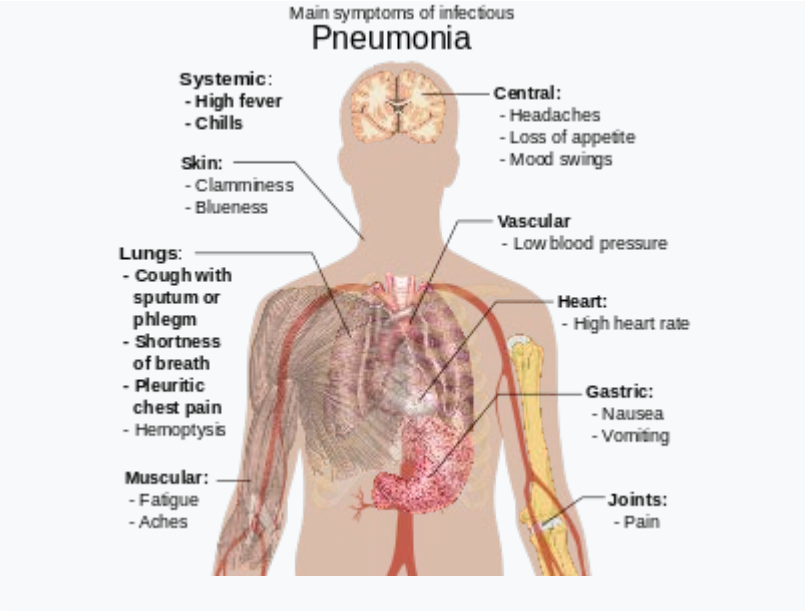
Pneumonia is usually caused by infection with viruses or bacteria and less commonly by other microorganisms, certain medications and conditions such as autoimmune diseases. Risk factors include other lung diseases such as cystic fibrosis, COPD, and asthma, diabetes, heart failure, a history of smoking, a poor ability to cough such as following a stroke, or a weak immune system. Diagnosis is often based on the symptoms and physical examination. Chest X-ray, blood tests, and cultureof the sputum may help confirm the diagnosis. The disease may be classified by where it was acquired with community, hospital, or health care associated pneumonia.

Vaccines to prevent certain types of pneumonia are available. Other methods of prevention include handwashing and not smoking. Treatment depends on the underlying cause. Pneumonia believed to be due to bacteria is treated with antibiotics. If the pneumonia is severe, the affected person is generally hospitalized. Oxygen therapy may be used if oxygen levels are low.

Pneumonia affects approximately 450 million people globally (7% of the population) and results in about 4 million deaths per year. Pneumonia was regarded by William Osler in the 19th century as "the captain of the men of death" With the introduction of antibiotics and vaccines in the 20th century, survival improved. Nevertheless, in developing countries, and among the very old, the very young, and the chronically ill, pneumonia remains a leading cause of death. Pneumonia often shortens suffering among those already close to death and has thus been called "the old man's friend".

Signs and symptoms

Symptoms frequency	
Symptom	**Frequency**
Cough	79–91%
Fatigue	90%
Fever	71–75%
Shortness of breath	67–75%
Sputum	60–65%



Chest pain	39–49%

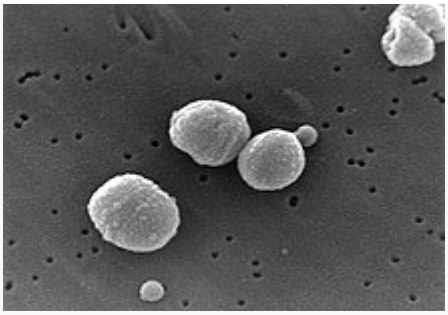
Main symptoms of infectious pneumonia

People with infectious pneumonia often have a productive cough, fever accompanied by shaking chills, shortness of breath, sharp or stabbing chest pain during deep breaths, and an increased rate of breathing. In the elderly, confusion may be the most prominent sign.

The typical signs and symptoms in children under five are fever, cough, and fast or difficult breathing. Fever is not very specific, as it occurs in many other common illnesses, may be absent in those with severe disease, malnutrition or in the elderly. In addition, a cough is frequently absent in children less than 2 months old. More severe signs and symptoms in children may include blue-tinged skin, unwillingness to drink, convulsions, ongoing vomiting, extremes of temperature, or a decreased level of consciousness.

Bacterial and viral cases of pneumonia usually present with similar symptoms.Some causes are associated with classic, but non-specific, clinical characteristics. Pneumonia caused by *Legionella* may occur with abdominal pain, diarrhea, or confusion,while pneumonia caused by *Streptococcus pneumoniae* is associated with rusty colored sputum,and pneumonia caused by *Klebsiella* may have bloody sputum often described as "currant jelly" Bloody sputum (known as hemoptysis) may also occur with tuberculosis, Gram-negative pneumonia, and lung abscesses as well as more commonly with acute bronchitis.[21] *Mycoplasma* pneumonia may occur in association with swelling of the lymph nodes in the neck, joint pain, or a middle ear infection. Viral pneumonia presents more commonly with wheezing than does bacterial pneumonia.Pneumonia was historically divided into "typical" and "atypical" based on the belief that the presentation predicted the underlying cause.[25] However, evidence has not supported this distinction, thus it is no longer emphasized.

Cause



The bacterium *Streptococcus pneumoniae*, a common cause of pneumonia, imaged by an electron microscope

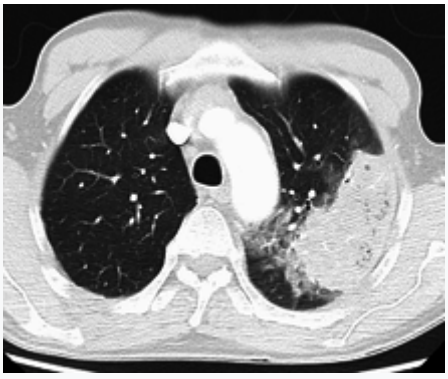
Pneumonia is due to infections caused primarily by bacteria or viruses and less commonly by fungi and parasites. Although there are more than 100 strains of infectious agents identified, only a few are responsible for the majority of the cases. Mixed infections with both viruses and bacteria may occur in up to 45% of infections in children and 15% of infections in adults. A causative agent may not be isolated in approximately half of cases despite careful testing.

The term *pneumonia* is sometimes more broadly applied to any condition resulting in inflammation of the lungs (caused for example by autoimmune diseases, chemical burns or drug reactions); however, this inflammation is more accurately referred to as pneumonitis.

Conditions and risk factors that predispose to pneumonia include smoking, immunodeficiency, alcoholism, chronic obstructive pulmonary disease, asthma, chronic kidney disease, liver disease, and old age.The use of acid-suppressing medications—such as proton-pump inhibitors or H2 blockers—is associated with an increased risk of pneumonia.Approximately 10% of people who require mechanical ventilation develop ventilator associated pneumonia,and people with gastric feeding tube have an increased risk of developing of aspiration pneumonia.

Bacteria

Main article: Bacterial pneumonia



Cavitating pneumonia as seen on CT. Pneumonia due to MRSA

Bacteria are the most common cause of community-acquired pneumonia (CAP), with *Streptococcus pneumoniae* isolated in nearly 50% of cases.[32][33] Other commonly isolated bacteria include *Haemophilus influenzae* in 20%, *Chlamydophila pneumoniae* in 13%, and *Mycoplasma pneumoniae* in 3% of cases;*Staphylococcus aureus*; *Moraxella catarrhalis*; *Legionella pneumophila* and Gram-negative bacilli. A number of drug-resistant versions of the above infections are becoming more common, including drug-

resistant *Streptococcus pneumoniae* (DRSP) and methicillin-resistant Staphylococcus aureus (MRSA).

The spreading of organisms is facilitated when risk factors are present.Alcoholism is associated with *Streptococcus pneumoniae*, anaerobic organisms, and *Mycobacterium tuberculosis*; smoking facilitates the effects of *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Legionella pneumophila*. Exposure to birds is associated with *Chlamydia psittaci*; farm animals with *Coxiella burnetti*; aspiration of stomach contents with anaerobic organisms; and cystic fibrosis with *Pseudomonas aeruginosa* and *Staphylococcus aureus*. *Streptococcus pneumoniae* is more common in the winter,and should be suspected in persons aspirating a large amount of anaerobic organisms.

Viruses

Main article: Viral pneumonia

In adults, viruses account for approximately a third and in children for about 15% of pneumonia cases.Commonly implicated agents include rhinoviruses, coronaviruses, influenza virus, respiratory syncytial virus (RSV), adenovirus, and parainfluenza.Herpes simplex virus rarely causes pneumonia, except in groups such as: newborns, persons with cancer, transplant recipients, and people with significant burns.People following organ transplantation or those otherwise-immunocompromised present high rates of cytomegalovirus pneumonia.Those with viral infections may be secondarily infected with the bacteria *Streptococcus pneumoniae*, *Staphylococcus aureus*, or *Haemophilus influenzae*, particularly when other health problems are present. Different viruses predominate at different periods of the year; during influenza season, for example, influenza may account for over half of all viral cases.[34] Outbreaks of other viruses also occasionally occur, including *hantaviruses* and *coronavirus*.

Fungi

Main article: Fungal pneumonia

Fungal pneumonia is uncommon, but occurs more commonly in individuals with weakened immune systems due to AIDS, immunosuppressive drugs, or other medical problems. It is most often caused by *Histoplasma capsulatum*, blastomyces, *Cryptococcus neoformans*, *Pneumocystis jiroveci* (pneumocystis pneumonia, or PCP), and *Coccidioides immitis*. Histoplasmosis is most common in the Mississippi River basin, and coccidioidomycosis is most common in the Southwestern United States. The number of cases has been increasing in the later half of the 20th century due to increasing travel and rates of immunosuppression in the population.

For people infected with HIV/AIDS, PCP is a common opportunistic infection.

Parasites

Main article: Parasitic pneumonia

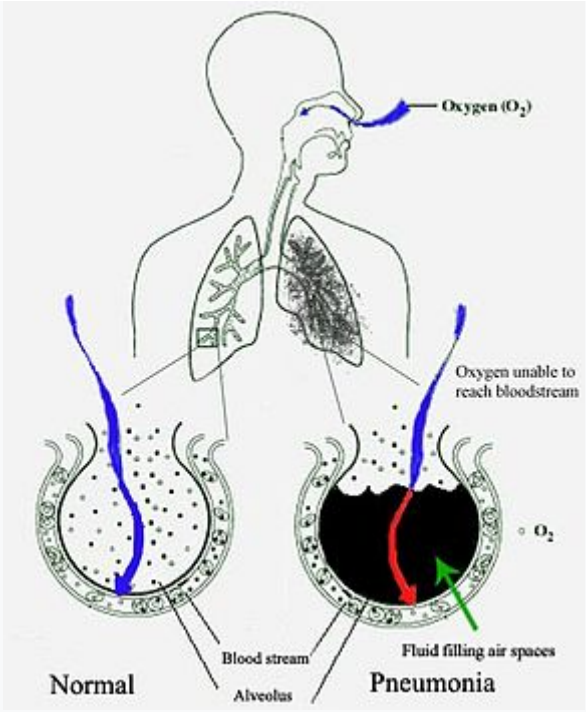
A variety of parasites can affect the lungs, including *Toxoplasma gondii*, *Strongyloides stercoralis*, *Ascaris lumbricoides*, and *Plasmodium malariae*.These organisms typically enter the body through direct contact with the skin, ingestion, or via an insect vector.Except for *Paragonimus westermani*, most parasites do not affect specifically the lungs but involve the lungs secondarily to other sites. Some parasites, in particular those belonging to the *Ascaris* and *Strongyloides* genera, stimulate a strong eosinophilic reaction, which may result in eosinophilic pneumonia. In other infections, such as malaria, lung involvement is due primarily to cytokine-induced systemic inflammation. In the developed worldthese infections are most common in people returning from travel or in immigrants. Around the world, these infections are most common in the immunodeficient.

Noninfectious

Main article: Idiopathic interstitial pneumonia

Idiopathic interstitial pneumonia or noninfectious pneumonia is a class of diffuse lung diseases. They include diffuse alveolar damage, organizing pneumonia, nonspecific interstitial pneumonia, lymphocytic interstitial pneumonia, desquamative interstitial pneumonia, respiratory bronchiolitis interstitial lung disease, and usual interstitial pneumonia.[42]

Mechanisms



Pneumonia fills the lung's alveoli with fluid, hindering oxygenation. The alveolus on the left is normal, whereas the one on the right is full of fluid from pneumonia.

Pneumonia frequently starts as an upper respiratory tract infection that moves into the lower respiratory tract. It is a type of pneumonitis (lung inflammation).

Viral

Viruses may reach the lung by a number of different routes. Respiratory syncytial virus is typically contracted when people touch contaminated objects and then they touch their eyes or nose.Other viral infections occur when contaminated airborne droplets are inhaled through the mouth or nose. Once in the upper airway, the viruses may make their way in the lungs, where they invade the cells lining the airways, alveoli, or lung parenchyma.Some viruses such as measles and herpes simplex may reach the lungs via the blood. The invasion of the lungs may lead to varying degrees of cell death.When the immune system responds to the infection, even more lung damage may occur.Primarily white blood cells, mainly mononuclear cells, generate the inflammation. As well as damaging the lungs, many viruses simultaneously affect other organs and thus disrupt other body functions. Viruses also make the body more susceptible to bacterial infections; in this way, bacterial pneumonia can arise as a co-morbid condition.

Bacterial

Most bacteria enter the lungs via small aspirations of organisms residing in the throat or nose.Half of normal people have these small aspirations during sleep.While the throat always contains bacteria, potentially infectious ones reside there only at certain times and under certain

conditions.A minority of types of bacteria such as *Mycobacterium tuberculosis* and *Legionella pneumophila* reach the lungs via contaminated airborne droplets.Bacteria can spread also via the blood.Once in the lungs, bacteria may invade the spaces between cells and between alveoli, where the macrophages and neutrophils (defensive white blood cells) attempt to inactivate the bacteria. The neutrophils also release cytokines, causing a general activation of the immune system. This leads to the fever, chills, and fatigue common in bacterial pneumonia. The neutrophils, bacteria, and fluid from surrounding blood vessels fill the alveoli, resulting in the consolidation seen on chest X-ray.

Diagnosis

Pneumonia is typically diagnosed based on a combination of physical signs and a chest X-ray. However, the underlying cause can be difficult to confirm, as there is no definitive test able to distinguish between bacterial and non-bacterial origin.

The World Health Organization has defined pneumonia in children clinically based on either a cough or difficulty breathing and a rapid respiratory rate, chest indrawing, or a decreased level of consciousness. A rapid respiratory rate is defined as greater than 60 breaths per minute in children under 2 months old, greater than 50 breaths per minute in children 2 months to 1 year old, or greater than 40 breaths per minute in children 1 to 5 years old. In children, low oxygen levels and lower chest indrawing are more sensitive than hearing chest crackles with a stethoscope or increased respiratory rate. Grunting and nasal flaring may be other useful signs in children less than five years old.

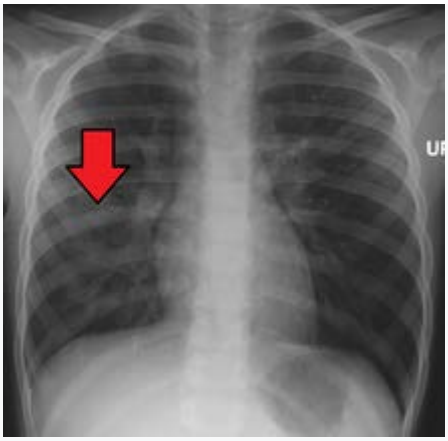
In general, in adults, investigations are not needed in mild cases. There is a very low risk of pneumonia if all vital signs and auscultation are normal. In persons requiring hospitalization, pulse oximetry, chest radiography and blood tests—including a complete blood count, serum electrolytes, C-reactive protein level, and possibly liver function tests—are recommended.[53] Procalcitonin may help determine the cause and support who should receive antibiotics.

The diagnosis of influenza-like illness can be made based on the signs and symptoms; however, confirmation of an influenza infection requires testing. Thus, treatment is frequently based on the presence of influenza in the community or a rapid influenza test.

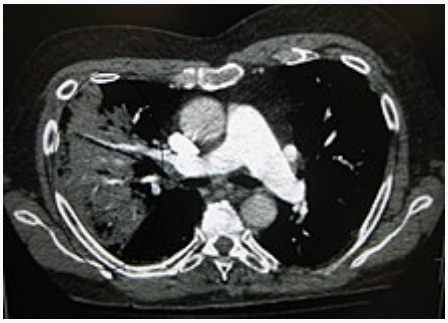
Physical exam

Physical examination may sometimes reveal low blood pressure, high heart rate, or low oxygen saturation. The respiratory rate may be faster than normal, and this may occur a day or two before other signs.[21][25] Examination of the chest may be normal, but it may show decreased chest expansion on the affected side. Harsh breath sounds from the larger airways that are transmitted through the inflamed lung are termed bronchial breathing and are heard on auscultation with a stethoscope.[21] Crackles (rales) may be heard over the affected area during inspiration.[21] Percussion may be dulled over the affected lung, and increased, rather than decreased, vocal resonance distinguishes pneumonia from a pleural effusion.[8]

Imaging



Right middle lobe pneumonia in a child as seen on plain X ray



CT of the chest demonstrating right-side pneumonia (left side of the image)

A chest radiograph is frequently used in diagnosis In people with mild disease, imaging is needed only in those with potential complications, those not having improved with treatment, or those in which the cause is uncertain. If a person is sufficiently sick to require hospitalization, a chest radiograph is recommended. Findings do not always match the severity of disease and do not reliably separate between bacterial infection and viral infection.

X-ray presentations of pneumonia may be classified as lobar pneumonia, bronchopneumonia (also known as lobular pneumonia), and interstitial pneumonia. Bacterial, community-acquired pneumonia classically show lung consolidation of one lung segmental lobe, which is known as lobar pneumonia.However, findings may vary, and other patterns are common in other types of pneumonia. Aspiration pneumonia may present with bilateral opacities primarily in the bases of the lungs and on the right side. Radiographs of viral pneumonia may appear normal, appear hyper-inflated, have bilateral patchy areas, or present similar to bacterial pneumonia with lobar consolidation.Radiologic findings may not be present in the early stages of the disease, especially in the presence of dehydration, or may be difficult to be interpreted in the obese or those with a history of lung disease. A CT scan can give additional information in indeterminate cases. Lung ultrasound may also be useful in helping to make the diagnosis.

Microbiology

In patients managed in the community, determining the causative agent is not cost-effective and typically does not alter management. For people who do not respond to treatment, sputum culture should be considered, and culture for *Mycobacterium tuberculosis* should be carried out in persons with a chronic productive cough. Testing for other specific organisms may be recommended during outbreaks, for public health reasons. In those hospitalized for severe disease, both sputum and blood cultures are recommended,as well as testing the urine for antigens to *Legionella* and *Streptococcus*.[60] Viral infections can be confirmed via detection

of either the virus or its antigens with culture or polymerase chain reaction (PCR), among other techniques.The causative agent is determined in only 15% of cases with routine microbiological tests.

Classification

Main article: Classification of pneumonia

Pneumonitis refers to lung inflammation; pneumonia refers to pneumonitis, usually due to infection but sometimes non-infectious, that has the additional feature of pulmonary consolidation. Pneumonia is most commonly classified by where or how it was acquired: community-acquired, aspiration, healthcare-associated, hospital-acquired, and ventilator-associated pneumonia.It may also be classified by the area of lung affected: lobar pneumonia, bronchial pneumonia and acute interstitial pneumonia; or by the causative organism. Pneumonia in children may additionally be classified based on signs and symptoms as non-severe, severe, or very severe.

The setting in which pneumonia develops is important to treatment, as it correlates to which pathogens are likely suspects, which mechanisms are likely, which antibiotics are likely to work or fail, and which complications can be expected based on the person's health status.

Community

Main article: Community-acquired pneumonia

Community-acquired pneumonia (CAP) is acquired in the community, outside of health care facilities. Compared with health care–associated pneumonia, it is less likely to involve multidrug-resistant bacteria. Although the latter are no longer rare in CAP? they are still less likely.

Healthcare

Health care–associated pneumonia (HCAP) is an infection associated with recent exposure to the health care system, including hospital, outpatient clinic, nursing home, dialysiscenter, chemotherapy treatment, or home care.HCAP is sometimes called MCAP (medical care–associated pneumonia).

Hospital

Hospital-acquired pneumonia is acquired in a hospital, specifically, pneumonia that occurs 48 hours or more after admission, which was not incubating at the time of admission.It is likely to involve hospital-acquired infections, with higher risk of multidrug-resistant pathogens. Also, because hospital patients are often ill (which is why they are present in the hospital), comorbidities are an issue.

Ventilator

Ventilator-associated pneumonia occurs in people breathing with the help of mechanical ventilation. Ventilator-associated pneumonia is specifically defined as pneumonia that arises more than 48 to 72 hours after endotracheal intubation.

Differential diagnosis

Several diseases can present with similar signs and symptoms to pneumonia, such as: chronic obstructive pulmonary disease (COPD), asthma, pulmonary edema, bronchiectasis, lung cancer, and pulmonary emboli. Unlike pneumonia, asthma and COPD typically present with wheezing, pulmonary edema presents with an abnormal electrocardiogram, cancer and bronchiectasis present with a cough of longer duration, and pulmonary emboli presents with acute onset sharp chest pain and shortness of breath.

Prevention

Prevention includes vaccination, environmental measures and appropriate treatment of other health problems. It is believed that, if appropriate preventive measures were instituted globally, mortality among children could be reduced by 400,000; and, if proper treatment were universally available, childhood deaths could be decreased by another 600,000.

Vaccination

Vaccination prevents against certain bacterial and viral pneumonias both in children and adults. Influenza vaccines are modestly effective at preventing symptoms of influenza,The Center for Disease Control and Prevention (CDC) recommends yearly influenza vaccination for every person 6 months and older. Immunizing health care workers decreases the risk of viral pneumonia among their patients.

Vaccinations against *Haemophilus influenzae* and *Streptococcus pneumoniae* have good evidence to support their use. There is strong evidence for vaccinating children under the age of 2 against *Streptococcus pneumoniae* (pneumococcal conjugate vaccine). Vaccinating children against *Streptococcus pneumoniae* has led to a decreased rate of these infections in adults, because many adults acquire infections from children. A *Streptococcus pneumoniae* vaccine is available for adults, and has been found to decrease the risk of invasive pneumococcal disease, but there is insufficient evidence to suggest using the pneumococcal vaccine to prevent pneumonia or mortality in the general adult population.The CDC recommends that young children and adults over the age of 65 receive the pneumococcal vaccine, as well as older children or younger adults who have an increased risk of getting pneumococcal disease. The pneumococcal vaccine has been shown to reduce the risk of community acquired pneumonia in people with chronic obstructive pulmonary disease (COPD), but does not reduce mortality or the risk of hospitalization for people with this condition. People with COPD are suggested to have a pneumococcal vaccination. Other vaccines for which there is support for a protective effect against pneumonia include pertussis, varicella, and measles.

Medications

When influenza outbreaks occur, medications such as amantadine or rimantadine may help prevent the condition; however are associated with side effects.Zanamivir or oseltamivir decrease the chance that those exposed will develop symptoms; however, it is recommended that potential side effects are taken into account.

Other

Smoking cessation and reducing indoor air pollution, such as that from cooking indoors with wood or dung, are both recommended. Smoking appears to be the single biggest risk factor for pneumococcal pneumonia in otherwise-healthy adults.Hand hygiene and coughing into one's sleeve may also be effective preventative measures.Wearing surgical masks by the sick may also prevent illness.

Appropriately treating underlying illnesses (such as HIV/AIDS, diabetes mellitus, and malnutrition) can decrease the risk of pneumonia. In children less than 6 months of age, exclusive breast feeding reduces both the risk and severity of disease.In those with HIV/AIDS and a CD4 count of less than 200 cells/uL the antibiotic trimethoprim/sulfamethoxazole decreases the risk of *Pneumocystis pneumonia* and is also useful for prevention in those that are immunocomprised but do not have HIV.

Testing pregnant women for Group B Streptococcus and *Chlamydia trachomatis*, and administering antibiotic treatment, if needed, reduces rates of pneumonia in infants;preventive measures for HIV transmission from mother to child may also be efficient. Suctioning the mouth and throat of infants with meconium-stained amniotic fluid has not been found to reduce the rate

of aspiration pneumonia and may cause potential harm, thus this practice is not recommended in the majority of situations.In the frail elderly good oral health care may lower the risk of aspiration pneumonia.Zinc supplementation in children 2 months to five years old appears to reduce rates of pneumonia.

For people with low levels of vitamin C in their diet or blood, taking vitamin C supplements may be suggested to decrease the risk of pneumonia, although there is no strong evidence of benefit There is insufficient evidence to recommend that the general population take vitamin C to prevent pneumonia.

Management

Oral antibiotics, rest, simple analgesics, and fluids usually suffice for complete resolution. However, those with other medical conditions, the elderly, or those with significant trouble breathing may require more advanced care. If the symptoms worsen, the pneumonia does not improve with home treatment, or complications occur, hospitalization may be required.Worldwide, approximately 7–13% of cases in children result in hospitalization, whereas in the developed world between 22 and 42% of adults with community-acquired pneumonia are admitted. The CURB-65 score is useful for determining the need for admission in adults. If the score is 0 or 1, people can typically be managed at home; if it is 2, a short hospital stay or close follow-up is needed; if it is 3–5, hospitalization is recommended. In children those with respiratory distress or oxygen saturations of less than 90% should be hospitalized. The utility of chest physiotherapy in pneumonia has not yet been determined.Non-invasive ventilation may be beneficial in those admitted to the intensive care unit.Over-the-counter cough medicine has not been found to be effective nor has the use of zinc in children.There is insufficient evidence for mucolytics.There is no strong evidence to recommend that children who have non-measles related pneumonia take Vitamin A supplements.

Bacterial

Antibiotics improve outcomes in those with bacterial pneumonia.Increased use of antibiotics, however, may lead to the development of antimicrobial resistant strains of bacteria.Antibiotic choice depends initially on the characteristics of the person affected, such as age, underlying health, and the location the infection was acquired. Antibiotic use is also associated with side effects such as nausea, diarrhea, dizziness, taste distortion, or headaches. In the UK, treatment before culture results with amoxicillin is recommended as the first line for community-acquired pneumonia, with doxycycline or clarithromycin as alternatives.In North America, where the "atypical" forms of community-acquired pneumonia are more common, macrolides (such as azithromycin or erythromycin), and doxycycline have displaced amoxicillin as first-line outpatient treatment in adults. In children with mild or moderate symptoms, amoxicillin taken by mouth remains the first line.The use of fluoroquinolones in uncomplicated cases is discouraged due to concerns about side-effects and generating resistance in light of there being no greater clinical benefit.

For those who require hospitalization and caught their pneumonia in the community the use of a β-lactam such as cephazolin plus macrolide such as azithromycin or a fluoroquinolones is recommended.

The duration of treatment has traditionally been seven to ten days, but increasing evidence suggests that shorter courses (3-5 days) may be effective for certain types of pneumonia and may reduce the risk of antibiotic resistance.· For pneumonia that is associated with a ventilator caused by non-fermenting Gram-negative bacilli (NF-GNB), a shorter course of antibiotics increases the risk of that pneumonia will return.Recommendations for hospital-acquired pneumonia include third- and fourth-generation cephalosporins, carbapenems, fluoroquinolones, aminoglycosides, and vancomycin. These antibiotics are often given intravenously and used in combination. In

those treated in hospital, more than 90% improve with the initial antibiotics.For people with ventilator-acquired pneumonia, the choice of antibiotic therapy will depend on the person's risk of being infected with a strain of bacteria that is multi-drug resistant.

The addition of corticosteroids to standard antibiotic treatment appears to improve outcomes,reducing the rate of mortality and morbidity for adults with severe community acquired pneumonia, and reducing morbidity for adults and children with non-severe community acquired pneumonia. There are adverse effects associated with the use of corticosteroids such as high blood sugar. There is some evidence that adding corticosteroids to the standard PCP pneumonia treatment may be beneficial for people who are infected with HIV.

The use of granulocyte colony stimulating factor (G-CSF) along with antibiotics does not appear to reduce mortality and routine use for treating pneumonia is not supported by evidence.

Viral

Neuraminidase inhibitors may be used to treat viral pneumonia caused by influenza viruses (influenza A and influenza B).No specific antiviral medications are recommended for other types of community acquired viral pneumonias including SARS coronavirus, adenovirus, hantavirus, and parainfluenza virus. Influenza A may be treated with rimantadine or amantadine, while influenza A or B may be treated with oseltamivir, zanamivir or peramivir. These are of most benefit if they are started within 48 hours of the onset of symptoms.Many strains of H5N1 influenza A, also known as avian influenza or "bird flu", have shown resistance to rimantadine and amantadine. The use of antibiotics in viral pneumonia is recommended by some experts, as it is impossible to rule out a complicating bacterial infection. The British Thoracic Society recommends that antibiotics be withheld in those with mild disease. The use of corticosteroids is controversial.

Aspiration

In general, aspiration pneumonitis is treated conservatively with antibiotics indicated only for aspiration pneumonia. choice of antibiotic will depend on several factors, including the suspected causative organism and whether pneumonia was acquired in the community or developed in a hospital setting. Common options include clindamycin, a combination of a beta-lactam antibiotic and metronidazole, or an aminoglycoside. Corticosteroids are sometimes used in aspiration pneumonia, but there is limited evidence to support their effectiveness.

Prognosis

With treatment, most types of bacterial pneumonia will stabilize in 3–6 days. It often takes a few weeks before most symptoms resolve. X-ray finding typically clear within four weeks and mortality is low (less than 1%).In the elderly or people with other lung problems, recovery may take more than 12 weeks. In persons requiring hospitalization, mortality may be as high as 10%, and in those requiring intensive care it may reach 30–50%.[21] Pneumonia is the most common hospital-acquired infection that causes death.[25]Before the advent of antibiotics, mortality was typically 30% in those that were hospitalized.

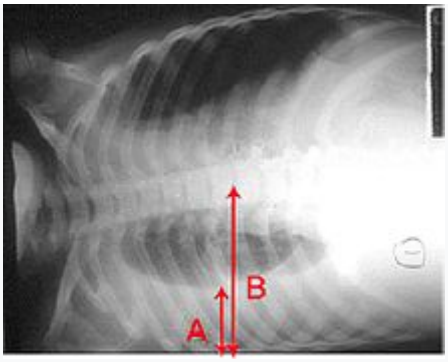
Complications may occur in particular in the elderly and those with underlying health problems.This may include, among others: empyema, lung abscess, bronchiolitis obliterans, acute respiratory distress syndrome, sepsis, and worsening of underlying health problems.

Clinical prediction rules

Clinical prediction rules have been developed to more objectively predict outcomes of pneumonia.These rules are often used in deciding whether or not to hospitalize the person.

- Pneumonia severity index (or *PSI Score*)
- CURB-65 score, which takes into account the severity of symptoms, any underlying diseases, and age

Pleural effusion, empyema, and abscess



A pleural effusion: as seen on chest X-ray. The A arrow indicates fluid layering in the right chest. The B arrow indicates the width of the right lung. The volume of the lung is reduced because of the collection of fluid around the lung.

In pneumonia, a collection of fluid may form in the space that surrounds the lung. Occasionally, microorganisms will infect this fluid, causing an empyema.To distinguish an empyema from the more common simple parapneumonic effusion, the fluid may be collected with a needle (thoracentesis), and examined.If this shows evidence of empyema, complete drainage of the fluid is necessary, often requiring a drainage catheter.In severe cases of empyema, surgery may be needed. If the infected fluid is not drained, the infection may persist, because antibiotics do not penetrate well into the pleural cavity. If the fluid is sterile, it must be drained only if it is causing symptoms or remains unresolved.

In rare circumstances, bacteria in the lung will form a pocket of infected fluid called a lung abscess. Lung abscesses can usually be seen with a chest X-ray but frequently require a chest CT scan to confirm the diagnosis. Abscesses typically occur in aspiration pneumonia, and often contain several types of bacteria. Long-term antibiotics are usually adequate to treat a lung abscess, but sometimes the abscess must be drained by a surgeon or radiologist.

Respiratory and circulatory failure

Pneumonia can cause respiratory failure by triggering acute respiratory distress syndrome (ARDS), which results from a combination of infection and inflammatory response. The lungs quickly fill with fluid and become stiff. This stiffness, combined with severe difficulties extracting oxygen due to the alveolar fluid, may require long periods of mechanical ventilation for survival.

Sepsis is a potential complication of pneumonia but occurs usually in people with poor immunity or hyposplenism. The organisms most commonly involved are *Streptococcus pneumoniae, Haemophilus influenzae,* and *Klebsiella pneumoniae*. Other causes of the symptoms should be considered such as a myocardial infarction or a pulmonary embolism.

Pneumonia is a common illness affecting approximately 450 million people a year and occurring in all parts of the world. It is a major cause of death among all age groups resulting in 4 million deaths (7% of the world's total death) yearly. Rates are greatest in children less than five, and adults older than 75 years. It occurs about five times more frequently in the developing world than in the developed world.Viral pneumonia accounts for about 200 million cases. In the United States, as of 2009, pneumonia is the 8th leading cause of death.[21]

Children

In 2008, pneumonia occurred in approximately 156 million children (151 million in the developing world and 5 million in the developed world). In 2010, it resulted in 1.3 million deaths, or 18% of all deaths in those under five years, of which 95% occurred in the developing world. Countries with the greatest burden of disease include India (43 million), China (21 million) and Pakistan (10 million).[1] It is the leading cause of death among children in low income countries. Many of these deaths occur in the newborn period. The World Health Organization estimates that one in three newborn infant deaths is due to pneumonia. Approximately half of these deaths can be prevented, as they are caused by the bacteria for which an effective vaccine is available. In 2011, pneumonia was the most common reason for admission to the hospital after an emergency department visit in the U.S. for infants and children.

Lecture number 2.

Subject of the lecture: Bronchial asthma

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1. Control for the purity of the audience 2. Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening

The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total:90minutes,2 h		

Theoretical part: Bronchial Asthma

Ever hear the term "bronchial asthma" and wonder what it means? When people talk about bronchial asthma, they are really talking about asthma, a chronic inflammatory disease of the airways that causes periodic "attacks" of coughing, wheezing, shortness of breath, and chest tightness.

According to the CDC, more than 25 million Americans, including 6.8 million children under age 18, suffer with asthma today.

Allergies are strongly linked to asthma and to other respiratory diseases such as chronic sinusitis, middle ear infections, and nasal polyps. Most interestingly, a recent analysis of people with asthma showed that those who had both allergies and asthma were much more likely to have nighttime awakening due to asthma, miss work because of asthma, and require more powerful medications to control their symptoms.

Asthma is associated with mast cells, eosinophils, and T lymphocytes. Mast cells are the allergy-causing cells that release chemicals like histamine. Histamine is the substance that causes nasal stuffiness and dripping in a cold or hay fever, constriction of airways in asthma, and itchy areas in a skin allergy. Eosinophils are a type of white blood cell associated with allergic disease. T lymphocytes are also white blood cells associated with allergyand inflammation.

These cells, along with other inflammatory cells, are involved in the development of airway inflammation in asthma that contributes to the airway hyperresponsiveness, airflow limitation, respiratory symptoms, and chronic disease. In certain individuals, the inflammation results in the feelings of chest tightness and breathlessness that's felt often at night (nocturnal asthma) or in the early morning hours. Others only feel symptoms when they exercise (called exercise-induced asthma). Because of the inflammation, the airway hyperresponsiveness occurs as a result of specific triggers.

Bronchial Asthma Triggers

Bronchial asthma triggers may include:

- Smoking and secondhand smoke
- Infections such as colds, flu, or pneumonia
- Allergens such as food, pollen, mold, dust mites, and pet dander
- Exercise
- Air pollution and toxins
- Weather, especially extreme changes in temperature
- Drugs (such as aspirin, NSAIDs, and beta-blockers)
- Food additives (such as MSG)
- Emotional stress and anxiety
- Singing, laughing, or crying
- Perfumes and fragrances
- Acid reflux

Signs and Symptoms of Bronchial Asthma

With bronchial asthma, you may have one or more of the following signs and symptoms:

- Shortness of breath
- Tightness of chest
- Wheezing
- Excessive coughing or a cough that keeps you awake at night

Diagnosing Bronchial Asthma

Because asthma symptoms don't always happen during your doctor's appointment, it's important for you to describe your, or your child's, asthma signs and symptoms to your health care provider. You might also notice when the symptoms occur such as during exercise, with a cold, or after smelling smoke. Asthma tests may include:

- Spirometry: A lung function test to measure breathing capacity and how well you breathe. You will breathe into a device called a spirometer.
- Peak Expiratory Flow (PEF): Using a device called a peak flow meter, you forcefully exhale into the tube to measure the force of air you can expend out of your lungs. Peak flow monitoring can allow you to monitor how well your asthma is doing at home.
- Chest X-ray: Your doctor may do a chest X-ray to rule out any other diseases that may be causing similar symptoms.

Treating Bronchial Asthma

Once diagnosed, your health care provider will recommend asthma medication (which can include asthma inhalers and pills) and lifestyle changes to treat and prevent asthma attacks. For example, long-acting anti-inflammatory asthma inhalers are often necessary to treat the inflammation associated with asthma. These inhalers deliver low doses of steroids to the lungs with minimal side effects if used properly. The fast-acting or "rescue" bronchodilator inhaler works immediately on opening airways during an asthma attack.

If you have bronchial asthma, make sure your health care provider shows you how to use the inhalers properly. Be sure to keep your rescue inhaler with you in case of an asthma attack or asthma emergency. While there is no asthma cure yet, there are excellent asthma medications that can help with preventing asthma symptoms. Asthma support groups are also available to help you better cope with your asthma.

Allergy and asthma

About 10% of children suffer from asthma. Childhood asthma is usually due to allergy.

In 30% to 50% of asthmatic adults, no allergy is found as the cause of asthma.

Acute worsening of asthma (an asthma attack or exacerbation) can arise at any time without any prodromal symptoms and independently of the previous severity of the disease. Bronchial obstruction during an acute attack can progress, either slowly or rapidly, to life-threatening severity. The mortality due to asthma in Germany has declined by about one-third in the last decade, yet it nonetheless remains relatively high compared to that in other countries (2141 deaths due to asthma in 2004 according to the German Federal Statistical Office [Statistisches Bundesamt], 2005). The reduction in asthma-related mortality is generally attributed to the introduction of maintenance therapy with inhaled corticosteroids (ICS) (4). Around the world, however, there is little correlation between the lethality of asthma and its prevalence. The World Health Organization (WHO) estimates the number of DALYs ("disability-adjusted life years") lost to asthma at 15 million per year, which corresponds to 1% of the global loss of DALYs due to illness.

Go to:

Diagnostic assessment

Airway obstruction is measured objectively with pulmonary function tests. The most important such test is spirometry, which measures the forced expiratory volume in one second (FEV1), the forced vital capacity (FVC), and the Tiffeneau parameters (FEV1/VC). Normal pulmonary function values do not rule out disease if they have been obtained during a symptom-free interval. Further aspects of the basic diagnostic assessment of bronchial asthma, including history-taking, symptoms, and physical findings, are summarized in box 1 (1–3).

Box 1

Basic diagnostic evaluation of bronchial asthma*1

History

- Sudden onset of symptoms, often at night or in the early morning hours, typically shortness of breath and cough (productive or unproductive), particularly

- after allergen exposure
- during (or, more commonly, after) physical exertion or sports (so-called
- exercise-induced asthma)
- in the setting of upper respiratory infection
- on exposure to thermal stimuli, e.g., cold air
- on exposure to smoke or dust
- Seasonal variation of symptoms (seasonal elevation of pollen count)
- Positive family history (allergy, asthma)
- Precipitants of asthmatic symptoms in the patient's environment at home, at work, and during leisure activities

Symptoms

Intermittent and variable (may also be absent, e.g., during symptom-free intervals or in mild disease)

- Shortness of breath (often in acute episodes)
- Expiratory wheezes
- Chest pressure sensation
- Cough

Findings on physical examination

- Rales, rhonchi, wheezes
- Prolonged expiratory phase
- Tachypnea
- Orthopnea
- Chest constriction

*1 modified from (1), (3).

The practical value of peak expiratory flow (PEF) measurement lies in the determination of circadian variability, which is a suitable parameter for self-monitoring of asthma in outpatient follow-up. "Min % Max" is the minimal value of PEF expressed as a percentage of the maximal value, i.e., the lowest value in the morning prior to the administration of a bronchodilator drug as a percentage of the current best value. A circadian variability greater than 20% is typical of inadequately treated asthma (2, 5).

History and physical examination

Acute attacks of shortness of breath and cough occurring early in the morning are typical of asthma. Auscultation of the chest reveals rales, rhonchi, and wheezes.

Standards and individualized norms exist for both PEF measurement and spirometry (2, 3). Whole-body plethysmographic pulmonary function analysis provides further information, e.g., for the demonstration of obstruction (airway resistance, Raw) or overdistention (intrathoracic gas volume, ITGV). Objective criteria for the confirmation of the diagnosis of bronchial asthma are given in box 2. An algorithm for the diagnostic assessment of asthma is shown in figure 1.

Box 2

Criteria for the diagnosis of asthma*1

- Demonstration of obstruction (FEV1/VC < 70%) and FEV1 increase by >15% (at least 200 mL) with respect to the initial value, and possibly also decrease of the specific airway resistance by at least 1 kPa × sec, measured at least 15 min after the inhalation of four puffs of a short-acting beta2 sympathomimetic agent, e.g., 400 µg of salbutamol
- Or: FEV1 worsening by >15% during, or within 30 minutes after, physical exercise (exertional asthma), possibly with an increase of the specific airway resistance by at least 150%
- Or: FEV1 improvement by >15% (or by at least 200 mL, if the initial value is below 1300 mL), and possibly also decrease of the specific airway resistance by at least 1 kPa × sec, after daily high-dose administration of an inhaled corticosteroid (ICS) for a maximum of four weeks
- Or: in patients with normal pulmonary function despite a typical history for asthma, demonstration of non-specific bronchial hyperreactivity by means of a standardized, multilevel inhalational provocative test and of a more than 20% circadian variation in PEF with measurements taken over 3 to 14 days.

Lecture number 3.

Subject of the lecture: Acute rheumatic fever

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
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Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
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2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work	Listens Write off

	3.Has homework	Write off
Total:90minutes,2 h		

Theoretical part: Acute Rheumatic Fever

Rheumatic fever (**RF**) is an inflammatory disease that can involve the heart, joints, skin, and brain. The disease typically develops two to four weeks after a streptococcal throat infection. Signs and symptoms include fever, multiple painful joints, involuntary muscle movements, and occasionally a characteristic non-itchy rash known as erythema marginatum. The heart is involved in about half of cases. Damage to the heart valves, known as rheumatic heart disease (RHD), usually occurs after repeated attacks but can sometimes occur after one. The damaged valves may result in heart failure, atrial fibrillation and infection of the valves.

Rheumatic fever may occur following an infection of the throat by the bacterium *Streptococcus pyogenes*. If the infection is untreated rheumatic fever can occur in up to three percent of people. The underlying mechanism is believed to involve the production of antibodies against a person's own tissues. Due to their genetics, some people are more likely to get the disease when exposed to the bacteria than others. Other risk factors include malnutrition and poverty. Diagnosis of RF is often based on the presence of signs and symptoms in combination with evidence of a recent streptococcal infection.

Treating people who have strep throat with antibiotics, such as penicillin, decreases the risk of developing rheumatic fever. In order to avoid antibiotic misuse this often involves testing people with sore throats for the infection, which may not be available in the developing world.Other preventive measures include improved sanitation. In those with rheumatic fever and rheumatic heart disease, prolonged periods of antibiotics are sometimes recommended. Gradual return to normal activities may occur following an attack. Once RHD develops, treatment is more difficult. Occasionally valve replacement surgery or valve repairis required. Otherwise complications are treated as per normal.

Rheumatic fever occurs in about 325,000 children each year and about 33.4 million people currently have rheumatic heart disease. Those who develop RF are most often between the ages of 5 and 14, with 20% of first-time attacks occurring in adults. The disease is most common in the developing world and among indigenous peoples in the developed world. In 2015 it resulted in 319,400 deaths down from 374,000 deaths in 1990. Most deaths occur in the developing world where as many as 12.5% of people affected may die each year. Descriptions of the condition are believed to date back to at least the 5th century BCE in the writings of Hippocrates. The disease is so named because its symptoms are similar to those of some rheumatic disorders.

Signs and symptoms

A culture positive case of streptococcal pharyngitis with typical tonsillar exudate in a 16-year-old.

The disease typically develops two to four weeks after a throat infection.[2] Symptoms include: fever, painful joints with those joints affected changing with time, involuntary muscle movements, and occasionally a characteristic non-itchy rash known as erythema marginatum. The heart is involved in about half of cases. Damage to the heart valves usually occurs only after multiple attacks but may occasionally occur after a single case of RF. The damaged valves may result in heart failure and also increase the risk of atrial fibrillationand infection of the valves.

Pathophysiology

Rheumatic fever is a systemic disease affecting the connective tissue around arterioles, and can occur after an untreated strep throatinfection, specifically due to group A streptococcus (GAS), *Streptococcus pyogenes*. It is believed to be caused by antibody cross-reactivity. This cross-reactivity is a type II hypersensitivity reaction and is termed molecular mimicry. Usually, self reactive B cells remain anergic in the periphery without T cell co-stimulation. During a streptococcal infection, mature antigen-presenting cells such as B cells present the bacterial antigen to CD4+T cells which differentiate into helper T_2 cells. Helper T_2 cells subsequently activate the B cells to become plasma cells and induce the production of antibodies against the cell wall of Streptococcus. However the antibodies may also react against the myocardium and joints, producing the symptoms of rheumatic fever. *S. pyogenes* is a species of aerobic, cocci, gram-positive bacteria that are non-motile, non-spore forming, and forms chains and large colonies.

S. pyogenes has a cell wall composed of branched polymers which sometimes contain M protein, a virulence factor that is highly antigenic. The antibodies which the immune system generates against the M protein may cross-react with heart muscle cell protein myosin, heart muscle glycogen and smooth muscle cells of arteries, inducing cytokine release and tissue destruction. However, the only proven cross-reaction is with perivascular connective tissue.[*citation needed*] This inflammation occurs through direct attachment of complement and Fc receptor-mediated recruitment of neutrophils and macrophages. Characteristic Aschoff bodies, composed of swollen eosinophilic collagen surrounded by lymphocytes and macrophages can be seen on light microscopy. The larger macrophages may become Anitschkow cells or Aschoff giant cells. Rheumatic valvular lesions may also involve a cell-mediated immunity reaction as these lesions predominantly contain T-helper cells and macrophages.

In rheumatic fever, these lesions can be found in any layer of the heart causing different types of carditis. The inflammation may cause a serofibrinous pericardial exudate described as "bread-and-butter" pericarditis, which usually resolves without sequelae. Involvement of the endocardium typically results in fibrinoid necrosis and wart formation along the lines of closure of the left-sided heart valves. Warty projections arise from the deposition, while subendocardial lesions may induce irregular thickenings called MacCallum plaques.

Chronic rheumatic heart disease (RHD) is characterized by repeated inflammation with fibrinous repair. The cardinal anatomic changes of the valve include leaflet thickening, commissural fusion, and shortening and thickening of the tendinous cords. It is caused by an autoimmune reaction to Group A β-hemolytic streptococci (GAS) that results in valvular damage. Fibrosis and scarring of valve leaflets, commissuresand cusps leads to abnormalities that can result in valve stenosis or regurgitation. The inflammation caused by rheumatic fever, usually during childhood, is referred to as rheumatic valvulitis. About half of patients with rheumatic fever develop inflammation involving valvular endothelium. The majority of morbidity and mortality associated with rheumatic fever is caused by its destructive effects on cardiac valve tissue. The pathogenesis of RHD is complex and not fully understood, but it is known to involve molecular mimicry and genetic predisposition that lead to autoimmune reactions.

Molecular mimicry occurs when epitopes are shared between host antigens and *Streptococcus* antigens. This causes an autoimmune reaction against native tissues in the heart that are incorrectly recognized as "foreign" due to the cross-reactivity of antibodies generated as a result of epitope sharing. The valvular endothelium is a prominent site of lymphocyte-induced damage. CD4+ T cells are the major effectors of heart tissue autoimmune reactions in RHD. Normally, T cell activation is triggered by the presentation of bacterial antigens. In RHD, molecular mimicry results in incorrect T cell activation, and these T lymphocytes can go on to activate B cells, which will begin to produce self-antigen-specific antibodies. This leads to an immune response attack mounted against tissues in the heart that

have been misidentified as pathogens. Rheumatic valves display increased expression of VCAM-1, a protein that mediates the adhesion of lymphocytes. Self-antigen-specific antibodies generated via molecular mimicry between human proteins and streptococcal antigens up-regulate VCAM-1 after binding to the valvular endothelium. This leads to the inflammation and valve scarring observed in rheumatic valvulitis, mainly due to CD4+ T cell infiltration.

While the mechanisms of genetic predisposition remain unclear, a few genetic factors have been found to increase susceptibility to autoimmune reactions in RHD. The dominant contributors are a component of MHC class II molecules, found on lymphocytes and antigen-presenting cells, specifically the DR and DQ alleles on human chromosome 6. Certain allele combinations appear to increase RHD autoimmune susceptibility. Human leukocyte antigen (HLA) class II allele DR7 (HLA-DR7) is most often associated with RHD, and its combination with certain DQ alleles is seemingly associated with the development of valvular lesions. The mechanism by which MHC class II molecules increase a host's susceptibility to autoimmune reactions in RHD is unknown, but it is likely related to the role HLA molecules play in presenting antigens to T cell receptors, thus triggering an immune response. Also found on human chromosome 6 is the cytokine TNF-α which is also associated with RHD. High expression levels of TNF-α may exacerbate valvular tissue inflammation, contributing to RHD pathogenesis. Mannose-binding lectin (MBL) is an inflammatory protein involved in pathogen recognition. Different variants of MBL2 gene regions are associated in RHD. RHD-induced mitral valve stenosis has been associated with MBL2 alleles encoding for high production of MBL. Aortic valve regurgitation in RHD patients has been associated with different MBL2 alleles that encode for low production of MBL. Other genes are also being investigated to better understand the complexity of autoimmune reactions that occur in RHD.

Diagnosis

Modified Jones criteria were first published in 1944 by T. Duckett Jones, MD. They have been periodically revised by the American Heart Association in collaboration with other groups. According to revised Jones criteria, the diagnosis of rheumatic fever can be made when two of the major criteria, or one major criterion plus two minor criteria, are present along with evidence of streptococcal infection: elevated or rising antistreptolysin O titre or DNAase. Exceptions are chorea and indolent carditis, each of which by itself can indicate rheumatic fever. An April 2013 review article in the *Indian Journal of Medical Research* stated that echocardiographic and Doppler (E & D) studies, despite some reservations about their utility, have identified a massive burden of rheumatic heart disease, which suggests the inadequacy of the 1992 Jones' criteria. E & D studies have identified subclinical carditis in patients with rheumatic fever, as well as in follow-ups of rheumatic heart disease patients who initially presented as having isolated cases of Sydenham's chorea. Signs of a preceding streptococcal infection include: recent scarlet fever, raised antistreptolysin O or other streptococcal antibody titre, or positive throat culture.

Major criteria

- Polyarthritis: A temporary migrating inflammation of the large joints, usually starting in the legs and migrating upwards.
- Carditis: Inflammation of the heart muscle (myocarditis) which can manifest as congestive heart failure with shortness of breath, pericarditis with a rub, or a new heart murmur.
- Subcutaneous nodules: Painless, firm collections of collagen fibers over bones or tendons. They commonly appear on the back of the wrist, the outside elbow, and the front of the knees.
- Erythema marginatum: A long-lasting reddish rash that begins on the trunk or arms as macules, which spread outward and clear in the middle to form rings, which continue to

spread and coalesce with other rings, ultimately taking on a snake-like appearance. This rash typically spares the face and is made worse with heat.
- Sydenham's chorea (St. Vitus' dance): A characteristic series of involuntary rapid movements of the face and arms. This can occur very late in the disease for at least three months from onset of infection.

Minor criteria

- Fever of 38.2–38.9 °C (100.8–102.0 °F)
- Arthralgia: Joint pain without swelling (Cannot be included if polyarthritis is present as a major symptom)
- Raised erythrocyte sedimentation rate or C reactive protein
- Leukocytosis
- ECG showing features of heart block, such as a prolonged PR interval (Cannot be included if carditis is present as a major symptom)
- Previous episode of rheumatic fever or inactive heart disease

Prevention

Rheumatic fever can be prevented by effectively treating strep throat with antibiotics.

In those who have previously had rheumatic fever, antibiotics in a preventative manner are occasionally recommended. As of 2017 the evidence to support long term antibiotics in those with underlying disease; however, is poor.

The American Heart Association suggests that dental health be maintained, and that people with a history of bacterial endocarditis, a heart transplant, artificial heart valves, or "some types of congenital heart defects" may wish to consider long-term antibiotic prophylaxis.

Treatment

The management of rheumatic fever is geared toward the reduction of inflammation with anti-inflammatory medications such as aspirin or corticosteroids. Individuals with positive cultures for strep throat should also be treated with antibiotics.

Aspirin is the drug of choice and should be given at high doses.

One should watch for side effects like gastritis and salicylate poisoning. In children and teenagers, the use of aspirin and aspirin-containing products can be associated with Reye's syndrome, a serious and potentially deadly condition. The risks, benefits, and alternative treatments must always be considered when administering aspirin and aspirin-containing products in children and teenagers. Ibuprofen for pain and discomfort and corticosteroids for moderate to severe inflammatory reactions manifested by rheumatic fever should be considered in children and teenagers.

Vaccine

No vaccines are currently available to protect against *S. pyogenes* infection, although research is underway to develop one. Difficulties in developing a vaccine include the wide variety of strains of *S. pyogenes* present in the environment and the large amount of time and people that will be needed for appropriate trials for safety and efficacy of the vaccine.

Infection

People with positive cultures for *Streptococcus pyogenes* should be treated with penicillin as long as allergy is not present. The use of antibiotics will not alter cardiac involvement in the development of rheumatic fever. Some suggest the use of benzathine benzylpenicillin.

Monthly injections of long-acting penicillin must be given for a period of five years in patients having one attack of rheumatic fever. If there is evidence of carditis, the length of therapy may be up to 40 years. Another important cornerstone in treating rheumatic fever includes the continual use of low-dose antibiotics (such as penicillin, sulfadiazine, or erythromycin) to prevent recurrence.

Inflammation

While corticosteroids are often used, evidence to support this is poor.Salicylates are useful for pain.

Steroids are reserved for cases where there is evidence of an involvement of the heart. The use of steroids may prevent further scarring of tissue and may prevent the development of sequelae such as mitral stenosis.

Heart failure

Some patients develop significant carditis which manifests as congestive heart failure. This requires the usual treatment for heart failure: ACE inhibitors, diuretics, beta blockers, and digoxin. Unlike normal heart failure, rheumatic heart failure responds well to corticosteroids.

Epidemiology

About 33 million people are affected by rheumatic heart disease with an additional 47 million having asymptomatic damage to their heart valves.[35] As of 2010 globally it resulted in 345,000 deaths, down from 463,000 in 1990.

In Western countries, rheumatic fever has become fairly rare since the 1960s, probably due to the widespread use of antibiotics to treat streptococcus infections. While it has been far less common in the United States since the beginning of the 20th century, there have been a few outbreaks since the 1980s. Although the disease seldom occurs, it is serious and has a case-fatality rate of 2–5%.

Rheumatic fever primarily affects children between ages 5 and 17 years and occurs approximately 20 days after strep throat. In up to a third of cases, the underlying strep infection may not have caused any symptoms.

The rate of development of rheumatic fever in individuals with untreated strep infection is estimated to be 3%. The incidence of recurrence with a subsequent untreated infection is substantially greater (about 50%).The rate of development is far lower in individuals who have received antibiotic treatment. Persons who have suffered a case of rheumatic fever have a tendency to develop flare-ups with repeated strep infections.

The recurrence of rheumatic fever is relatively common in the absence of maintenance of low dose antibiotics, especially during the first three to five years after the first episode. Recurrent bouts of rheumatic fever can lead to valvular heart disease. Heart complications may be long-term and severe, particularly if valves are involved. In countries in Southeast-Asia, sub-saharan Africa, and Oceania, the percentage of people with rheumatic heart disease detected by listening to the heart was 2.9 per 1000 children and by echocardiography it was 12.9 per 1000 children.

Lecture number 4.

Subject of the lecture: Arrhythmias and cardiac blockade

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1. Control for the purity of the audience 2. Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work	Listens Write off

	3.Has homework	Write off
Total:90minutes,2 h		

Theoretical part: Valvular Heart Disease

Valvular heart disease is characterized by damage to or a defect in one of the four heart valves: the mitral, aortic, tricuspid or pulmonary.

The **mitral and tricuspid valves** control the flow of blood between the atria and the ventricles (the upper and lower chambers of the heart). The **pulmonary valve** controls the flow of blood from the heart to the lungs, and the **aortic valve** governs blood flow between the heart and the aorta, and thereby the blood vessels to the rest of the body. The **mitral and aortic valves** are the ones most frequently affected by valvular heart disease.

Normally functioning valves ensure that blood flows with proper force in the proper direction at the proper time. In valvular heart disease, the valves become too narrow and hardened (stenotic) to open fully, or are unable to close completely (incompetent).

A stenotic valve forces blood to back up in the adjacent heart chamber, while an incompetent valve allows blood to leak back into the chamber it previously exited. To compensate for poor pumping action, the heart muscle enlarges and thickens, thereby losing elasticity and efficiency. In addition, in some cases, blood pooling in the chambers of the heart has a greater tendency to clot, increasing the risk of stroke or pulmonary embolism.

The severity of valvular heart disease varies. In mild cases there may be no symptoms, while in advanced cases, valvular heart disease may lead to congestive heart failure and other complications. Treatment depends upon the extent of the disease.

When to Call an Ambulance
Call an ambulance if you experience severe chest pain.

When to Call Your Doctor
Call your physician if you develop persistent shortness of breath, palpitations or dizziness.
Symptoms
Valve disease symptoms can occur suddenly, depending upon how quickly the disease develops. If it advances slowly, then your heart may adjust and you may not notice the onset of any symptoms easily. Additionally, the severity of the symptoms does not necessarily correlate to the severity of the valve disease. That is, you could have no symptoms at all, but have severe valve disease. Conversely, severe symptoms could arise from even a small valve leak.

Many of the symptoms are similar to those associated with congestive heart failure, such as shortness of breath and wheezing after limited physical exertion and swelling of the feet, ankles, hands or abdomen (edema). Other symptoms include:

- Palpitations, chest pain (may be mild).
- Fatigue.
- Dizziness or fainting (with aortic stenosis).

- Fever (with bacterial endocarditis).
- Rapid weight gain.

Causes
There are many different types of valve disease; some types can be present at birth (congenital), while others may be acquired later in life.

- Heart valve tissue may degenerate with age.
- Rheumatic fever may cause valvular heart disease.
- Bacterial endocarditis, an infection of the inner lining of the heart muscle and heart valves (endocardium), is a cause of valvular heart disease.
- High blood pressure and atherosclerosis may damage the aortic valve.
- A heart attack may damage the muscles that control the heart valves.
- Other disorders such as carcinoid tumors, rheumatoid arthritis, systemic lupus erythematosus, or syphilis may damage one or more heart valves.
- Methysergide, a medication used to treat migraine headaches, and some diet drugs may promote valvular heart disease.
- Radiation therapy (used to treat cancer) may be associated with valvular heart disease.

Prevention
Get prompt treatment for a sore throat that lasts longer than 48 hours, especially if accompanied by a fever. Timely administration of antibiotics may prevent the development of rheumatic fever which can cause valvular heart disease.

A heart-healthy lifestyle is also advised to reduce the risks of high blood pressure, atherosclerosis and heart attack.

- Don’t smoke.
- Consume no more than two alcoholic beverages a day.
- Eat a healthy, balanced diet low in salt and fat, exercise regularly and lose weight if you are overweight.
- Adhere to a prescribed treatment program for other forms of heart disease.
- If you are diabetic, maintain careful control of your blood sugar.

Diagnosis
During your examination, the doctor listens for distinctive heart sounds, known as heart murmurs, which indicate valvular heart disease. As part of your diagnosis, you may undergo one or more of the following tests:

- An **electrocardiogram**, also called an ECG or EKG, to measure the electrical activity of the heart, regularity of heartbeats, thickening of heart muscle (hypertrophy) and heart-muscle damage from coronary artery disease.
- **Stress testing**, also known as treadmill tests, to measure blood pressure, heart rate, ECG changes and breathing rates during exercise. During this test, the heart’s electrical activity is monitored through small metal sensors applied to your skin while you exercise on a treadmill.
- **Chest X-rays**.
- **Echocardiogram** to evaluate heart function. During this test, sound waves bounced off the heart are recorded and translated into images. The pictures can reveal abnormal heart size, shape and movement. Echocardiography also can be used to calculate the ejection fraction, or volume of blood pumped out to the body when the heart contracts.

- **Cardiac catheterization**, which is the threading of a catheter into the heart chambers to measure pressure irregularities across the valves (to detect stenosis) or to observe backflow of an injected dye on an X-ray (to detect incompetence).

Treatment

The following provides an overview of the treatment options for valvular heart disease:

- Don't smoke; follow prevention tips for a **heart-healthy lifestyle**. Avoid excessive alcohol consumption, excessive salt intake and diet pills—all of which may raise blood pressure.
- Your doctor may adopt a **"watch and wait"** policy for mild or asymptomatic cases.
- **A course of antibiotics** is prescribed prior to surgery or dental work for those with valvular heart disease, to prevent bacterial endocarditis.
- **Long-term antibiotic therapy** is recommended to prevent a recurrence of streptococcal infection in those who have had rheumatic fever.
- **Antithrombotic (clot-preventing) medications** such as aspirin or ticlopidine may be prescribed for those with valvular heart disease who have experienced unexplained transient ischemic attacks, also known as TIAs (see this disorder for more information).
- More **potent anticoagulants**, such as warfarin, may be prescribed for those who have atrial fibrillation (a common complication of mitral valve disease) or who continue to experience TIAs despite initial treatment. Long-term administration of anticoagulants may be necessary following valve replacement surgery, because prosthetic valves are associated with a higher risk of blood clots.
- **Balloon dilatation** (a surgical technique involving insertion into a blood vessel of a small balloon that is led via catheter to the narrowed site and then inflated) may be done to widen a stenotic valve.
- Valve Surgery to repair or replace a damaged valve may be necessary. Replacement valves may be artificial (prosthetic valves) or made from animal tissue (bioprosthetic valves). The type of replacement valve selected depends on the patient's age, condition, and the specific valve affected.

  A number of minimally-invasive cardiac surgeries are performed at the Heart and Vascular Institute. These include:

- Minimally-Invasive Atrial Septal Defect Closure
- Minimally-Invasive Mitral Valve Repair and Replacement
- Minimally-Invasive Aortic Valve Replacement

Cardiac Surgery (Valve Surgery) at Johns Hopkins

What is it? You may have had an illness or injury or been born with a problem that does not let a heart valve work the way it should. You may need to have heart surgery to repair or replace the heart valve.

Why is it necessary? You have four valves in your heart. Valve surgery is needed when one of the valves in your heart is not working, which means the blood is not flowing through your heart in the right way. Sometimes the valve can be repaired. Other times the valve must be replaced, either with a valve from a pig or one that is manmade.

How is it done? The surgeon opens the chest by cutting through the breastbone. The surgeon then connects the heart-lung machine. The machine "acts" as the heart and lungs so that the doctor can work on the heart. Once the surgery is done, the heart starts beating and the machine is stopped. The breastbone is wired together to let the bone heal, which takes about four to six weeks.

For more information on this procedure, including patient information, please see the full description of Cardiac Surgery (Valve Surgery) at Johns Hopkins.

Cardiovascular Diagnostic and Interventional Laboratory at Johns Hopkins

The Johns Hopkins Hospital Cardiovascular Diagnostic and Interventional Laboratory (CVIL) is a state-of-the-art imaging facility performing over 24,000 diagnostic and interventional procedures annually. The CVIL operates 12 procedure rooms.

There are two general areas included in the CVIL: Cardiology and Electrophysiology. The Cardiology section is involved in treating patients with disorders of the heart and vascular tree including coronary artery disease, congestive heart failure, valve disease, congenital heart defects, cardiomyopathy and peripheral vascular disease.

Valvular Heart Disease services included in the CVIL:

- Diagnosis of valvular stenosis and regurgitation.
- Percutaneous mitral valvuloplasty for mitral stenosis.
- Percutaneous pulmonary valvuloplasty for pulmonic stenosis.
- Percutaneous aortic valvuloplasty for aortic stenosis.
- Transcatheter aortic valve replacement
- Transcatheter pulmonary valve replacement

Heart arrhythmia

Overview

Heart rhythm problems (heart arrhythmias) occur when the electrical impulses that coordinate your heartbeats don't work properly, causing your heart to beat too fast, too slow or irregularly.

Heart arrhythmias (uh-RITH-me-uhs) may feel like a fluttering or racing heart and may be harmless. However, some heart arrhythmias may cause bothersome — sometimes even life-threatening — signs and symptoms.

Heart arrhythmia treatment can often control or eliminate fast, slow or irregular heartbeats. In addition, because troublesome heart arrhythmias are often made worse — or are even caused — by a weak or damaged heart, you may be able to reduce your arrhythmia risk by adopting a heart-healthy lifestyle.

Symptoms

Arrhythmias may not cause any signs or symptoms. In fact, your doctor might find you have an arrhythmia before you do, during a routine examination. Noticeable signs and symptoms don't necessarily mean you have a serious problem, however.

Noticeable arrhythmia symptoms may include:

- A fluttering in your chest
- A racing heartbeat (tachycardia)

- A slow heartbeat (bradycardia)
- Chest pain
- Shortness of breath
- Lightheadedness or dizziness
- Sweating
- Fainting (syncope) or near fainting

When to see a doctor

Arrhythmias may cause you to feel premature or extra heartbeats, or you may feel that your heart is racing or beating too slowly. Other signs and symptoms may be related to your heart not pumping effectively due to the fast or slow heartbeat. These include shortness of breath, weakness, dizziness, lightheadedness, fainting or near fainting, and chest pain or discomfort.

Seek urgent medical care if you suddenly or frequently experience any of these signs and symptoms at a time when you wouldn't expect to feel them.

Ventricular fibrillation is one type of arrhythmia that can be deadly. It occurs when the heart beats with rapid, erratic electrical impulses. This causes pumping chambers in your heart (the ventricles) to quiver uselessly instead of pumping blood. Without an effective heartbeat, blood pressure plummets, cutting off blood supply to your vital organs.

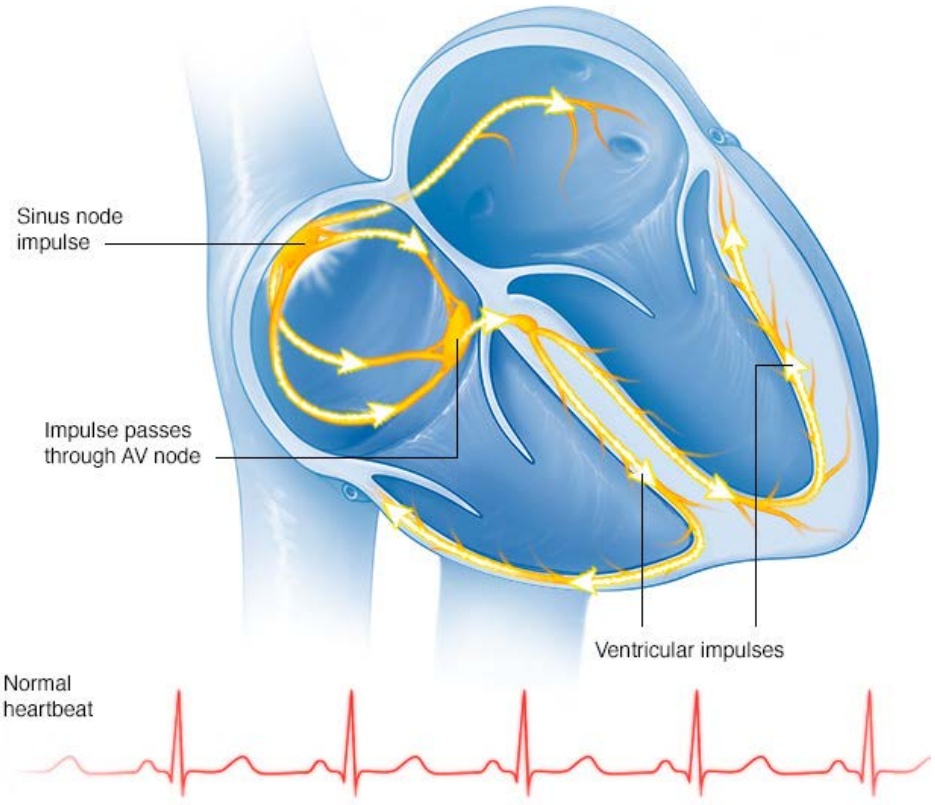
A person with ventricular fibrillation will collapse within seconds and soon won't be breathing or have a pulse. If this occurs, follow these steps:

- Call 911 or the emergency number in your area.
- If there's no one nearby trained in cardiopulmonary resuscitation (CPR), provide hands-only CPR. That means uninterrupted chest compressions at a rate of 100 to 120 a minute until paramedics arrive. To do chest compressions, push hard and fast in the center of the chest. You don't need to do rescue breathing.
- If you or someone nearby knows CPR, begin providing it if it's needed. CPR can help maintain blood flow to the organs until an electrical shock (defibrillation) can be given.
- Find out if an automated external defibrillator (AED) is available nearby. These portable defibrillators, which can deliver an electric shock that may restart heartbeats, are available in an increasing number of places, such as in airplanes, police cars and shopping malls. They can even be purchased for your home.

No training is required. The AED will tell you what to do. It's programmed to allow a shock only when appropriate.

Request an Appointment at Mayo Clinic

Causes



Normal heartbeat

Many things can lead to, or cause, an arrhythmia, including:

- A heart attack that's occurring right now
- Scarring of heart tissue from a prior heart attack
- Changes to your heart's structure, such as from cardiomyopathy
- Blocked arteries in your heart (coronary artery disease)
- High blood pressure
- Overactive thyroid gland (hyperthyroidism)
- Underactive thyroid gland (hypothyroidism)
- Smoking
- Drinking too much alcohol or caffeine

- Drug abuse
- Stress
- Certain medications and supplements, including over-the-counter cold and allergy drugs and nutritional supplements
- Diabetes
- Sleep apnea
- Genetics

What's a normal heartbeat?

Your heart is made up of four chambers — two upper chambers (atria) and two lower chambers (ventricles). The rhythm of your heart is normally controlled by a natural pacemaker (the sinus node) located in the right atrium. The sinus node produces electrical impulses that normally start each heartbeat.

From the sinus node, electrical impulses travel across the atria, causing the atria muscles to contract and pump blood into the ventricles.

The electrical impulses then arrive at a cluster of cells called the atrioventricular node (AV node) — usually the only pathway for signals to travel from the atria to the ventricles.

The AV node slows down the electrical signal before sending it to the ventricles. This slight delay allows the ventricles to fill with blood. When electrical impulses reach the muscles of the ventricles, they contract, causing them to pump blood either to the lungs or to the rest of the body.

In a healthy heart, this process usually goes smoothly, resulting in a normal resting heart rate of 60 to 100 beats a minute.

Types of arrhythmias

Doctors classify arrhythmias not only by where they originate (atria or ventricles) but also by the speed of heart rate they cause:

- **Tachycardia (tak-ih-KAHR-dee-uh).** This refers to a fast heartbeat — a resting heart rate greater than 100 beats a minute.
- **Bradycardia (brad-e-KAHR-dee-uh).** This refers to a slow heartbeat — a resting heart rate less than 60 beats a minute.

Not all tachycardias or bradycardias mean you have heart disease. For example, during exercise it's normal to develop a fast heartbeat as the heart speeds up to provide your tissues with more oxygen-rich blood. During sleep or times of deep relaxation, it's not unusual for the heartbeat to be slower.

Tachycardias in the atria

Tachycardias originating in the atria include:

- **Atrial fibrillation.** Atrial fibrillation is a rapid heart rate caused by chaotic electrical impulses in the atria. These signals result in rapid, uncoordinated, weak contractions of the atria.

  The chaotic electrical signals bombard the AV node, usually resulting in an irregular, rapid rhythm of the ventricles. Atrial fibrillation may be temporary, but some episodes won't end unless treated.

  Atrial fibrillation may lead to serious complications such as stroke.

- **Atrial flutter.** Atrial flutter is similar to atrial fibrillation. The heartbeats in atrial flutter are more-organized and more-rhythmic electrical impulses than in atrial fibrillation. Atrial flutter may also lead to serious complications such as stroke.
- **Supraventricular tachycardia.** Supraventricular tachycardia is a broad term that includes many forms of arrhythmia originating above the ventricles (supraventricular) in the atria or AV node.
- **Wolff-Parkinson-White syndrome.** In Wolff-Parkinson-White syndrome, a type of supraventricular tachycardia, there is an extra electrical pathway between the atria and the ventricles, which is present at birth. However, you may not experience symptoms until you're an adult. This pathway may allow electrical signals to pass between the atria and the ventricles without passing through the AV node, leading to short circuits and rapid heartbeats.

Tachycardias in the ventricles

Tachycardias occurring in the ventricles include:

- **Ventricular tachycardia.** Ventricular tachycardia is a rapid, regular heart rate that originates with abnormal electrical signals in the ventricles. The rapid heart rate doesn't allow the ventricles to fill and contract efficiently to pump enough blood to the body. Ventricular tachycardia can often be a medical emergency. Without prompt medical treatment, ventricular tachycardia may worsen into ventricular fibrillation.

- **Ventricular fibrillation.** Ventricular fibrillation occurs when rapid, chaotic electrical impulses cause the ventricles to quiver ineffectively instead of pumping necessary blood to the body. This serious problem is fatal if the heart isn't restored to a normal rhythm within minutes.

  Most people who experience ventricular fibrillation have an underlying heart disease or have experienced serious trauma, such as being struck by lightning.

- **Long QT syndrome.** Long QT syndrome is a heart disorder that carries an increased risk of fast, chaotic heartbeats. The rapid heartbeats, caused by changes in the electrical system of your heart, may lead to fainting, and can be life-threatening. In some cases, your heart's rhythm may be so erratic that it can cause sudden death.

  You can be born with a genetic mutation that puts you at risk of long QT syndrome. In addition, several medications may cause long QT syndrome. Some medical conditions, such as congenital heart defects, may also cause long QT syndrome.

Bradycardia — A slow heartbeat

Although a heart rate below 60 beats a minute while at rest is considered bradycardia, a low resting heart rate doesn't always signal a problem. If you're physically fit, you may have an efficient heart capable of pumping an adequate supply of blood with fewer than 60 beats a minute at rest.

In addition, certain medications used to treat other conditions, such as high blood pressure, may lower your heart rate. However, if you have a slow heart rate and your heart isn't pumping enough blood, you may have one of several bradycardias, including:

- **Sick sinus syndrome.** If your sinus node, which is responsible for setting the pace of your heart, isn't sending impulses properly, your heart rate may be too slow (bradycardia), or it may speed up (tachycardia) and slow down intermittently. Sick sinus syndrome can also be caused by scarring near the sinus node that's slowing, disrupting or blocking the travel of impulses.
- **Conduction block.** A block of your heart's electrical pathways can occur in or near the AV node, which lies on the pathway between your atria and your ventricles. A block can also occur along other pathways to each ventricle.

  Depending on the location and type of block, the impulses between the upper and lower halves of your heart may be slowed or blocked. If the signal is completely blocked, certain cells in the AV node or ventricles can make a steady, although usually slower, heartbeat.

Some blocks may cause no signs or symptoms, and others may cause skipped beats or bradycardia.

Premature heartbeats

Although it often feels like a skipped heartbeat, a premature heartbeat is actually an extra beat. Even though you may feel an occasional premature beat, it seldom means you have a more serious problem. Still, a premature beat can trigger a longer lasting arrhythmia — especially in people with heart disease.

Premature heartbeats are commonly caused by stress, strenuous exercise or stimulants, such as caffeine or nicotine.

Risk factors

Certain factors may increase your risk of developing an arrhythmia. These include:

- **Coronary artery disease, other heart problems and previous heart surgery.**Narrowed heart arteries, a heart attack, abnormal heart valves, prior heart surgery, heart failure, cardiomyopathy and other heart damage are risk factors for almost any kind of arrhythmia.
- **High blood pressure.** This increases your risk of developing coronary artery disease. It may also cause the walls of your left ventricle to become stiff and thick, which can change how electrical impulses travel through your heart.
- **Congenital heart disease.** Being born with a heart abnormality may affect your heart's rhythm.
- **Thyroid problems.** Having an overactive or underactive thyroid gland can raise your risk of arrhythmias.
- **Drugs and supplements.** Certain over-the-counter cough and cold medicines and certain prescription drugs may contribute to arrhythmia development.
- **Diabetes.** Your risk of developing coronary artery disease and high blood pressure greatly increases with uncontrolled diabetes.
- **Obstructive sleep apnea.** This disorder, in which your breathing is interrupted during sleep, can increase your risk of bradycardia, atrial fibrillation and other arrhythmias.
- **Electrolyte imbalance.** Substances in your blood called electrolytes — such as potassium, sodium, calcium and magnesium — help trigger and conduct the electrical impulses in your heart. Electrolyte levels that are too high or too low can affect your heart's electrical impulses and contribute to arrhythmia development.

- **Drinking too much alcohol.** Drinking too much alcohol can affect the electrical impulses in your heart and can increase the chance of developing atrial fibrillation.
- **Caffeine or nicotine use.** Caffeine, nicotine and other stimulants can cause your heart to beat faster and may contribute to the development of more-serious arrhythmias. Illegal drugs, such as amphetamines and cocaine, may profoundly affect the heart and lead to many types of arrhythmias or to sudden death due to ventricular fibrillation.

Complications

Certain arrhythmias may increase your risk of developing conditions such as:

- **Stroke.** When your heart quivers, it's unable to pump blood effectively, which can cause blood to pool. This can cause blood clots to form. If a clot breaks loose, it can travel from your heart to your brain. There it might block blood flow, causing a stroke.

  Certain medications, such as blood thinners, can greatly lower your risk of stroke or damage to other organs caused by blood clots. Your doctor will determine if a blood-thinning medication is appropriate for you, depending on your type of arrhythmia and your risk of blood clots.

- **Heart failure.** Heart failure can result if your heart is pumping ineffectively for a prolonged period due to a bradycardia or tachycardia, such as atrial fibrillation. Sometimes controlling the rate of an arrhythmia that's causing heart failure can improve your heart's function.

Prevention

To prevent heart arrhythmia, it's important to live a heart-healthy lifestyle to reduce your risk of heart disease. A heart-healthy lifestyle may include:

- Eating a heart-healthy diet
- Increasing your physical activity
- Avoiding smoking
- Keeping a healthy weight
- Limiting or avoiding caffeine and alcohol
- Reducing stress, as intense stress and anger can cause heart rhythm problems
- Using over-the-counter medications with caution, as some cold and cough medications contain stimulants that may trigger a rapid heartbeat

Lecture number 5.

Subject of the lecture: IHD. Angina pectoris. Myocardial infarction.

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
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Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
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	conclusions. Active students are encouraged	
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total:90minutes,2 h		

Ischemic heart disease

Ischemic heart disease is a condition of recurring chest pain or discomfort that occurs when a part of the heart does not receive enough blood. This condition occurs most often during exertion or excitement, when the heart requires greater blood flow. Ischemic heart disease, also called coronary heart disease, is common in the United States and is a leading cause of death worldwide.

Ischemic heart disease develops when cholesterol particles in the blood begin to accumulate on the walls of the arteries that supply blood to the heart. Eventually, deposits called plaques may form. These deposits narrow the arteries and eventually block the flow of blood. This decrease in blood flow reduces the amount of oxygen supplied to the heart muscle.

The signs and symptoms of ischemic heart disease may develop slowly as arteries gradually become blocked, or they may occur quickly if an artery suddenly becomes blocked. Some people with ischemic heart disease have no symptoms at all, while others may have severe chest pain (angina) and shortness of breath that can pose a risk of heart attack.

Fortunately, ischemic heart disease can be treated successfully with lifestyle changes, medicines, and surgical procedures. Even better, you can reduce your risk of ischemic heart disease by following heart-healthy practices, such as eating a low-fat, low-sodium diet, being physically active, not smoking, and maintaining a healthy body weight.

Left untreated, ischemic heart disease may lead to severe heart damage. Heart damage can result in heart attack and shock and may be life threatening. Seek immediate medical care (call 911) for serious symptoms, such as difficulty breathing, which may be accompanied by pale or blue lips, rapid heart rate (tachycardia), and severe chest pain. Seek prompt medical care if you are being treated for angina but have mild symptoms that recur or are persistent.

What are the symptoms of ischemic heart disease?

Ischemic heart disease reduces the flow of blood to the coronary arteries, which carry oxygen to the heart. This reduction in blood flow may result in a number of symptoms, which can vary in intensity among individuals.

Common symptoms of ischemic heart disease

You may experience ischemic heart disease symptoms daily or just occasionally. Common symptoms include chest pain, chest pressure, or shortness of breath that:

- Is relieved by rest or medicine
- May feel as if pain starting in the chest spreads to the arms, back, or other areas
- May feel like gas or indigestion (more common in women)
- Occurs repeatedly; episodes tend to be alike
- Occurs when the heart must work harder, usually during physical exertion
- Usually lasts a short time (five minutes or less)

Serious symptoms that might indicate a life-threatening condition

In some cases, ischemic heart disease can be life threatening. Seek immediate medical care (call 911) if you, or someone you are with, have any of these life-threatening symptoms including:

- Chest pain, typically on the left side of the body (angina pectoris)
- Clammy skin
- Nausea with or without vomiting
- Pain in the neck or jaw
- Rapid breathing (tachypnea) or shortness of breath
- Shoulder or arm pain

What causes ischemic heart disease?

Ischemic heart disease is caused by a decrease in blood flow through one or more of the blood vessels that carry oxygen to your heart (coronary arteries). When blood flow is reduced, the heart muscle does not receive the amount of oxygen it needs to function properly.

Ischemic heart disease may develop slowly, as plaque builds up over time, or it may occur quickly if an artery is suddenly blocked. For this reason, ischemic heart disease occurs most frequently in people who have atherosclerosis (buildup of plaque on the walls of the coronary arteries), blood clots, coronary artery spasm, or severe illnesses that increase the heart's need for oxygen.

What are the risk factors for ischemic heart disease?

A number of factors increase the risk of developing ischemic heart disease. Not all people with risk factors will get ischemic heart disease. Risk factors for ischemic heart disease include:

- Diabetes
- Family history of heart disease
- High blood cholesterol
- High blood pressure
- High blood triglycerides
- Obesity

- Physical inactivity
- Smoking and other tobacco use

Reducing your risk of ischemic heart disease

You may be able to lower your risk of ischemic heart disease by:

- Carefully managing your diabetes, if applicable
- Getting regular physical activity
- Keeping your cholesterol at a healthy level
- Maintaining normal blood pressure
- Quitting smoking and other tobacco use
- Reducing the amount of cholesterol and fat in your diet

How is ischemic heart disease treated?

Treatment for ischemic heart disease begins with seeking medical care from your health care provider. To determine if you have ischemic heart disease, your health care provider will ask you to undergo several diagnostic tests.

Medications used to treat ischemic heart disease

Drug therapy is commonly used for treatment of ischemic heart disease and includes:

- Angiotensin-converting enzyme (ACE) inhibitors, which relax the blood vessels and lower blood pressure
- Angiotensin receptor blockers (ARBs), which lower blood pressure
- Anti-ischemic agents such as ranolazine (Ranexa)
- Antiplatelet drugs, which prevent the formation of blood clots
- Beta-blockers, which lower the heart rate
- Calcium channel blockers, which reduce workload on the heart muscle
- Nitrates, which dilate the blood vessels
- Statins, which lower cholesterol

Many different medicines are available to treat ischemic heart disease. Your health care provider will work with you to select the appropriate medications, depending on your individual condition. It is important to follow your treatment plan for ischemic heart disease precisely and to take all of the medications as instructed.

Surgical procedures used to treat ischemic heart disease

Severe symptoms that are not relieved by medication alone are treated with surgical procedures including:

- Angioplasty and stent placement (procedure to remove plaque and restore blood flow in clogged arteries)

- Coronary artery bypass graft (procedure that helps restore blood flow to the heart by routing the flow through transplanted arteries)

What you can do to improve your ischemic heart disease

In addition to following your treatment plan, you may be able to improve your ischemic heart disease by:

- Carefully managing your diabetes, if applicable
- Getting regular physical activity
- Keeping your cholesterol at a healthy level
- Maintaining normal blood pressure
- Quitting tobacco use
- Reducing cholesterol and fat in your diet
-

What are the potential complications of ischemic heart disease?

You can help minimize your risk of serious complications by following the treatment plan you and your health care professional design specifically for you. Complications of ischemic heart disease include:

- Arrythmia (irregular heart rhythm)
- Chronic angina
- Congestive heart failure
- Heart damage
- Myocardial infarction (heart attack)

Stenocardia is a sudden shortage of oxygen in the heart muscle due to narrowing of the coronary arteries of the heart. This shortage, which is observed mainly during physical or emotional stress, is the cause of chest pain, or compression pressing nature. In addition, the feeling of tightness in the chest that occurs during the attack often makes people fear.

Symptoms

- Pain radiating to the arms, neck and abdomen.
- Shortness of breath.
- A feeling of tightness in the chest.
- Fear.

Causes

Blood supply to the heart muscle (myocardium) is done by coronary arteries. When they become narrow, blood flow to the heart muscle becomes insufficient. As a rule, the cause of narrowing is calcification of the arteries (atherosclerosis), in rare cases – heart disease (damaged heart valves).

Treatment

In each case, the using of therapeutic agents depends on the frequency and severity of attacks. Usually nitroglycerin tablets are prescribed to patients (nitroglycerin dilates blood vessels, and the pain in a few minutes pass). Patients with recurrent stenocardia, should take extra medication, the effect of which is longer. If stenocardia is not reduced with medical treatment, then the artery bypass surgery is done – imposing bypass graft lesions of the coronary arteries. Smokers should first of all stop smoking, limit consumption of fatty foods – and the first and the second contributes to atherosclerosis, in addition, when smoking there are more narrowing vessels. You should regularly move, but at a moderate pace, as too much exercise can be dangerous. If frequent stenocardia, for prevention before a planned physical activity you can take nitroglycerin

Myocardial infarction (MI)

Myocardial infarction (MI) (ie, heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia). Approximately 1.5 million cases of MI occur annually in the United States. See the images below.

Acute myocardial infarction, reperfusion type. In this case, the infarct is diffusely hemorrhagic. There is a rupture track through the center of this posterior left ventricular transmural infarct. The mechanism of death was hemopericardium

Acute anterior myocardial infarction.

Signs and symptoms

Patients with typical MI may have the following symptoms in the days or even weeks preceding the event (although typical STEMI may occur suddenly, without warning):

- Fatigue
- Chest discomfort
- Malaise

Typical chest pain in acute MI has the following characteristics:

- Intense and unremitting for 30-60 minutes
- Substernal, and often radiates up to the neck, shoulder, and jaw, and down the left arm

- Usually described as a substernal pressure sensation that also may be characterized as squeezing, aching, burning, or even sharp
- In some patients, the symptom is epigastric, with a feeling of indigestion or of fullness and gas

The patient’s vital signs may demonstrate the following in MI:

- The patient’s heart rate is often increased (tachycardic) secondary to a high sympathoadrenal discharge
- The pulse may be irregular because of ventricular ectopy, an accelerated idioventricular rhythm, ventricular tachycardia, atrial fibrillation or flutter, or other supraventricular arrhythmias; bradyarrhythmias may be present
- In general, the patient's blood pressure is initially elevated because of peripheral arterial vasoconstriction resulting from an adrenergic response to pain and ventricular dysfunction
- However, with right ventricular MI or severe left ventricular dysfunction, hypotension and cardiogenic shock can be seen
- The respiratory rate may be increased in response to pulmonary congestion or anxiety
- Coughing, wheezing, and the production of frothy sputum may occur

See Clinical Presentation for more detail.

Diagnosis

Laboratory studies

Laboratory tests used in the diagnosis of MI include the following:

- Cardiac biomarkers/enzymes: The American College of Cardiology/American Heart Association (ACC/AHA) and the European Society of Cardiology (ESC) guidelines recommend that cardiac biomarkers should be measured at presentation in patients with suspected MI, and that the only biomarker that is recommended to be used for the diagnosis of acute MI at this time is cardiac troponin due to its superior sensitivity and accuracy. [1, 2, 3, 4]
- Troponin levels: Troponin is a contractile protein that normally is not found in serum; it is released only when myocardial necrosis occurs
- Complete blood cell count
- Comprehensive metabolic panel
- Lipid profile

Electrocardiography

The ECG is the most important tool in the initial evaluation and triage of patients in whom an acute coronary syndrome (ACS), such as MI, is suspected. It is confirmatory of the diagnosis in approximately 80% of cases.

Cardiac imaging

For individuals with highly probable or confirmed acute MI, coronary angiography can be used to definitively diagnose or rule out coronary artery disease.

See Workup for more detail.

Management

Prehospital care

For patients with chest pain, prehospital care includes the following:

- Intravenous access, supplemental oxygen if SaO 2 is less than 90%, pulse oximetry
- Immediate administration of aspirin
- Nitroglycerin for active chest pain, given sublingually or by spray
- Telemetry and prehospital ECG, if available

Emergency department and inpatient care

Initial stabilization of patients with suspected MI and ongoing acute chest pain should include administration of sublingual nitroglycerin if patients have no contraindications to it.

The American Heart Association (AHA) recommends the initiation of beta blockers to all patients with STEMI (unless beta blockers are contraindicated). [1, 2]

If STEMI is present and the patient is within 90 minutes of a PCI-capable facility, the patient should undergo emergent coronary angiography and primary PCI. If the patient is longer than 120 minutes from a PCI-capable facility, fibrinolysis should be considered. [2]

Although patients presenting without ST-segment elevation (non-STE-ACS) are not candidates for immediate administration of thrombolytic agents, they should receive anti-ischemic therapy and may be candidates for PCI urgently or during admission.

Coronary care units have reduced early mortality rates from acute MI by approximately 50% by providing immediate defibrillation and by facilitating the implementation of beneficial interventions. These interventions include the administration of intravenous (IV) medications and therapy designed to do the following:

- Limit the extent of MI
- Salvage jeopardized ischemic myocardium
- Recanalize infarct-related arteria

Background

Myocardial infarction (MI) usually results from an imbalance in oxygen supply and demand, which is most often caused by plaque rupture with thrombus formation in an epicardial coronary artery, resulting in an acute reduction of blood supply to a portion of the myocardium. (See Etiology for details.)

The electrocardiographic (ECG) results of an acute MI are seen below.

Acute inferior myocardial infarction.

Although the clinical presentation of a patient is a key component in the overall evaluation of the patient with MI, many events are either "silent" or are not clinically recognized by patients, families, and health care providers. (See Presentation.) The appearance of cardiac biomarkers in the circulation generally indicates myocardial necrosis and is a useful adjunct to diagnosis. (See Workup.)

MI is considered part of a spectrum referred to as acute coronary syndrome (ACS). The ACS continuum representing ongoing myocardial ischemia or injury consists of unstable angina, non–ST-segment elevation MI (NSTEMI)—collectively referred to as non–ST-segment acute coronary syndrome (NSTE ACS)—and ST-segment elevation MI (STEMI). Patients with ischemic discomfort may or may not have ST-segment or T-wave changes denoted on the electrocardiogram (ECG). ST elevations seen on the ECG reflect active and ongoing transmural myocardial injury. Without immediate reperfusion therapy, most patients with STEMI develop Q waves, reflecting a dead zone of myocardium that has undergone irreversible damage and death. Those without ST elevations are diagnosed either with unstable angina or NSTEMI—differentiated by the presence of cardiac enzymes. Both these conditions may or may not have changes on the surface ECG, including ST-segment depressions or T-wave morphological changes.

MI may lead to impairment of systolic or diastolic function and to increased predisposition to arrhythmias and other long-term complications.

Coronary thrombolysis and mechanical revascularization have revolutionized the primary treatment of acute MI, largely because they allow salvage of the myocardium when implemented early after the onset of ischemia. (See Treatment.)

The modest prognostic benefit of an opened infarct-related artery may be realized even when recanalization is induced only 6 hours or more after the onset of symptoms; that is, when the salvage of substantial amounts of jeopardized ischemic myocardium is no longer likely. The opening of an infarct-related artery may improve ventricular function and collateral blood flow; prevent ventricular remodeling, as well as decrease infarct expansion, ventricular aneurysm formation, and left ventricular dilatation; and reduce late arrhythmia associated with ventricular aneurysms, and mortality. [5, 6, 7]

Evidence suggests a benefit from the use of beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers, and statins.

The American College of Cardiology (ACC)/American Heart Association (AHA)/European Society of Cardiology/World Heart Federation released the Observations From the TRITON-TIMI 38 Trial (Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition With Prasugrel–Thrombolysis in Myocardial Infarction 38), which better outlines a universal definition of MI, along with a classification system and risk factors for cardiovascular death.

Definitions

The third universal definition of myocardial infarction

Myocardial infarction (MI), commonly known as a heart attack, is defined pathologically as the irreversible death of myocardial cells caused by ischemia. Clinically, MI is a syndrome that can be recognized by a set of symptoms, chest pain being the hallmark of these symptoms in most cases, supported by biochemical laboratory changes, electrocardiographic (ECG) changes, or findings on imaging modalities able to detect myocardial injury and necrosis.

According to the third universal definition of MI, implemented by a joint task force from the European Society of Cardiology (ESC), American College of Cardiology (ACC) Foundation, American Heart Association (AHA), and the World Heart Federation (WHF), MI is diagnosed when either of the following two criteria are met.

1. Detection of an increase or decrease in cardiac biomarker values (preferably using cardiac troponin [cTn]) with at least one value above the 99th percentile of the upper reference limit (URL) and with at least one of the following findings:

- Symptoms of ischemia
- New or presumed new significant ST-segment-T wave (ST-T) changes or new left bundle branch block (LBBB)
- Development of pathologic Q waves on the ECG
- Imaging evidence of new loss of viable myocardium or a new regional wall motion abnormality
- Identification of an intracoronary thrombus by angiography or autopsy

2. Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemic changes or injury or new BBB on ECG, but death occurred before cardiac biomarker levles were obtained, or before cardiac biomarker values would be increased.

Types of MI

The Joint ESC/ACCF/AHA/WHF Task Force further classified MI into 5 types on the basis of the underlying cause :

- Type 1 (spontaneous MI): Related to atherosclerotic plaque rupture, ulceration, fissuring, erosion, or dissection with intraluminal thrombus in one or more of the coronary arteries, leading to decreased myocardial blood flow or distal platelet emboli and thereby resulting in myocyte necrosis. The patient may or may not have underlying obstructive coronary artery disease (CAD).
- Type 2 (MI secondary to an ischemic imbalance): MI consequent to increased oxygen demand or a decreased supply (eg, coronary endothelial dysfunction, coronary artery spasm, coronary artery embolus, tachyarryhthmias/bradyarrhythmias, anemia, respiratory failure, hypertension, or hypotension).
- Type 3 (MI resulting in death when biomarker values are unavailable): Sudden, unexpected cardiac death before blood samples for biomarkers could be drawn or before their appearance in the circulation.
- Type 4a (MI related to percutaneous coronary intervention [PCI]): Elevation of biomarker values (cTn is preferred) to more than 5 times the 99 th percentile of the URL in patients with normal baseline values (<99 th percentile URL) or a rise of values over 20% if the baseline values are elevated but stable or falling. In addition, any of the following are required: (1) symptoms suggestive of myocardial ischemia; (2) new ischemic ECG changes or new BBB; (3) angiographic loss of patency of a major coronary artery or a side branch or persistent slow flow or no flow or embolization; or (4) demonstration of the new loss of viable myocardium or new regional wall motion abnormality by cardiac imaging.
- Type 4b (MI related to stent thrombosis): MI associated with stent thrombosis as detected by coronary angiography or autopsy in the setting of myocardial ischemia in combination with a rise and/or fall of cardiac biomarkers with at least one value above the 99 th percentile URL.
- Type 5 (MI related to coronary artery bypass grafting [CABG]): Elevation of cardiac biomarker values more than 10 times the 99 th percentile URL in patients with normal baseline cTn values. In addition, either (1) new pathologic Q waves or new BBB, (2) angiographic-documented new graft or native coronary artery occlusion, or (3) evidence of new loss of viable myocardium or new regional wall motion abnormality by cardiac imaging is required.

Acute coronary syndrome

The term "acute coronary syndrome" (ACS) refers to a spectrum of conditions that occur due to acute myocardial ischemia and/or infarction as a result of an abrupt reduction in blood flow through the coronary artery circulation.

ACS is divided into two main categories, non–ST elevation (NSTE) ACS and ST-elevation MI (STEMI)

Lecture number 6.

Subject of the lecture: Chronic hepatitis.

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1. Control for the purity of the audience 2. Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work	Listens Write off

	3.Has homework	Write off
Total:90minutes,2 h		

Theoretical part:

Chronic hepatitis is inflammation of the liver that lasts at least 6 months.

- Common causes include hepatitis B and C viruses and certain drugs.
- Many people have no symptoms, but some have vague symptoms, such as a general feeling of illness, poor appetite, and fatigue.
- Chronic hepatitis can result in cirrhosis with portal hypertension and liver failure.
- A biopsy is done to confirm the diagnosis.
- Drugs, such as antiviral drugs or corticosteroids, may be used, and for advanced disease, liver transplantation may be needed.

Chronic hepatitis, although much less common than acute hepatitis, can persist for years, even decades. In many people, it is quite mild and does not cause significant liver damage. However, in some people, continued inflammation slowly damages the liver, eventually resulting in cirrhosis (severe scarring of the liver), liver failure, and sometimes liver cancer.

Causes

The most common causes of chronic hepatitis are

- Hepatitis C virus
- Hepatitis B virus
- Fatty liver not due to alcohol use (nonalcoholic steatohepatitis)
- Alcoholic hepatitis
- Autoimmune hepatitis

Hepatitis C virus causes about 60 to 70% of cases, and at least 75% of acute hepatitis C cases become chronic.

About 5 to 10% of **hepatitis B** cases, sometimes with hepatitis D coinfection, become chronic. (Hepatitis D does not occur by itself. It occurs only as a coinfection with hepatitis B.) Acute hepatitis B becomes chronic in up to 90% of infected newborns and in 25 to 50% of young children.

Rarely, **hepatitis E virus** causes chronic hepatitis in people with a weakened immune system, such as those who are taking drugs to suppress the immune system after an organ transplant, who are taking drugs to treat cancer, or who have HIV infection.

Hepatitis A virus does not cause chronic hepatitis.

Nonalcoholic steatohepatitis usually occurs in people with excess body weight (obesity), diabetes, and/or abnormal levels of cholesterol and other fats (lipids) in the blood. All of these conditions cause the body to synthesize more fat or process (metabolize) and excrete fat more slowly. As a result, fat accumulates and is then stored inside liver cells (called fatty liver). Fatty liver can lead to chronic inflammation and cirrhosis.

Alcohol, after being absorbed in the digestive tract, is usually processed (metabolized) in the liver. As alcohol is processed, substances that can damage the liver are produced. Alcoholic

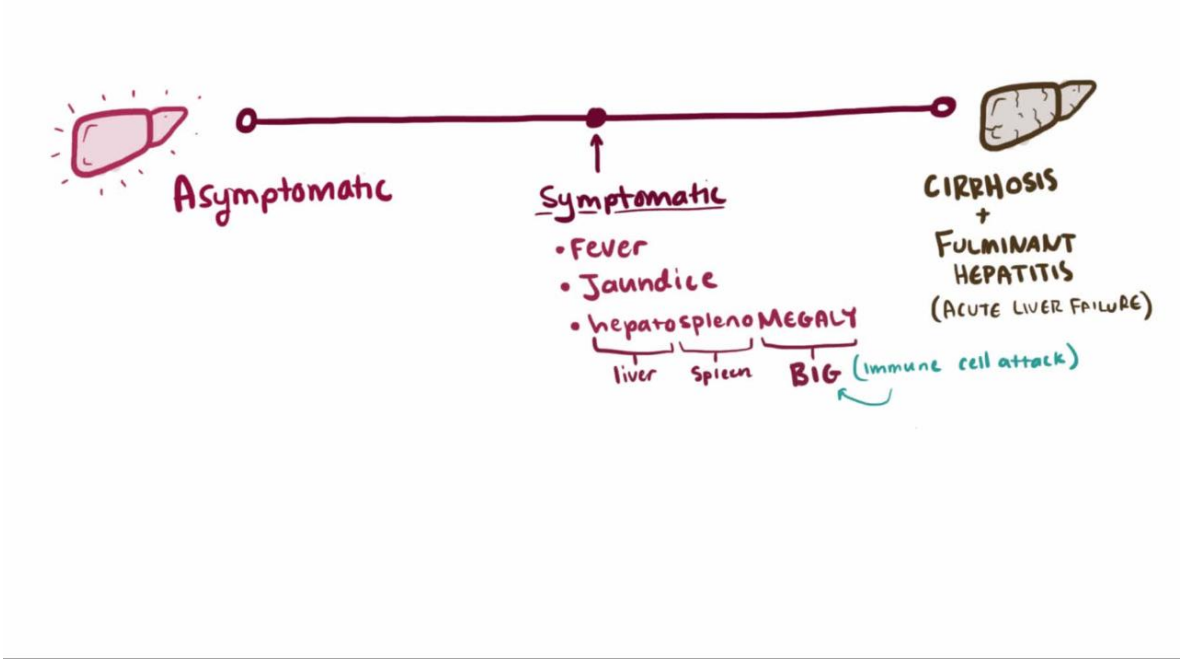
hepatitis typically occurs in people who drink heavily for many months or years. Alcoholic hepatitis is characterized by fatty liver and widespread liver inflammation that can result in the death of liver cells. If people continue drinking, scar tissue can form in the liver and may eventually replace a large amount of normal liver tissue, resulting in cirrhosis.

In **autoimmune hepatitis,** the chronic inflammation resembles inflammation caused by the body attacking its own tissues (an autoimmune reaction). Autoimmune hepatitis is more common among women than men.

Certain **drugs** can cause chronic hepatitis, particularly when they are taken for a long time. They include isoniazid, methyldopa, and nitrofurantoin.

Less often, chronic hepatitis results from

- Alpha-1 antitrypsin deficiency (a hereditary disorder)
- Celiac disease
- Hemochromatosis (a hereditary disorder that causes the body to absorb too much iron)
- A thyroid disorder
- In children and young adults, Wilson disease (a rare hereditary disorder involving abnormal retention of copper in the liver)



Overview of Autoimmune Hepatitis

No one knows exactly why a particular virus or drug causes chronic hepatitis in some people but not in others or why the degree of severity varies.

Symptoms

In about two thirds of people, chronic hepatitis develops gradually, often without causing any symptoms of a liver disorder until cirrhosis occurs. In the remaining one third, it develops after a bout of acute viral hepatitis that persists or returns (often several weeks later).

Symptoms of chronic hepatitis often include a vague feeling of illness (malaise), poor appetite, and fatigue. Sometimes affected people also have a low-grade fever and some discomfort in the upper abdomen. Jaundice is rare.

Often, the first specific symptoms are those of chronic liver disease or cirrhosis. They can include

- An enlarged spleen
- Small spiderlike blood vessels visible in the skin (called spider angiomas)
- Redness of the palms
- Accumulation of fluid within the abdomen (ascites)
- Deterioration of brain function (hepatic encephalopathy)

Brain function deteriorates because the badly damaged liver cannot remove toxic substances from the blood as it normally does. These substances then build up in the blood and reach the brain. Normally, the liver removes them from the blood, breaks them down, then excretes them as harmless by-products into the bile (the greenish yellow fluid that aids in digestion) or blood (see Functions of the Liver). Treatment of hepatic encephalopathy can prevent the deterioration of brain function from becoming permanent.

Portal hypertension develops because the large amount of scar tissue in the liver interferes with blood flowing through the liver. As a result, blood backs up in the veins that bring blood to the liver (portal veins), and pressure in these veins increases.

Blood cannot clot as it normally does because the damaged liver can no longer synthesize enough of the proteins that help blood clot.

A few people have jaundice, itchiness, and light-colored stools. Jaundice and itchiness develop because the damaged liver cannot remove bilirubin from the blood as it normally does. Bilirubin then builds up in the blood and is deposited in the skin. Bilirubin is a yellow pigment produced as a waste product during the normal breakdown of red blood cells. Stool is light-colored because the flow of bile out of the liver is blocked and less bilirubin is eliminated in stool. Bilirubin is what gives stool its typical brown color.

Autoimmune hepatitis may cause other symptoms that involve other body systems. Symptoms can include cessation of menstrual periods, joint pain and swelling, loss of appetite, and nausea. People with autoimmune hepatitis may also have other autoimmune disorders such as type I diabetes mellitus, ulcerative colitis, celiac sprue, or autoimmune disorders that cause anemia or inflammation of the thyroid gland or kidneys.

In many people, chronic hepatitis does not progress for years. In others, it gradually worsens. The outlook depends partly on which virus is the cause:

- Chronic hepatitis C, if untreated, causes cirrhosis in about 20 to 30% of people. However, cirrhosis may take decades to develop. The risk of liver cancer is increased usually only if cirrhosis is present.
- Chronic hepatitis B tends to worsen, sometimes rapidly but sometimes over decades, leading to cirrhosis. Chronic hepatitis B also increases the risk of liver cancer whether cirrhosis develops or not. Occasionally, chronic hepatitis B resolves on its own, without treatment.
- Chronic coinfection with hepatitis B and D, if untreated, causes cirrhosis in up to 70%.

- Autoimmune hepatitis can be effectively treated in most people, but some develop cirrhosis.
- Chronic hepatitis caused by a drug may completely resolve once the drug is stopped.

Diagnosis

- Blood tests
- A biopsy

Doctors may suspect chronic hepatitis when

- People have typical symptoms.
- Blood tests (done for other reasons) detect elevated liver enzymes.
- People have had acute hepatitis before.

Also, everyone born between 1945 and 1965, regardless of whether symptoms are present, should be tested once for hepatitis C. Such testing is recommended because hepatitis C is common among this age group and is often unrecognized.

Testing for chronic hepatitis usually begins with blood tests to determine how well the liver is functioning and whether it is damaged (liver function tests). Liver function tests involve measuring the levels of liver enzymes and other substances produced by the liver. These tests may help establish or exclude the diagnosis of hepatitis, identify the cause, and determine the severity of liver damage.

Blood tests are also done to help doctors identify which hepatitis virus is causing the infection. If no virus is identified, other blood tests are needed to check for other causes, such as autoimmune hepatitis.

However, a liver biopsy may be necessary to confirm the diagnosis. The liver biopsy also enables a doctor to do the following:

- Determine how severe the inflammation is
- Determine whether any scarring or cirrhosis has developed
- Possibly help identify the cause of hepatitis

Other tests may be done to determine how badly the liver is damaged and to check for other liver problems. Tests may include

- Specialized imaging tests, such as ultrasound elastography and magnetic resonance elastography
- Blood tests to measure substances (called markers) that indicate whether and how much fibrosis is present

Screening for liver cancer

If people have chronic hepatitis B, screening for liver cancer is done every 6 months. Two tests are used:

- Ultrasonography
- Sometimes measurement of levels of alpha-fetoprotein in the blood

Levels of alpha-fetoprotein—a protein normally produced by immature liver cells in fetuses—may be elevated when liver cancer is present.

People with chronic hepatitis C are screened similarly, but only if they have cirrhosis.

Treatment

- Treatment of the cause (such as antiviral drugs for hepatitis B or C)
- Treatment of complications

Treatment of chronic hepatitis focuses on treating the cause and managing the complications, such as ascites and hepatic encephalopathy.

If a drug is the cause, the drug is stopped. If another disorder is the cause, it is treated.

Hepatitis B and C

If chronic hepatitis B or chronic hepatitis C is worsening or if liver enzyme levels are high, people are usually given antiviral drugs.

In some people, hepatitis B tends to recur once drug treatment is stopped and may be even more severe. Thus, these people may need to take an antiviral drug indefinitely.

For chronic hepatitis C, treatment can last from 8 to 24 weeks. Treating hepatitis C can eliminate the virus from the body and thus stop inflammation and prevent scarring, which can lead to cirrhosis.

Nonalcoholic steatohepatitis

Treatment of nonalcoholic steatohepatitis focuses on managing the conditions that contribute to it. For example, treatment may include

- Losing weight
- Eating a healthy diet (which can help control weight, diabetes, and possibly lipid levels)
- Taking drugs to treat diabetes
- Taking drugs to lower lipid levels
- Not taking drugs that can contribute to the disorder (such as tamoxifen, corticosteroids, and synthetic estrogens)

Autoimmune hepatitis

Usually, corticosteroids (such as prednisone) are used to treat autoimmune hepatitis, sometimes with azathioprine, a drug used to suppress the immune system. These drugs suppress the inflammation, relieve symptoms, and improve long-term survival. Nevertheless, scarring in the liver may gradually worsen.

Stopping these drugs usually leads to recurrence of the inflammation, so most people have to take the drugs indefinitely. However, taking corticosteroids for a long time can have significant side effects. So doctors usually gradually reduce the dose of the corticosteroid so that people can stop taking it. People then take azathioprine or mycophenolate (other drugs that suppress the immune system) indefinitely.

Treatment of complications

Regardless of the cause or type of chronic hepatitis, cirrhosis, liver failure, and their complications require treatment.

Treating ascites involves restricting salt consumption and taking a drug that helps the kidneys excrete more sodium and water into the urine (a diuretic).

Treating hepatic encephalopathy involves taking drugs to help the body eliminate the toxic substances that can cause the brain function to deteriorate.

Liver transplantation

Liver transplantation may be considered for people with severe liver failure.

Lecture number 7.

Subject of the lecture: Glomerulonephritis.Chronic pyelonephritis.

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
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1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10	1. Make the final conclusions	Listens

minutes)	2. Gives independent work 3.Has homework	Write off Write off
Total:90minutes,2 h		

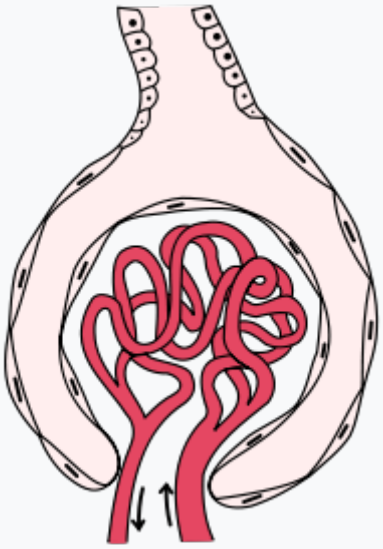
Theoretical part:

Glomerulonephritis (**GN**), also known as **glomerular nephritis**, is a term used to refer to several kidney diseases (usually affecting both kidneys). Many of the diseases are characterised by inflammation either of the glomeruli or of the small blood vessels in the kidneys, hence the name,[1] but not all diseases necessarily have an inflammatory component.

As it is not strictly a single disease, its presentation depends on the specific disease entity: it may present with isolated hematuria and/or proteinuria (blood or protein in the urine); or as a nephrotic syndrome, a nephritic syndrome, acute kidney injury, or chronic kidney disease.

They are categorized into several different pathological patterns, which are broadly grouped into non-proliferative or proliferative types. Diagnosing the pattern of GN is important because the outcome and treatment differs in different types. Primary causes are intrinsic to the kidney. Secondary causes are associated with certain infections (bacterial, viral or parasitic pathogens), drugs, systemic disorders (SLE, vasculitis), or diabetes.

Signs and symptoms



A glomerulus, a functional unit that represents the first step in the filtration of blood and generation of urine.

Glomerulonephritis refers to an inflammation of the glomerulus, which is the unit involved in filtration in the kidney. This inflammation typically results in one or both of the nephrotic or nephritic syndromes.

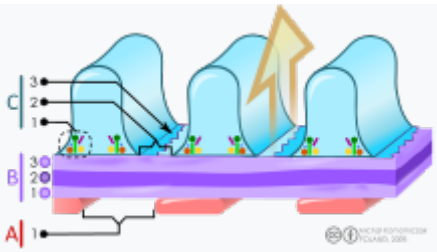
Nephrotic syndrome

Main article: Nephrotic syndrome

The nephrotic syndrome is characterised by the finding of edema in a person with increased protein in the urine and decreased protein in the blood, with increased fat in the blood. Inflammation that affects the cells surrounding the glomerulus, podocytes, increases the

permeability to proteins, resulting in an increase in excreted proteins. When the amount of proteins excreted in the urine exceeds the liver's ability to compensate, fewer proteins are detected in the blood - in particular albumin, which makes up the majority of circulating proteins. With decreased proteins in the blood, there is a decrease in the oncotic pressure of the blood. This results in edema, as the oncotic pressure in tissue remains the same. Although decreased intravascular oncotic (i.e. osmotic) pressure partially explains the patient's edema, more recent studies have shown that extensive sodium retention in the distal nephron (collecting duct) is the predominant cause of water retention and edema in the nephrotic syndrome.[3] This is worsened by the secretion of the hormone aldosterone by the adrenal gland, which is secreted in response to the decrease in circulating blood and causes sodium and water retention. Hyperlipidemia is thought to be a result of the increased activity of the liver.

Nephritic syndrome



Podocytes, cells which line the glomerulus, are negatively charged and have small gaps, preventing the filtration of large molecules. When damaged by inflammation, this can result in an increased permeability to proteins

Main article: Nephritic syndrome

The nephritic syndrome is characterised by blood in the urine (especially Red blood cell casts with dysmorphic red blood cells) and a decrease in the amount of urine in the presence of hypertension. In this syndrome, inflammatory damage to cells lining the glomerulus are thought to result in destruction of the epithelial barrier, leading to blood being found in the urine. At the same time, reactive changes, e.g. proliferation of mesangial cells, may result in a decrease in kidney blood flow, resulting in a decrease in the production of urine. The renin-angiotensin system may be subsequently activated, because of the decrease in perfusion of juxtaglomerular apparatus, which may result in hypertension.

Nonproliferative

This is characterised by forms of glomerulonephritis in which the number of cells is not changed. These forms usually result in the nephrotic syndrome. Causes include:

Minimal change disease

Main article: Minimal change disease

Minimal change disease is characterised as a cause of nephrotic syndrome without visible changes in the glomerulus on microscopy. Minimal change disease typically presents with edema, an increase in proteins passed from urine and decrease in blood protein levels, and an increase in circulating lipids (i.e., nephrotic syndrome) and is the most common cause of the nephrotic syndrome in children. Although no changes may be visible by light microscopy, changes on electron microscopy within the glomerules may show a fusion of the foot processes of the podocytes (cells lining the basement membrane of the capillaries of glomerulus). It is typically managed with corticosteroids and does not progress to chronic kidney disease.

Focal segmental glomerulosclerosis

Main article: Focal segmental glomerulosclerosis

Focal segmental glomerulosclerosis is characterised by a sclerosis of segments of some glomerules. It is likely to present as a nephrotic syndrome. This form of glomerulonephritis may be associated with conditions such as HIV and heroin abuse, or inherited as Alport syndrome. The cause of about 20–30% of focal-segmental glomerulosclerosis is unknown. On microscopy, affected glomerules may show an increase in hyalin, a pink and homogenous material, fat cells, an increase in the mesangial matrix and collagen. Treatment may involve corticosteroids, but up to half of people with focal segmental glomerulonephritis continue to have progressive deterioration of kidney function, ending in kidney failure.

Membranous glomerulonephritis

Main article: Membranous glomerulonephritis

Membranous glomerulonephritis may cause either nephrotic or a nephritic picture. About two-thirds are associated with auto-antibodies to phospholipase A2 receptor, but other associations include cancers of the lung and bowel, infections such as hepatitis B and malaria, drugs including penicillamine, and connective tissue diseases such as systemic lupus erythematosus. Individuals with cerebral shunts are at risk of developing shunt nephritis, which frequently produces MGN.

Microscopically, MGN is characterized by a thickened glomerular basement membrane without a hyperproliferation of the glomerular cells. Immunofluorescence demonstrates diffuse granular uptake of IgG. The basement membrane may completely surround the granular deposits, forming a "spike and dome" pattern. Tubules also display the symptoms of a typical Type III hypersensitivity reaction, which causes the endothelial cells to proliferate, which can be seen under a light microscope with a PAS stain.[5]

Prognosis follows the rule of thirds: one-third remain with MGN indefinitely, one-third remit, and one-third progress to end-stage kidney failure. As the glomerulonephritis progresses, the tubules of the kidney become infected, leading to atrophy and hyalinisation. The kidney appears to shrink. Treatment with corticosteroids is attempted if the disease progresses.

In extremely rare cases, the disease has been known to run in families, usually passed down through the females. This condition, similarly, is called Familial Membranous Glomerulonephritis. There have only been about nine documented cases in the world.

Thin basement membrane disease

Main article: Thin basement membrane disease

Thin basement membrane disease is an autosomal dominant inherited disease characterized by thin glomerular basement membranes on electron microscopy. It is a benign condition that causes persistent microscopic hematuria. This also may cause proteinuria which is usually mild and overall prognosis is excellent.

Proliferative

Proliferative glomerulonephritis is characterised by an increased number of cells in the glomerulus. These forms usually present with a triad of blood in the urine, decreased urine production, and hypertension, the nephritic syndrome. These forms usually progress to end-stage kidney failure (ESKF) over weeks to years (depending on type).

IgA nephropathy

Main article: IgA nephropathy

IgA nephropathy, also known as *Berger's disease*, is the most common type of glomerulonephritis, and generally presents with isolated visible or occult hematuria, occasionally combined with low grade proteinuria, and rarely causes a nephritic syndrome characterised by protein in the urine, and visible blood in the urine. IgA nephropathy is classically described as a self-resolving form in young adults several days after a respiratory infection. It is characterised by deposits of IgA in the space between glomerular capillaries.

Henoch–Schönlein purpura refers to a form of IgA nephropathy, typically affecting children, characterised by a rash of small bruises affecting the buttocks and lower legs, with abdominal pain.

Post-infectious

Main article: Post-infectious glomerulonephritis

Post-infectious glomerulonephritis can occur after essentially any infection, but classically occurs after infection with the bacteria *Streptococcus pyogenes*. It typically occurs 1–4 weeks after a pharyngeal infection with this bacterium, and is likely to present with malaise, a slight fever, nausea and a mild nephritic syndrome of moderately increased blood pressure, gross haematuria, and smoky-brown urine. Circulating immune complexes that deposit in the glomerules may lead to an inflammatory reaction.

Diagnosis may be made on clinical findings or through antistreptolysin O antibodies found in the blood. A biopsy is seldom done, and the disease is likely to self-resolve in children in 1–4 weeks, with a poorer prognosis if adults are affected.

Membranoproliferative

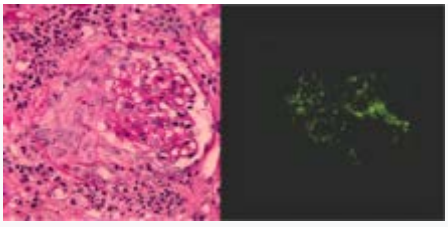
Main article: Membranoproliferative glomerulonephritis

Membranoproliferative GN (MPGN), also known as *mesangiocapillary glomerulonephritis*, is characterised by an increase in the number of cells in the glomerulus, and alterations in the glomerular basement membrane. These forms present with the nephritic syndrome, hypocomplementemia, and have a poor prognosis. Two primary subtypes exist:

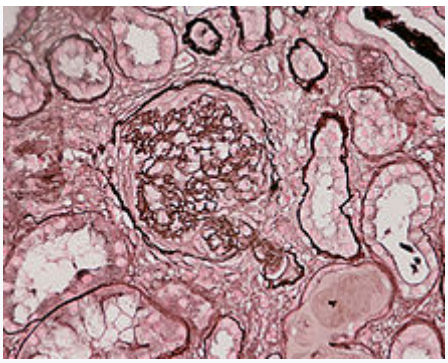
- Type 1 MPGN is caused by circulating immune complexes, typically secondary to systemic lupus erythematosus, hepatitis B and C, or other chronic or recurring infections. Circulating immune complexes may activate the complement system, leading to inflammation and an influx of inflammatory cells.
- Type 2 MPGN, also known as *Dense Deposit Disease*, is characterised by an excessive activation of the complement system. The C3 Nephritic Factor autoantibody stabilizes C3-convertase, which may lead to an excessive activation of complement.

Rapidly progressive glomerulonephritis

Main article: Rapidly progressive glomerulonephritis



Crescentic glomerulonephritisinduced by infective endocarditis on PAS staining and immunofluorescence. PAS staining (left) demonstrated circumferential and cellular crescent formation with interstitial nephritis. Immunofluorescence (right) demonstrated C3 positive staining in mesangial area.



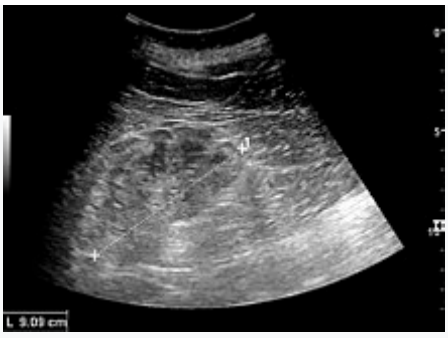
Photomicrograph of renal biopsyshowing crescent formation and tuft narrowing. Periodic acid silver methenamine stain.

Rapidly progressive glomerulonephritis, also known as *crescentic GN*, is characterised by a rapid, progressive deterioration in kidney function. People with rapidly progressive glomerulonephritis may present with a nephritic syndrome. In management, steroid therapy is sometimes used, although the prognosis remains poor.[6] Three main subtypes are recognised:

- Type 1 is Goodpasture syndrome, an autoimmune disease also affecting the lung. In Goodpasture syndrome, IgG antibodies directed against the glomerular basement membrane trigger an inflammatory reaction, causing a nephritic syndrome and the coughing up of blood.[4]: High dose immunosuppression is required (intravenous methylprednisolone) and cyclophosphamide, plus plasmapheresis. Immunohistochemistry staining of tissue specimens shows linear IgG deposits.
- Type 2 is characterised by immune-complex-mediated damage, and may be associated with systemic lupus erythematosus, post-infective glomerulonephritis, IgA nephropathy, and IgA vasculitis.
- Type 3 rapidly progressive glomerulonephritis, also called *pauciimmune type*, is associated with causes of vascular inflammationincluding granulomatosis with polyangiitis (GPA) and microscopic polyangiitis. No immune deposits can be seen on staining, however blood tests may be positive for the ANCA antibody.

Histopathologically, the majority of glomeruli present "crescents". Formation of crescents is initiated by passage of fibrin into the Bowman space as a result of increased permeability of glomerular basement membrane. Fibrin stimulates the proliferation of endothelial cells of Bowman capsule, and an influx of monocytes. Rapid growing and fibrosis of crescents compresses the capillary loops and decreases the Bowman space, which leads to kidney failure within weeks or months.

Diagnosis



Renal ultrasonography of chronic renal disease caused by glomerulonephritis with increased echogenicity and reduced cortical thickness. Measurement of kidney length on the US image is illustrated by '+' and a dashed line.

Some forms of glomerulonephritis are diagnosed clinically, based on findings on history and examination. Other tests may include:

- Urine examination
- Blood tests investigating the cause, including FBC, inflammatory markers and special tests including (ASLO, ANCA, Anti-GBM, Complement levels, Antinuclear antibodies
- Biopsy of the kidney
- Renal ultrasonography is useful for prognostic purposes in finding signs of chronic kidney disease, which however may be caused by many other diseases than glomerulonephritis.

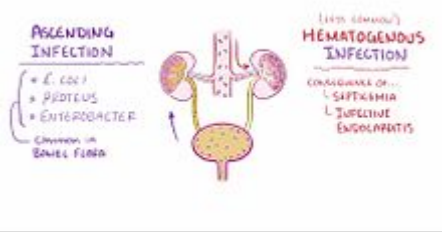
Pyelonephritis is inflammation of the kidney, typically due to a bacterial infection. Symptoms most often include fever and flank tenderness. Other symptoms may include nausea, burning with urination, and frequent urination. Complications may include pus around the kidney, sepsis, or kidney failure.

It is typically due to a bacterial infection, most commonly *Escherichia coli*. Risk factors include sexual intercourse, prior urinary tract infections, diabetes, structural problems of the urinary tract, and spermicide use. The mechanism of infection is usually spread up the urinary tract. Less often infection occurs through the bloodstream. Diagnosis is typically based on symptoms and supported by urinalysis.If there is no improvement with treatment, medical imaging may be recommended.

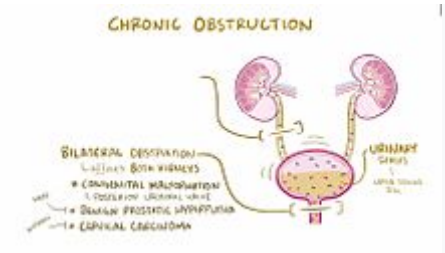
Pyelonephritis may be preventable by urination after sex and drinking sufficient fluids.Once present it is generally treated with antibiotics, such as ciprofloxacin or ceftriaxone. Those with severe disease may required treatment in hospital.In those with certain structural problems of the urinary tract or kidney stones, surgery may be required.

Pyelonephritis is common. About 1 to 2 per 1,000 women are affected a year and just under 0.5 per 1,000 males.Young adult females are most often affected, followed by the very young and old. With treatment, outcomes are generally good in young adults. Among people over the age of 65 the risk of death is about 40%.

Signs and symptoms



Video explanation of acute pyelonephritis



Video explanation of chronic pyelonephritis

Signs and symptoms of acute pyelonephritis generally develop rapidly over a few hours or a day. It can cause high fever, pain on passing urine, and abdominal pain that radiates along the flank towards the back. There is often associated vomiting.

Chronic pyelonephritis causes persistent flank or abdominal pain, signs of infection (fever, unintentional weight loss, malaise, decreased appetite), lower urinary tract symptoms and blood in the urine. Chronic pyelonephritis can in addition cause fever of unknown origin. Furthermore, inflammation-related proteins can accumulate in organs and cause the condition AA amyloidosis.

Physical examination may reveal fever and tenderness at the costovertebral angle on the affected side.

Pyelonephritis that has progressed to urosepsis may be accompanied by signs of septic shock, including rapid breathing, decreased blood pressure, shivering, and occasionally delirium.

Causes

Most cases of "community-acquired" pyelonephritis are due to bowel organisms that enter the urinary tract. Common organisms are *E. coli*(70–80%) and *Enterococcus faecalis*. Hospital-acquired infections may be due to coliform bacteria and enterococci, as well as other organisms uncommon in the community (e.g., *Pseudomonas aeruginosa* and various species of *Klebsiella*). Most cases of pyelonephritis start off as lower urinary tract infections, mainly cystitis and prostatitis.*E. coli* can invade the superficial umbrella cells of the bladder to form intracellular bacterial communities (IBCs), which can mature into biofilms. These biofilm-producing *E. coli* are resistant to antibiotic therapy and immune system responses, and present a possible explanation for recurrent urinary tract infections, including pyelonephritis.Risk is increased in the following situations:

- Mechanical: any structural abnormalities in the urinary tract, vesicoureteral reflux (urine from the bladder flowing back into the ureter), kidney stones, urinary tract catheterization, ureteral stents or drainage procedures (e.g., nephrostomy), pregnancy, neurogenic bladder(e.g., due to spinal cord damage, spina bifida or multiple sclerosis) and prostate disease (e.g., benign prostatic hyperplasia) in men
- Constitutional: diabetes mellitus, immunocompromised states
- Behavioral: change in sexual partner within the last year, spermicide use
- Positive family history (close family members with frequent urinary tract infections)

Diagnosis

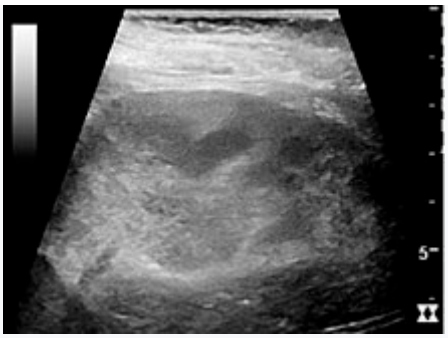
Laboratory examination

Analysis of the urine may show signs of urinary tract infection. Specifically, the presence of nitrite and white blood cells on a urine test strip in patients with typical symptoms are sufficient for the diagnosis of pyelonephritis, and are an indication for empirical treatment. Blood tests such as a complete blood count may show neutrophilia. Microbiological

cultureof the urine, with or without blood cultures and antibiotic sensitivity testing are useful for establishing a formal diagnosis, and are considered mandatory.

Imaging studies

If a kidney stone is suspected (e.g. on the basis of characteristic colicky pain or the presence of a disproportionate amount of blood in the urine), a kidneys, ureters, and bladder x-ray(KUB film) may assist in identifying radioopaque stones.Where available, a noncontrast helical CT scan with 5 millimeter sections is the diagnostic modality of choice in the radiographic evaluation of suspected nephrolithiasis.All stones are detectable on CT scans except very rare stones composed of certain drug residues in the urine. In patients with recurrent ascending urinary tract infections, it may be necessary to exclude an anatomical abnormality, such as vesicoureteral reflux or polycystic kidney disease. Investigations used in this setting include kidney ultrasonography or voiding cystourethrography. CT scan or kidney ultrasonography is useful in the diagnosis of xanthogranulomatous pyelonephritis; serial imaging may be useful for differentiating this condition from kidney cancer.



Acute pyelonephritis with increased cortical echogenicity and blurred delineation of the upper pole.

Ultrasound findings that indicate pyelonephritis are enlargement of the kidney, edema in the renal sinus or parenchyma, bleeding, loss of corticomedullary differentiation, abscess formation, or an areas of poor blood flow on doppler ultrasound. However, ultrasound findings are seen in only 20% to 24% of people with pyelonephritis.

A DMSA scan is a radionuclide scan that uses dimercaptosuccinic acid in assessing the kidney morphology. It is now the most reliable test for the diagnosis of acute pyelonephritis.[21]

Classification

Acute pyelonephritis

Acute pyelonephritis is an exudative purulent localized inflammation of the renal pelvis (collecting system) and kidney. The kidney parenchyma presents in the interstitium abscesses (suppurative necrosis), consisting in purulent exudate (pus): neutrophils, fibrin, cell debris and central germ colonies (hematoxylinophils). Tubules are damaged by exudate and may contain neutrophil casts. In the early stages, the glomerulus and vessels are normal. Gross pathology often reveals pathognomonic radiations of bleeding and suppuration through the renal pelvis to the renal cortex.

Chronic pyelonephritis

Chronic pyelonephritis implies recurrent kidney infections and can result in scarring of the renal parenchyma and impaired function, especially in the setting of obstruction. A perinephric abscess (infection around the kidney) and/or pyonephrosis may develop in severe cases of pyelonephritis.

Xanthogranulomatous pyelonephritis

Xanthogranulomatous pyelonephritis is an unusual form of chronic pyelonephritis characterized by granulomatous abscess formation, severe kidney destruction, and a clinical picture that may resemble renal cell carcinoma and other inflammatory kidney parenchymal diseases. Most affected individuals present with recurrent fevers and urosepsis, anemia, and a painful kidney mass. Other common manifestations include kidney stones and loss of function of the affected kidney. Bacterial cultures of kidney tissue are almost always positive.Microscopically, there are granulomas and lipid-laden macrophages (hence the term *xantho-*, which means yellow in ancient Greek). It is found in roughly 20% of specimens from surgically managed cases of pyelonephritis.

Management

In people suspected of having pyelonephritis, a urine culture and antibiotic sensitivity test is performed, so therapy can eventually be tailored on the basis of the infecting organism.[5]As most cases of pyelonephritis are due to bacterial infections, antibiotics are the mainstay of treatment.The choice of antibiotic depends on the species and antibiotic sensitivity profile of the infecting organism, and may include fluoroquinolones, cephalosporins, aminoglycosides, or trimethoprim/sulfamethoxazole, either alone or in combination.

Simple

In people who do not require hospitalization and live in an area where there is a low prevalence of antibiotic-resistant bacteria, an fluoroquinolone by mouth such as ciprofloxacin or levofloxacin is an appropriate initial choice for therapy.[5] In areas where there is a higher prevalence of fluoroquinolone resistance, it is useful to initiate treatment with a single intravenous dose of a long-acting antibiotic such as ceftriaxone or an aminoglycoside, and then continuing treatment with a fluoroquinolone. Oral trimethoprim/sulfamethoxazole is an appropriate choice for therapy if the bacteria is known to be susceptible.If trimethoprim/sulfamethoxazole is used when the susceptibility is not known, it is useful to initiate treatment with a single intravenous dose of a long-acting antibiotic such as ceftriaxone or an aminoglycoside. Oral beta-lactam antibiotics are less effective than other available agents for treatment of pyelonephritis. Improvement is expected in 48 to 72 hours.

Complicated

People with acute pyelonephritis that is accompanied by high fever and leukocytosis are typically admitted to the hospital for intravenous hydration and intravenous antibiotic treatment. Treatment is typically initiated with an intravenous fluoroquinolone, an aminoglycoside, an extended-spectrum penicillin or cephalosporin, or a carbapenem. Combination antibiotic therapy is often used in such situations. The treatment regimen is selected based on local resistance data and the susceptibility profile of the specific infecting organism(s).

During the course of antibiotic treatment, serial white blood cell count and temperature are closely monitored. Typically, the intravenous antibiotics are continued until the person has no fever for at least 24 to 48 hours, then equivalent antibiotics by mouth can be given for a total of 2–week duration of treatment.Intravenous fluids may be administered to compensate for the reduced oral intake, insensible losses (due to the raised temperature) and vasodilation and to optimize urine output. Percutaneous nephrostomy or ureteral stent placement may be indicated to relieve obstruction caused by a stone. Children with acute pyelonephritis can be treated effectively with oral antibiotics (cefixime, ceftibuten and amoxicillin/clavulanic acid) or with short courses (2 to 4 days) of intravenous therapy followed by oral therapy. If intravenous therapy is chosen, single daily dosing with aminoglycosides is safe and effective.

Treatment of xanthogranulomatous pyelonephritis involves antibiotics as well as surgery. Removal of the kidney is the best surgical treatment in the overwhelming majority of cases, although polar resection (partial nephrectomy) has been effective for some people with localized disease.Watchful waiting with serial imaging may be appropriate in rare circumstances.

Prevention

In people who experience recurrent urinary tract infections, additional investigations may identify an underlying abnormality. Occasionally, surgical intervention is necessary to reduce the likelihood of recurrence. If no abnormality is identified, some studies suggest long-term preventive treatment with antibiotics, either daily or after sexual activity.In children at risk for recurrent urinary tract infections, not enough studies have been performed to conclude prescription of long-term antibiotics have a net positive benefit. Drinking cranberry juice does not appear to provide much if any benefit in decreasing urinary tract infections.

Epidemiology

There are roughly 12–13 cases annually per 10,000 population in women receiving outpatient treatment and 3–4 cases requiring admission. In men, 2–3 cases per 10,000 are treated as outpatients and 1– cases/10,000 require admission.Young women are most often affected, probably reflecting sexual activity in that age group. Infants and the elderly are also at increased risk, reflecting anatomical changes and hormonal status.Xanthogranulomatous pyelonephritis is most common in middle-aged women. It can present somewhat differently in children, in whom it may be mistaken for Wilms' tumor.

Lecture number 8.

Subject of the lecture: Rheumatoid arthritis. Gout

Technological module of training

The duration of the lesson is 2 hours.	Number of students: up to 18-40
Occupation form	Information lecture
Lecture plan: Goals and objectives - 5 minutes Etiology and pathogenesis - 15 minutes Classification and clinic -25 minutes Coffee break - 5 minutes Demonstration of the patient - 10 minutes Laboratory-instrumental diagnostics - 10 minutes Differential diagnosis - 5 minutes Treatment - 15 minutes The conclusion. Answers to the questions -5 min.	**Brief annotation of the lecture:** This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
The purpose of the lesson: 1. To study etiology, pathogenesis, clinic, diagnosis, differential diagnosis, treatment, prevention of diseases. 2. To learn the standards of diagnosis and treatment of the disease. 3.Identify new, modern methods of diagnosis and treatment of the disease.	The goal is to teach the students the basics of clinical thinking, medical logic, deontology, ethics and aesthetics in accordance with the requirements of training a doctor at the level of world standards.
Teaching methods: Collective	Multimedia discs with a set of illustrated materials. 2. Multimedia installation, laptop, drives 3. Lecture text, computer, banners
Conditions of education	Audience established methodology
Monitoring and evaluation	Written test control of the initial level on the topic

1.2 Technological map of lecture classes.

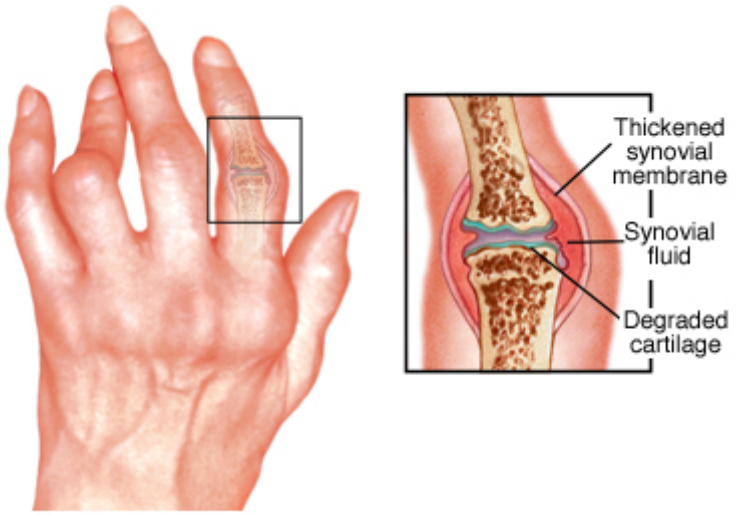
Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1. Control for the purity of the audience 2. Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multimedia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work	Listens Write off

	3.Has homework	Write off
Total:90minutes,2 h		

Theoretical part:

Autoimmune diseases are illnesses that occur when the body's tissue mistakenly attacks its own immune system. Patients with these types of diseases have antibodies in their blood that target their own body's tissues. Rheumatoid arthritis is an autoimmune disease that causes chronic inflammation the joints as well as other organs in the body. It often develops gradually over a period of years, however, in rare cases it can appear Rheumatoid arthritis affects more than two million people each year in the United States alone. It afflicts people of all races equally, but is three times more common in women than in men. It occurs most often in people twenty to fifty years old, however, young children and the elderly also have the potential to develop the disease. The exact cause of rheumatoid arthritis is unknown.

Overview



- Rheumatoid arthritis

Rheumatoid arthritis is a chronic inflammatory disorder that can affect more than just your joints. In some people, the condition also can damage a wide variety of body systems, including the skin, eyes, lungs, heart and blood vessels.

An autoimmune disorder, rheumatoid arthritis occurs when your immune system mistakenly attacks your own body's tissues.

Unlike the wear-and-tear damage of osteoarthritis, rheumatoid arthritis affects the lining of your joints, causing a painful swelling that can eventually result in bone erosion and joint deformity.

The inflammation associated with rheumatoid arthritis is what can damage other parts of the body as well. While new types of medications have improved treatment options dramatically, severe rheumatoid arthritis can still cause physical disabilities.

Symptoms

Signs and symptoms of rheumatoid arthritis may include:

- Tender, warm, swollen joints
- Joint stiffness that is usually worse in the mornings and after inactivity
- Fatigue, fever and weight loss

Early rheumatoid arthritis tends to affect your smaller joints first — particularly the joints that attach your fingers to your hands and your toes to your feet.

As the disease progresses, symptoms often spread to the wrists, knees, ankles, elbows, hips and shoulders. In most cases, symptoms occur in the same joints on both sides of your body.

About 40 percent of the people who have rheumatoid arthritis also experience signs and symptoms that don't involve the joints. Rheumatoid arthritis can affect many nonjoint structures, including:

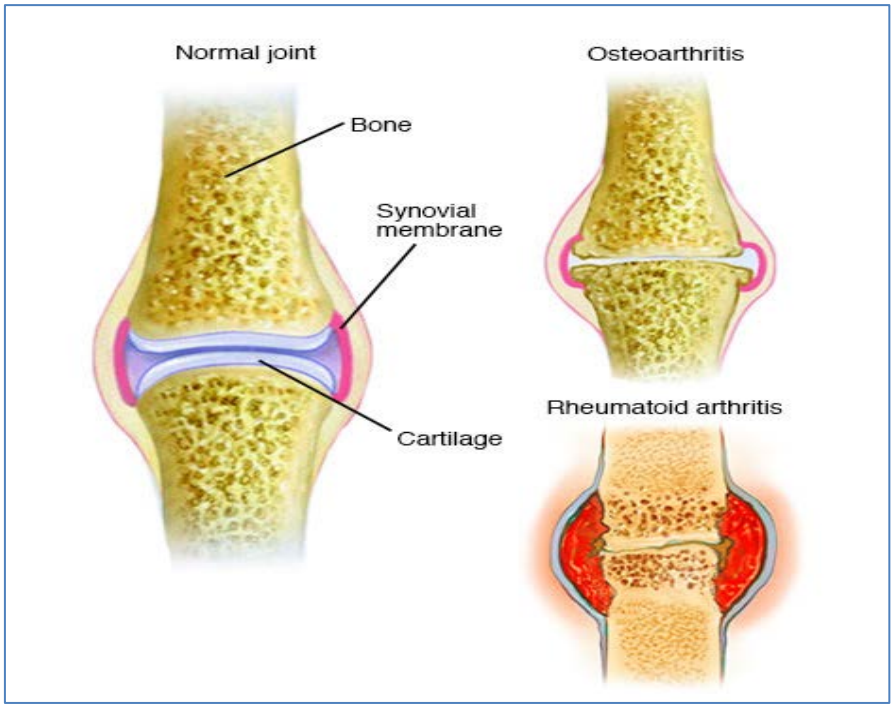
- Skin
- Eyes
- Lungs
- Heart
- Kidneys
- Salivary glands
- Nerve tissue
- Bone marrow
- Blood vessels

Rheumatoid arthritis signs and symptoms may vary in severity and may even come and go. Periods of increased disease activity, called flares, alternate with periods of relative remission — when the swelling and pain fade or disappear. Over time, rheumatoid arthritis can cause joints to deform and shift out of place.

When to see a doctor

Make an appointment with your doctor if you have persistent discomfort and swelling in your joints.

Causes

- 

Rheumatoid arthritis vs. osteoarthritis

Rheumatoid arthritis occurs when your immune system attacks the synovium — the lining of the membranes that surround your joints.

The resulting inflammation thickens the synovium, which can eventually destroy the cartilage and bone within the joint.

The tendons and ligaments that hold the joint together weaken and stretch. Gradually, the joint loses its shape and alignment.

Doctors don't know what starts this process, although a genetic component appears likely. While your genes don't actually cause rheumatoid arthritis, they can make you more susceptible to

environmental factors — such as infection with certain viruses and bacteria — that may trigger the disease.

Risk factors

Factors that may increase your risk of rheumatoid arthritis include:

- **Your sex.** Women are more likely than men to develop rheumatoid arthritis.
- **Age.** Rheumatoid arthritis can occur at any age, but it most commonly begins between the ages of 40 and 60.
- **Family history.** If a member of your family has rheumatoid arthritis, you may have an increased risk of the disease.
- **Smoking.** Cigarette smoking increases your risk of developing rheumatoid arthritis, particularly if you have a genetic predisposition for developing the disease. Smoking also appears to be associated with greater disease severity.
- **Environmental exposures.** Although uncertain and poorly understood, some exposures such as asbestos or silica may increase the risk for developing rheumatoid arthritis. Emergency workers exposed to dust from the collapse of the World Trade Center are at higher risk of autoimmune diseases such as rheumatoid arthritis.
- **Obesity.** People who are overweight or obese appear to be at somewhat higher risk of developing rheumatoid arthritis, especially in women diagnosed with the disease when they were 55 or younger.

Complications

Rheumatoid arthritis increases your risk of developing:

- **Osteoporosis.** Rheumatoid arthritis itself, along with some medications used for treating rheumatoid arthritis, can increase your risk of osteoporosis — a condition that weakens your bones and makes them more prone to fracture.
- **Rheumatoid nodules.** These firm bumps of tissue most commonly form around pressure points, such as the elbows. However, these nodules can form anywhere in the body, including the lungs.
- **Dry eyes and mouth.** People who have rheumatoid arthritis are much more likely to experience Sjogren's syndrome, a disorder that decreases the amount of moisture in your eyes and mouth.

- **Infections.** The disease itself and many of the medications used to combat rheumatoid arthritis can impair the immune system, leading to increased infections.
- **Abnormal body composition.** The proportion of fat compared to lean mass is often higher in people who have rheumatoid arthritis, even in people who have a normal body mass index (BMI).
- **Carpal tunnel syndrome.** If rheumatoid arthritis affects your wrists, the inflammation can compress the nerve that serves most of your hand and fingers.
- **Heart problems.** Rheumatoid arthritis can increase your risk of hardened and blocked arteries, as well as inflammation of the sac that encloses your heart.
- **Lung disease.** People with rheumatoid arthritis have an increased risk of inflammation and scarring of the lung tissues, which can lead to progressive shortness of breath.
- **Lymphoma.** Rheumatoid arthritis increases the risk of lymphoma, a group of blood cancers that develop in the lymph system.

Diagnosis

Rheumatoid arthritis can be difficult to diagnose in its early stages because the early signs and symptoms mimic those of many other diseases. There is no one blood test or physical finding to confirm the diagnosis.

During the physical exam, your doctor will check your joints for swelling, redness and warmth. He or she may also check your reflexes and muscle strength.

Blood tests

People with rheumatoid arthritis often have an elevated erythrocyte sedimentation rate (ESR, or sed rate) or C-reactive protein (CRP), which may indicate the presence of an inflammatory process in the body. Other common blood tests look for rheumatoid factor and anti-cyclic citrullinated peptide (anti-CCP) antibodies.

Imaging tests

Your doctor may recommend X-rays to help track the progression of rheumatoid arthritis in your joints over time. MRI and ultrasound tests can help your doctor judge the severity of the disease in your body.

Treatment

There is no cure for rheumatoid arthritis. But recent discoveries indicate that remission of symptoms is more likely when treatment begins early with strong medications known as disease-modifying antirheumatic drugs (DMARDs).

Medications

The types of medications recommended by your doctor will depend on the severity of your symptoms and how long you've had rheumatoid arthritis.

- **NSAIDs.** Nonsteroidal anti-inflammatory drugs (NSAIDs) can relieve pain and reduce inflammation. Over-the-counter NSAIDs include ibuprofen (Advil, Motrin IB) and naproxen sodium (Aleve). Stronger NSAIDs are available by prescription. Side effects may include ringing in your ears, stomach irritation, heart problems, and liver and kidney damage.
- **Steroids.** Corticosteroid medications, such as prednisone, reduce inflammation and pain and slow joint damage. Side effects may include thinning of bones, weight gain and diabetes. Doctors often prescribe a corticosteroid to relieve acute symptoms, with the goal of gradually tapering off the medication.
- **Disease-modifying antirheumatic drugs (DMARDs).** These drugs can slow the progression of rheumatoid arthritis and save the joints and other tissues from permanent damage. Common DMARDs include methotrexate (Trexall, Otrexup, Rasuvo), leflunomide (Arava), hydroxychloroquine (Plaquenil) and sulfasalazine (Azulfidine).

  Side effects vary but may include liver damage, bone marrow suppression and severe lung infections.

- **Biologic agents.** Also known as biologic response modifiers, this newer class of DMARDs includes abatacept (Orencia), adalimumab (Humira), anakinra (Kineret), certolizumab (Cimzia), etanercept (Enbrel), golimumab (Simponi), infliximab (Remicade), rituximab (Rituxan), tocilizumab (Actemra) and tofacitinib (Xeljanz).

  These drugs can target parts of the immune system that trigger inflammation that causes joint and tissue damage. These types of drugs also increase the risk of infections.

  Biologic DMARDs are usually most effective when paired with a nonbiologic DMARD, such as methotrexate.

Therapy

Your doctor may send you to a physical or occupational therapist who can teach you exercises to help keep your joints flexible. The therapist may also suggest new ways to do daily tasks, which will be easier on your joints. For example, if your fingers are sore, you may want to pick up an object using your forearms.

Assistive devices can make it easier to avoid stressing your painful joints. For instance, a kitchen knife equipped with a saw handle helps protect your finger and wrist joints. Certain tools, such as buttonhooks, can make it easier to get dressed. Catalogs and medical supply stores are good places to look for ideas.

Surgery

If medications fail to prevent or slow joint damage, you and your doctor may consider surgery to repair damaged joints. Surgery may help restore your ability to use your joint. It can also reduce pain and correct deformities.

Rheumatoid arthritis surgery may involve one or more of the following procedures:

- **Synovectomy.** Surgery to remove the inflamed synovium (lining of the joint). Synovectomy can be performed on knees, elbows, wrists, fingers and hips.
- **Tendon repair.** Inflammation and joint damage may cause tendons around your joint to loosen or rupture. Your surgeon may be able to repair the tendons around your joint.
- **Joint fusion.** Surgically fusing a joint may be recommended to stabilize or realign a joint and for pain relief when a joint replacement isn't an option.
- **Total joint replacement.** During joint replacement surgery, your surgeon removes the damaged parts of your joint and inserts a prosthesis made of metal and plastic.

Surgery carries a risk of bleeding, infection and pain. Discuss the benefits and risks with your doctor.

Clinical trials

Explore Mayo Clinic studies testing new treatments, interventions and tests as a means to prevent, detect, treat or manage this disease.

Lifestyle and home remedies

You can take steps to care for your body if you have rheumatoid arthritis. These self-care measures, when used along with your rheumatoid arthritis medications, can help you manage your signs and symptoms:

- **Exercise regularly.** Gentle exercise can help strengthen the muscles around your joints, and it can help fight fatigue you might feel. Check with your doctor before you start exercising. If you're just getting started, begin by taking a walk. Try swimming or gentle water aerobics. Avoid exercising tender, injured or severely inflamed joints.
- **Apply heat or cold.** Heat can help ease your pain and relax tense, painful muscles. Cold may dull the sensation of pain. Cold also has a numbing effect and decreases muscle spasms.
- **Relax.** Find ways to cope with pain by reducing stress in your life. Techniques such as guided imagery, distraction and muscle relaxation can all be used to control pain.

Alternative medicine

Some common complementary and alternative treatments that have shown promise for rheumatoid arthritis include:

- **Fish oil.** Some preliminary studies have found that fish oil supplements may reduce rheumatoid arthritis pain and stiffness. Side effects can include nausea, belching and a fishy taste in the mouth. Fish oil can interfere with medications, so check with your doctor first.
- **Plant oils.** The seeds of evening primrose, borage and black currant contain a type of fatty acid that may help with rheumatoid arthritis pain and morning stiffness. Side effects may include nausea, diarrhea and gas. Some plant oils can cause liver damage or interfere with medications, so check with your doctor first.
- **Tai chi.** This movement therapy involves gentle exercises and stretches combined with deep breathing. Many people use tai chi to relieve stress in their lives. Small studies have found that tai chi may reduce rheumatoid arthritis pain. When led by a knowledgeable instructor, tai chi is safe. But don't do any moves that cause pain.

Coping and support

The pain and disability associated with rheumatoid arthritis can affect a person's work and family life. Depression and anxiety are common, as are feelings of helplessness and low self-esteem.

The degree to which rheumatoid arthritis affects your daily activities depends in part on how well you cope with the disease. Talk to your doctor or nurse about strategies for coping. With time you'll learn what strategies work best for you. In the meantime, try to:

- **Take control.** With your doctor, make a plan for managing your arthritis. This will help you feel in charge of your disease.
- **Know your limits.** Rest when you're tired. Rheumatoid arthritis can make you prone to fatigue and muscle weakness. A rest or short nap that doesn't interfere with nighttime sleep may help.
- **Connect with others.** Keep your family aware of how you're feeling. They may be worried about you but might not feel comfortable asking about your pain. Find a family member or friend you can talk to when you're feeling especially overwhelmed. Also connect with other people who have rheumatoid arthritis — whether through a support group in your community or online.
- **Take time for yourself.** It's easy to get busy and not take time for yourself. Find time for what you like, whether it's time to write in a journal, go for a walk or listen to music. Use this time to relieve stress and reflect on your feelings.

Preparing for your appointment

While you might first discuss your symptoms with your family doctor, he or she may refer you to a rheumatologist — a doctor who specializes in the treatment of arthritis and other inflammatory conditions — for further evaluation.

What you can do?

Write a list that includes:

- Detailed descriptions of your symptoms
- Information about medical problems you've had in the past
- Information about the medical problems of your parents or siblings
- All the medications and dietary supplements you take
- Questions you want to ask the doctor

What to expect from your doctor?

Your doctor may ask some of the following questions:

- When did your symptoms begin?

- Have your symptoms changed over time?
- Which joints are affected?
- Does any activity make your symptoms better or worse?
- Are your symptoms interfering with daily tasks?

Gout (Gouty Arthritis)

Gout (gouty arthritis) facts

- Gout is a type of arthritis that causes inflammation, usually in one joint, that begins suddenly.
- Gouty arthritis is caused by the deposition of crystals of uric acid in a joint.
- Gout can cause symptoms and signs such as
  - nodules under the skin called tophi,
  - joint redness,
  - swollen joints,
  - joint pain, and
  - warmth of the joint.
- The most reliable method to diagnose gout is to have fluid removed from an inflamed joint and examined under a microscope for uric acid crystals.
- Chronic gout is treated using medications that lower the uric acid level in the body.
- Left untreated, gout can cause irreversible joint damage, kidney problems, and tophi.
- Triggers for acute attacks of gout include surgery, dehydration, beverages sweetened with sugar or high fructose corn syrup, beer, liquor, red meat, and seafood.
- Cherries may help prevent gout attacks.

What is gout?

Gout is a type of arthritis that causes sudden joint inflammation, usually in a single joint. Severe gout can sometimes affect many joints at once. This is known as polyarticular gout.

What causes gout?

Gout is caused by too much uric acid in the bloodstream and accumulation of uric acid crystals in tissues of the body. Uric acid crystal deposits in the joint cause inflammation of the joint leading to pain, redness, heat, and swelling. Uric acid is normally found in the body as a byproduct of the way the body breaks down certain proteins called purines. Causes of an elevated blood uric acid level

(hyperuricemia) include genetics, obesity, certain medications such as diuretics (water pills), and chronic decreased kidney function.

What are risk factors for gout?

There are many risk factors for gout. Gout is more common after surgery, trauma, and dehydration. Certain medications such as diuretics (commonly known as water pills), which treat high blood pressure, that raise the level of uric acid in the bloodstream are risks for gout.

Surprisingly, medications that lower the level of uric acid in the bloodstream, such as allopurinol (Zyloprim, Aloprim), can also initially cause a flare of gout. This is because anything that raises or lowers the uric acid level can cause a gout flare by causing uric acid crystals to deposit in a joint. Low-dose aspirin can precipitate gout attacks. The treatment of certain types of cancer can cause gout because of high levels of uric acid released when the cancer cells are destroyed. Degenerative

arthritis also makes affected joints more likely to be the site of a gouty attack.

What are gout symptoms and signs?

The characteristic symptoms and signs of gout are

- sudden onset of joint pain,
- joint swelling,
- heat in the affected area, and
- joint redness.

These symptoms and signs usually affect a single joint. The pain is typically severe, reflecting the severity of inflammation in the joint. The affected joint is often very sensitive to touch to the point that some people with gout attacks experience pain from something as simple as pulling the bedsheets over the inflamed joint. The affected joint becomes swollen. The medical term for excessive fluid in a joint is a "joint effusion."

Gout frequently involves joints in the lower extremities. The classic location for gout to occur is the big toe. *Podagra* is the medical term for inflammation at the base of the big toe. Gout can also affect the foot, knee, ankle, elbow, wrist, hands, or nearly any joint in the body. When gout is more severe or longstanding, multiple joints may be affected at the same time. This causes pain and joint stiffness in multiple joints.

Another sign of gout is the presence of tophi. A tophus is a hard nodule of uric acid that deposits under the skin. Tophi can be found in various locations in the body, commonly on the elbows, upper ear cartilage, and on the surface of other joints. When a tophus is present, it indicates that the body is substantially overloaded with uric acid. When tophi are present, the uric acid level in the bloodstream typically has been high for years. The presence of tophi indicates tophaceous gout and treatment with medications is necessary.

Longstanding untreated gout can lead to joint damage and physical deformity.

Kidney stones may be a sign of gout as uric acid crystals can deposit in the kidney and cause kidney stones.

What types of doctors treat gout?

Rheumatologists traditionally have expertise in diagnosing and treating gout, especially complicated situations. Other specialists such as internists, general practitioners, family medicine doctors, and orthopedists can manage straightforward cases of gout. Nephrologists may treat patients with uric-acid-lowering medications such as allopurinol in order to prevent damage to the kidneys, which can occur with elevated uric acid levels (hyperuricemia).

For IV students of the faculty
medical business and medical
pedagogy in the subject

FACULTY THERAPY

MATERIALS OF PRACTICAL ACTIVITY

Practical lesson № 1. PNEUMONIA. PLEURISY

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Pneumonia

Pneumonia is an infection in one or both lungs. It can be caused by bacteria, viruses, or fungi. Bacterial pneumonia is the most common type in adults.

Pneumonia causes inflammation in the air sacs in your lungs, which are called alveoli. The alveoli fill with fluid or pus, making it difficult to breathe.

Read on to learn more about pneumonia and how to treat it.

SYMPTOMS

What are the symptoms of pneumonia?

Pneumonia symptoms can be mild to life-threatening. The most common symptoms of pneumonia can include:

- coughing that may produce phlegm (mucus)
- fever, sweating, and chills
- shortness of breath
- chest pain

Other symptoms can vary according to the cause and severity of the infection, as well as the age and general health of the individual.

Symptoms by cause

- Viral pneumonia may start with flu-like symptoms, such as wheezing. A high fever may occur after 12–36 hours.
- Bacterial pneumonia may cause a fever as high as 105°F along with profuse sweating, bluish lips and nails, and confusion.

Symptoms by age

- Children under 5 years of age may have fast breathing.

- Infants may vomit, lack energy, or have trouble drinking or eating.
- Older people may have a lower-than-normal body temperature.

TYPES AND CAUSES

What are the types and causes of pneumonia?

The major types of pneumonia are classified by the cause of the infection, where the infection was transmitted, and how the infection was acquired.

Types by germ

Pneumonia can be classified according to the organism that caused the infection.

Bacterial pneumonia: The most common cause of bacterial pneumonia is *Streptococcus pneumoniae*. *Chlamydophila pneumonia* and *Legionella pneumophila* can also cause bacterial pneumonia.

Viral pneumonia: Respiratory viruses are often the cause of pneumonia, especially in young children and older people. Viral pneumonia is usually not serious and lasts for a shorter time than bacterial pneumonia.

Mycoplasma pneumonia: Mycoplasma organisms are not viruses or bacteria, but they have traits common to both. Mycoplasmas generally cause mild cases of pneumonia, most often in older children and young adults.

Fungal pneumonia: Fungi from soil or bird droppings can cause pneumonia in people who inhale large amounts of the organisms. They can also cause pneumonia in people with chronic diseases or weakened immune systems.

One kind of fungal pneumonia is called *Pneumocystis jirovecii* pneumonia (PCP). This condition generally affects people with weakened immune systems, such as those with AIDS. In fact, PCP can be one of the first signs of infection with AIDS.

Types by location

Pneumonia is also classified according to where it was acquired.

Hospital-acquired pneumonia (HAP): This type of bacterial pneumonia is acquired during a hospital stay. It can be more serious than other types, because the bacteria involved may be more resistant to antibiotics.

Community-acquired pneumonia (CAP): This refers to pneumonia that is acquired outside of a medical or institutional setting.

Types by how they are acquired

Pneumonia can also be classified according to how it is acquired.

Aspiration pneumonia: This type of pneumonia occurs when you inhale bacteria into your lungs from food, drink, or saliva. This type is more likely to occur if you have a swallowing problem or if you become too sedate from the use of medications, alcohol, or some types of illicit drugs.

Ventilator-associated pneumonia (VAP): When people who are using a ventilator get pneumonia, it's called VAP.

IS IT CONTAGIOUS?

Is pneumonia contagious?

Most kinds of pneumonia are contagious.

Both viral and bacterial pneumonia can spread to others through inhalation of airborne droplets from a sneeze or cough. But while you can become infected with fungal pneumonia from the environment, it doesn't spread from person to person.

RISK FACTORS

Who is at risk of pneumonia?

Anyone can get pneumonia, but certain people are at higher risk:

- infants from birth to age 2 years, and individuals ages 65 years or older
- people who have had a stroke, have problems swallowing, or are bedridden
- people with weakened immune systems because of disease or use of medications such as steroids or certain cancer drugs
- people who smoke, misuse certain types of illicit drugs, or drink excessive amounts of alcohol
- people with certain chronic medical conditions such as asthma, cystic fibrosis, diabetes, or heart failure

DIAGNOSIS

How is pneumonia diagnosed?

Your doctor will start by asking you questions about when your symptoms first appeared and about your medical history. They'll also give you a physical exam. This will include listening to your lungs with a stethoscope for any abnormal sounds, such as crackling.

Your doctor will also likely order a chest X-ray. Typically, pneumonia can be diagnosed with the physical exam and the chest X-ray. But depending on the severity of your symptoms and your risk of complications, your doctor may also order one or more of these tests:

- **A blood test.** This test can confirm an infection, but it may not be able to identify what's causing it.
- **A sputum test.** This test can provide a sample from your lungs that may identify the cause of the infection.
- **Pulse oximetry.** An oxygen sensor placed on one of your fingers can indicate whether your lungs are moving enough oxygen through your bloodstream.

- **A urine test.** This test can identify the bacteria *Streptococcus pneumoniae* and *Legionella pneumophila*.
- **A CT scan.** This test provides a clearer and more detailed picture of your lungs.
- **A fluid sample.** If your doctor suspects there is fluid in the pleural space of your chest, they may take fluid using a needle placed between your ribs. This test can help identify the cause of your infection.
- **A bronchoscopy.** This test looks into the airways in your lungs. It does this using a camera on the end of a flexible tube that's gently guided down your throat and into your lungs. Your doctor may do this test if your initial symptoms are severe, or if you're hospitalized and your body is not responding well to antibiotics.

TREATMENT

How is pneumonia treated?

Your treatment will depend on the type of pneumonia you have, how severe it is, and your general health.

Prescribed treatment

Antibiotic, antiviral, and antifungal drugs are used to treat pneumonia, depending on the specific cause of the condition. Most cases of bacterial pneumonia can be treated at home with oral antibiotics, and most people respond to the antibiotics in one to three days.

Your doctor may also recommend over-the-counter (OTC) medication to relieve your pain and fever, as needed. These may include aspirin, ibuprofen (Advil, Motrin), and acetaminophen(Tylenol).

Your doctor may also recommend cough medicine to calm your cough so you can rest. However, coughing helps remove fluid from your lungs, so you don't want to eliminate it entirely.

Home treatment

You can help your recovery and prevent a recurrence by:

- taking your drugs as prescribed
- getting a lot of rest
- drinking plenty of fluids
- not overdoing it by going back to school or work too soon

Hospitalization

If your symptoms are very severe or you have other health problems, you may need to be hospitalized. At the hospital, doctors can keep track of your heart rate, temperature, and breathing. Treatment may include:

- **Intravenous antibiotics.** These are injected into your vein.
- **Respiratory therapy.** This therapy uses a variety of techniques, including delivering specific medications directly into the lungs. The respiratory therapist may also teach you or help you to perform breathing exercises to maximize your oxygenation.
- **Oxygen therapy.** This treatment helps maintain the oxygen level in your bloodstream. You may receive oxygen through a nasal tube or a face mask. If your case is extreme, you may need a ventilator (a machine that supports breathing).

RECOVERY AND COMPLICATIONS

What's the outlook for pneumonia?

Most people respond to treatment and recover from pneumonia. However, for some people, pneumonia can worsen chronic conditions or cause complications.

Recovery

Like your treatment, your recovery time will depend on the type of pneumonia you have, how severe it is, and your general health.

A younger person may feel back to normal in a week after treatment. Others may take longer to recover and may have lingering fatigue. If your symptoms are severe, your recovery may take several weeks.

Worsened chronic conditions

If you have certain health problems already, pneumonia could make them worse. These conditions include congestive heart failure and emphysema.

For certain people, pneumonia increases their risk of having a heart attack.

Potential complications

Pneumonia may cause complications, especially in people with weakened immune systems or chronic diseases such as diabetes. Complications can include:

- **Bacteremia.** Bacteria from the pneumonia infection may spread to your bloodstream. This can lead to dangerously low blood pressure, septic shock, and in some cases, organ failure.
- **Lung abscesses.** These are cavities in the lungs that contain pus.
- **Impaired breathing.** You may have trouble getting enough oxygen when you breathe. You may need to use a ventilator.
- **Acute respiratory distress syndrome.** This is a severe form of respiratory failure. It's a medical emergency.
- **Pleural effusion.** If your pneumonia is not treated, you may develop fluid around your lungs in your pleura. The pleura are thin membranes that line the outside of your lungs and the inside of your rib cage. The fluid may become infected and need to be drained.
- **Death.** In some cases, pneumonia can be fatal. Between 2 and 3 million people per year develop pneumonia in the United States, and of these, about 60,000 die.

PREVENTION

Can pneumonia be prevented?

In many cases, pneumonia can be prevented.

Pneumonia vaccine

The first line of defense against pneumonia is to get vaccinated. Ask your doctor about the two pneumonia vaccines, which can help protect against bacterial pneumonia. Pneumonia can often be a complication of the flu, so be sure to also get an annual flu shot.

According to the National Institutes of Health, pneumonia vaccines won't prevent all cases of the condition. But if you're vaccinated, you're likely to have a milder and shorter illness, and a lower risk of complications.

Two types of pneumonia vaccines are available in the United States. Your doctor can tell you which one might be better for you.

Prevnar 13: This vaccine is effective against 13 types of pneumococcal bacteria. The Centers for Disease Control and Prevention (CDC) recommends this vaccine for:

- babies and children under the age of 2
- adults ages 65 years or older
- people between ages 2 and 65 years with chronic conditions that increase their risk of pneumonia

Pneumovax 23: This vaccine is effective against 23 types of pneumococcal bacteria. The CDC recommends it for:

- adults ages 65 years or older
- adults ages 19–64 years who smoke
- people between ages 2 and 65 years with chronic conditions that increase their risk of pneumonia

Other prevention tips

In addition to vaccination, there are other things you can to avoid pneumonia:

- If you smoke, try to quit. Smoking makes you more susceptible to respiratory infections, especially pneumonia.
- Wash your hands regularly with soap and water.
- Cover your coughs and sneezes, and dispose of used tissues promptly.
- Maintain a healthy lifestyle to strengthen your immune system. Get enough rest, eat a healthy diet, and get regular exercise.

Pleurisy facts

- Pleurisy involves inflammation of the tissue layers (pleura) lining the lungs and inner chest wall.
- Pleurisy is often associated with the accumulation of fluid between the two layers of pleura, known as pleural effusion.
- Pleurisy is caused by a variety of conditions, such as
    - infections,
    - tuberculosis (TB),
    - congestive heart failure,
    - cancer,
    - pulmonary embolism, and
    - collagen vascular diseases.
- Symptoms of pleurisy include pain in the chest, which is aggravated by breathing in, shortness of breath, and local tenderness. This pain can effect the chest cavity in either the front or back of the cavity, and sometimes patient's have back or shoulder pain.
- The diagnosis of pleurisy is made by the characteristic chest pain and physical findings on examination of the chest. The sometimes-associated pleural accumulation of fluid (pleural effusion) can be seen by imaging studies (chest X-ray, ultrasound, or CT).
- Analysis of pleural fluid aspirated from the chest can help determine the cause of the pleurisy.
- Treatment of the underlying conditions is key to the proper management of pleurisy.

Shortness of Breath

Common Pleurisy Symptom

Causes of shortness of breath include

- Anemia
- Asthma
- Bronchitis
- Congestive heart failure
- Lung cancer
- Obesity
- Pneumonia
- Pneumothorax
- Pulmonary embolism...

What is pleurisy?

Pleurisy describes the chest pain syndrome characterized by a sharp chest cavity pain that worsens with breathing.

Pleurisy is caused by inflammation of the linings around the lungs (the pleura), a condition also known as pleuritis. There are two layers of pleura: one covering the lung (termed the visceral pleura) and the other covering the inner wall of the chest (the parietal pleura). These two layers are lubricated by pleural fluid.

Pleurisy is frequently associated with the accumulation of extra fluid in the space between the two layers of pleura. This fluid is referred to as a pleural effusion.

The pain fibers of the lung are located in the pleura. When this tissue becomes inflamed, it results in a sharp pain in the chest that is worse with breathing. Other symptoms of pleurisy can include cough, chest tenderness, and shortness of breath.

What causes pleurisy?

Pleurisy can be caused by any of the following conditions:

- Infections: bacterial (including those that cause tuberculosis), fungi, parasites, or viruses
- Inhaled chemicals or toxic substances:exposure to some cleaning agents like ammonia
- Collagen vascular diseases: lupus, rheumatoid arthritis
- Cancers: for example, the spread of lung cancer or breast cancer to the pleura
- Tumors of the pleura: mesothelioma or sarcoma
- Congestion: heart failure
- Pulmonary embolism: blood clot inside the blood vessels to the lungs. These clots sometimes severely reduce blood and oxygen to portions of the lung and can result in death to that portion of lung tissue (termed lung infarction). This, too, can cause pleurisy.
- Obstruction of lymph channels: as a result of centrally located lung tumors
- Trauma: rib fractures or irritation from chest tubes used to drain air or fluid from the pleural cavity in the chest
- Certain drugs: drugs that can cause lupus-like syndromes (such as hydralazine[Apresoline], Procan [Pronestyl, Procan-SR, Procanbid - these brands no longer are available in the U.S.], phenytoin [Dilantin], and others)
- Abdominal processes: such as pancreatitis, cirrhosis of the liver, gallbladder disease, and damage to the spleen.
- Pneumothorax: air in the pleural space, occurring spontaneously or from trauma.

How does the pleura work?

The pleura is composed of two layers of thin lining tissue. The layer covering the lung (visceral pleura) and the parietal pleura that covers the inner wall of the chest are lubricated by pleural fluid. Normally, there is about 10-20 ml of clear liquid that acts as a lubricant between these layers. The fluid is continually absorbed and replaced, mainly through the outer lining of the pleura. Pressure inside the pleura is negative (as in sucking) and becomes even more negative during inspiration (breathing in). The pressure becomes less negative during exhalation(breathing out). Therefore, the space between the two layers of pleura always has a negative pressure. The introduction of air (positive pressure) into the space (such as from a knife wound) will result in a collapse of the lung.

What are the symptoms of pleurisy?
Symptoms of pleurisy include:

1. pain in the chest that is aggravated by breathing,
2. shortness of breath, and/or
3. a "stabbing" sensation.

The most common symptom of pleurisy is pain that is generally aggravated by inspiration (breathing in). Although the lungs themselves do not contain any pain nerves, the pleura contains abundant nerve endings. When extra fluid accumulates in the space between the layers of pleura, the pain usually is a less severe form of pleurisy. With very large amounts of fluid accumulation, the expansion of the lungs can be limited, and shortness of breath can worsen.

The chest (thoracic) cavity represents both the front and back of the upper portion of the body. If the inflammation is more toward the back, then the pain may be described as a back pain. Of importance is that with pleurisy; the the pain will worsen with deep breaths. Most other causes of back pain don't have this quality, however, for some people back pain will worsen with cough. (As can be seen in spinal disc disease.)

How is pleurisy diagnosed?

The pain of pleurisy is very distinctive. The pain is in the chest and is usually sharp and aggravated by breathing. However, the pain can be confused with the pain of

- inflammation around the heart (pericarditis), or

- heart attack.

To make the diagnosis of pleurisy, a doctor examines the chest in the area of pain and can often hear (with a stethoscope) the friction that is generated by the rubbing of the two inflamed layers of pleura with each breath. The noise generated by this sound is termed a pleural friction rub. (In contrast, the friction of the rubbing that is heard with pericarditis occurs synchronous with the heartbeat and does not vary with respiration.) With large amounts of pleural fluid accumulation, there can be decreased breath sounds (less audible respiratory sounds heard through a stethoscope) and the chest is dull sounding when the doctor drums on it (termed dullness upon percussion).

A chest X-ray taken in the upright position and while lying on the side is a tool in diagnosing fluid in the pleural space. It is possible to estimate the amount of fluid collection by findings on the X-ray. Occasionally, as much as 4-5 liters of fluid can accumulate inside the pleural space.

Ultrasound is a method of detecting the presence of pleural fluid.

A CT scan can be very helpful in detecting very small amounts of fluid and trapped pockets of pleural fluid, as well as in determining the nature of the tissues surrounding the area.

Removal of pleural fluid with a needle and syringe (aspiration) is essential in diagnosing the cause of pleurisy. The fluid's color, consistency, and clarity are analyzed in the laboratory. The fluid analysis is defined as either an "exudate" (high in protein, low in sugar, high in LDH enzyme, and high white cell count; characteristic of an inflammatory process) or a "transudate" (containing normal levels of these body chemicals).

- Causes of exudative fluid include infections (such as pneumonia), cancer, tuberculosis, and collagen diseases (such as rheumatoid arthritis and lupus).
- Causes of transudative fluid are congestive heart failure and liver and kidney diseases. Pulmonary emboli can cause either transudates or exudates in the pleural space.

The fluid can also be tested for the presence of infectious organisms and cancer cells. In some cases, a small piece of pleura may be removed for microscopic study (biopsied) if there is suspicion of tuberculosis (TB) or cancer.

How is pleurisy treated?

External splinting of the chest wall and pain medication can reduce the pain of pleurisy. Treatment of the underlying disease, of course, ultimately relieves the pleurisy. For example, if a heart, lung, or kidney condition is present, it is treated. Removal of fluid from the chest cavity (thoracentesis) can relieve the pain and shortness of breath. Sometimes fluid removal can make the pleurisy temporarily worse because without the lubrication of the fluid, the two inflamed pleural surfaces can rub directly on each other with each breath.

If the pleural fluid shows signs of infection, appropriate treatment involves antibiotics and drainage of the fluid. If there is pus inside the pleural space, a chest drainage tube should be inserted. This procedure involves placing a tube inside the chest under local anesthesia. The tube is then connected to a sealed chamber that is connected to a suction device in order to create a negative pressure environment. In severe cases, in which there are large amounts of pus and scar tissue (adhesions), there is a need for "decortication." This procedure involves examining the pleural space under general anesthesia with a special scope (thoracoscope). Through this pipelike instrument, the scar tissue, pus, and debris can be removed. Sometimes, an open surgical procedure (thoracotomy) is required for more complicated cases.

In cases of pleural effusion that result from cancer, the fluid often reaccumulates. In this setting, a procedure called pleurodesis is used. This procedure entails instilling an irritant, such as bleomycin,tetracycline, or talc powder, inside the space between the pleural layers in order to create inflammation. This inflammation, in turn, will adhere or tack the two layers of pleura together as scarring develops. This procedure thereby obliterates the space between the pleura and prevents the reaccumulation of fluid.

Can pleurisy be prevented?

Some cases of pleurisy can be prevented, depending on the cause. For example, early intervention in treating pneumonia may prevent the accumulation of pleural fluid. In the case of heart, lung, or kidney disease, management of the underlying disease can help prevent the fluid collection

Practical lesson № 2. BRONCHIAL ASTHMA

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Asthma is a common long-term inflammatory disease of the airways of the lungs. It is characterized by variable and recurring symptoms, reversible airflow obstruction, and bronchospasm. Symptoms include episodes of wheezing, coughing, chest tightness, and shortness of breath. These episodes may occur a few times a day or a few times per week. Depending on the person, they may become worse at night or with exercise.

Asthma is thought to be caused by a combination of genetic and environmental factors. Environmental factors include exposure to air pollution and allergens. Other potential triggers include medications such as aspirin and beta blockers. Diagnosis is usually based on the pattern of symptoms, response to therapy over time, and spirometry. Asthma is classified according to the frequency of symptoms, forced expiratory volume in one second (FEV1), and peak expiratory flow rate. It may also be classified as atopic or non-atopic, where atopy refers to a predisposition toward developing a type 1 hypersensitivityreaction.

There is no cure for asthma. Symptoms can be prevented by avoiding triggers, such as allergens and irritants, and by the use of inhaled corticosteroids. Long-acting beta agonists (LABA) or antileukotriene agents may be used in addition to inhaled corticosteroids if asthma symptoms remain uncontrolled. Treatment of rapidly worsening symptoms is usually with an inhaled short-acting beta-2 agonist such as salbutamol and corticosteroids taken by mouth. In very severe cases, intravenous corticosteroids, magnesium sulfate, and hospitalization may be required.

In 2015, 358 million people globally had asthma, up from 183 million in 1990. It caused about 397,100 deaths in 2015, most of which occurred in the developing world. It often begins in childhood. The rates of asthma have increased significantly since the 1960s. Asthma was recognized as early as Ancient Egypt. The word "asthma" is from the Greek ἅσθμα, *ásthma*, which means "panting".

Signs and symptoms

Asthma is characterized by recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing. Sputum may be produced from the lung by coughing but is often hard to bring up. During recovery from an attack, it may appear pus-likedue to high levels of white blood cells called eosinophils.

Symptoms are usually worse at night and in the early morning or in response to exercise or cold air. Some people with asthma rarely experience symptoms, usually in response to triggers, whereas others may have marked and persistent symptoms.

Associated conditions

A number of other health conditions occur more frequently in those with asthma, including gastro-esophageal reflux disease (GERD), rhinosinusitis, and obstructive sleep apnea. Psychological disorders are also more common, with anxiety disorders occurring in between 16–52% and mood disorders in 14–41%. However, it is not known whether asthma causes psychological problems or psychological problems lead to asthma. Those with asthma, especially if it is poorly controlled, are at high risk for radiocontrast reactions.

Causes

Asthma is caused by a combination of complex and incompletely understood environmental and genetic interactions. These factors influence both its severity and its responsiveness to treatment.It is believed that the recent increased rates of asthma are due to changing epigenetics (heritable factors other than those related to the DNA sequence) and a changing living environment. Onset before age 12 is more likely due to genetic influence, while onset after 12 is more likely due to environmental influence.

Environmental

See also: Asthma-related microbes

Many environmental factors have been associated with asthma's development and exacerbation including allergens, air pollution, and other environmental chemicals.Smoking during pregnancy and after delivery is associated with a greater risk of asthma-like symptoms. Low air quality from factors such as traffic pollution or high ozone levels has been associated with both asthma development and increased asthma severity. Over half of cases in children in the United States occur in areas with air quality below EPA standards.Low air quality is more common in low-income and minority communities.

Exposure to indoor volatile organic compounds may be a trigger for asthma; formaldehyde exposure, for example, has a positive association. Also, phthalates in certain types of PVC are associated with asthma in children and adults. While exposure to pesticides is linked to the development of asthma it is unclear if this is a cause and effect relationship.

There is an association between acetaminophen (paracetamol) use and asthma. The majority of the evidence does not, however, support a causal role. A 2014 review found that the association disappeared when respiratory infections were taken into account. Use by a mother during pregnancy is also associated with an increased risk as is psychological stress during pregnancy.

Asthma is associated with exposure to indoor allergens. Common indoor allergens include dust mites, cockroaches, animal dander (fragments of fur or feathers), and mold.[53][54]Efforts to decrease dust mites have been found to be ineffective on symptoms in sensitized subjects.Certain viral respiratory infections, such

as respiratory syncytial virus and rhinovirus, may increase the risk of developing asthma when acquired as young children.Certain other infections, however, may decrease the risk.

Hygiene hypothesis

The hygiene hypothesis attempts to explain the increased rates of asthma worldwide as a direct and unintended result of reduced exposure, during childhood, to non-pathogenic bacteria and viruses. It has been proposed that the reduced exposure to bacteria and viruses is due, in part, to increased cleanliness and decreased family size in modern societies. Exposure to bacterial endotoxin in early childhood may prevent the development of asthma, but exposure at an older age may provoke bronchoconstriction. Evidence supporting the hygiene hypothesis includes lower rates of asthma on farms and in households with pets.

Use of antibiotics in early life has been linked to the development of asthma. Also, delivery via caesarean section is associated with an increased risk (estimated at 20–80%) of asthma—this increased risk is attributed to the lack of healthy bacterial colonization that the newborn would have acquired from passage through the birth canal. There is a link between asthma and the degree of affluence which may be related to the hygiene hypothesis as less affluent individuals often have more exposure to bacteria and viruses.

Genetic

CD14-endotoxin interaction based on CD14 SNP C-159T

Endotoxin levels	CC genotype	TT genotype
High exposure	Low risk	High risk
Low exposure	High risk	Low risk

Family history is a risk factor for asthma, with many different genes being implicated. If one identical twin is affected, the probability of the other having the disease is approximately 25%. By the end of 2005, 25 genes had been associated with asthma in six or more separate populations, including GSTM1, IL10, CTLA-4, SPINK5, LTC4S, IL4R and ADAM33, among others. Many of these genes are related to the immune system or modulating inflammation. Even among this list of genes supported by highly replicated studies, results have not been consistent among all populations tested. In 2006 over 100 genes were associated with asthma in one genetic association study alone; more continue to be found.

Some genetic variants may only cause asthma when they are combined with specific environmental exposures. An example is a specific single nucleotide polymorphism in the CD14 region and exposure to endotoxin (a bacterial product). Endotoxin exposure can come from several environmental sources including tobacco smoke, dogs, and farms. Risk for asthma, then, is determined by both a person's genetics and the level of endotoxin exposure.

Medical conditions

A triad of atopic eczema, allergic rhinitis and asthma is called atopy. The strongest risk factor for developing asthma is a history of atopic disease; with asthma occurring at a much greater rate in those who have either eczema or hay fever. Asthma has been associated with eosinophilic granulomatosis with polyangiitis (formerly known as Churg–Strauss syndrome), an autoimmune disease and vasculitis. Individuals with certain types of urticaria may also experience symptoms of asthma.

There is a correlation between obesity and the risk of asthma with both having increased in recent years. Several factors may be at play including decreased respiratory function due to a buildup of fat and the fact that adipose tissue leads to a pro-inflammatory state.

Beta blocker medications such as propranolol can trigger asthma in those who are susceptible. Cardioselective beta-blockers, however, appear safe in those with mild or moderate disease. Other medications that can cause problems in asthmatics are angiotensin-converting enzyme inhibitors, aspirin, and NSAIDs.

Exacerbation

Some individuals will have stable asthma for weeks or months and then suddenly develop an episode of acute asthma. Different individuals react to various factors in different ways. Most individuals can develop severe exacerbation from a number of triggering agents.

Home factors that can lead to exacerbation of asthma include dust, animal dander (especially cat and dog hair), cockroach allergens and mold. Perfumes are a common cause of acute attacks in women and children. Both viral and bacterial infections of the upper respiratory tract can worsen the disease. Psychological stress may worsen symptoms—it is thought that stress alters the immune system and thus increases the airway inflammatory response to allergens and irritants.

Pathophysiology

Pathophysiology of asthma

Asthma is the result of chronic inflammation of the conducting zone of the airways (most especially the bronchi and bronchioles), which subsequently results in increased contractability of the surrounding smooth muscles. This among other factors leads to bouts of narrowing of the airway and the classic symptoms of

wheezing. The narrowing is typically reversible with or without treatment. Occasionally the airways themselves change. Typical changes in the airways include an increase in eosinophils and thickening of the lamina reticularis. Chronically the airways' smooth muscle may increase in size along with an increase in the numbers of mucous glands. Other cell types involved include: T lymphocytes, macrophages, and neutrophils. There may also be involvement of other components of the immune system including: cytokines, chemokines, histamine, and leukotrienes among others.

Diagnosis

While asthma is a well-recognized condition, there is not one universal agreed upon definition.] It is defined by the Global Initiative for Asthma as "a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper-responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment".

There is currently no precise test for the diagnosis, which is typically based on the pattern of symptoms and response to therapy over time. A diagnosis of asthma should be suspected if there is a history of recurrent wheezing, coughing or difficulty breathing and these symptoms occur or worsen due to exercise, viral infections, allergens or air pollution. Spirometry is then used to confirm the diagnosis.In children under the age of six the diagnosis is more difficult as they are too young for spirometry.

Spirometry

Spirometry is recommended to aid in diagnosis and management. It is the single best test for asthma. If the FEV1 measured by this technique improves more than 12% and increases by at least 200 milliliters following administration of a bronchodilator such as salbutamol, this is supportive of the diagnosis. It however may be normal in those with a history of mild asthma, not currently acting up. As caffeine is a bronchodilator in people with asthma, the use of caffeine before a lung function test may interfere with the results. Single-breath diffusing capacity can help differentiate asthma from COPD.It is reasonable to perform spirometry every one or two years to follow how well a person's asthma is controlled.

Others

The methacholine challenge involves the inhalation of increasing concentrations of a substance that causes airway narrowing in those predisposed. If negative it means that a person does not have asthma; if positive, however, it is not specific for the disease.

Other supportive evidence includes: a ≥20% difference in peak expiratory flow rate on at least three days in a week for at least two weeks, a ≥20% improvement of peak flow following treatment with either salbutamol, inhaled corticosteroids or prednisone, or a ≥20% decrease in peak flow following exposure to a trigger. Testing peak expiratory flow is more variable than spirometry, however, and thus not recommended for routine diagnosis. It may be useful for daily self-monitoring in those with moderate to severe disease and for checking the effectiveness of new medications. It may also be helpful in guiding treatment in those with acute exacerbations.

Classification

Clinical classification (≥ 12 years old)					
Severity	**Symptom frequency**	**Night-time symptoms**	**%FEV_1 of predicted**	**FEV_1variability**	**SABA use**
Intermittent	≤2/week	≤2/month	≥80%	<20%	≤2 days/week
Mild persistent	>2/week	3–4/month	≥80%	20–30%	>2 days/week
Moderate persistent	Daily	>1/week	60–80%	>30%	daily
Severe persistent	Continuously	Frequent (7/week)	<60%	>30%	≥twice/day

Asthma is clinically classified according to the frequency of symptoms, forced expiratory volume in one second (FEV_1), and peak expiratory flow rate. Asthma may also be classified as atopic (extrinsic) or non-atopic (intrinsic), based on whether symptoms are precipitated by allergens (atopic) or not (non-atopic). While asthma is classified based on severity, at the moment there is no clear method for

classifying different subgroups of asthma beyond this system. Finding ways to identify subgroups that respond well to different types of treatments is a current critical goal of asthma research.

Although asthma is a chronic obstructive condition, it is not considered as a part of chronic obstructive pulmonary disease, as this term refers specifically to combinations of disease that are irreversible such as bronchiectasis, chronic bronchitis, and emphysema. Unlike these diseases, the airway obstruction in asthma is usually reversible; however, if left untreated, the chronic inflammation from asthma can lead the lungs to become irreversibly obstructed due to airway remodeling. In contrast to emphysema, asthma affects the bronchi, not the alveoli.

Asthma exacerbation

Severity of an acute exacerbation		
Near-fatal	High $PaCO_2$, or requiring mechanical ventilation, or both	
Life-threatening (any one of)	**Clinical signs**	**Measurements**
	Altered level of consciousness	Peak flow < 33%
	Exhaustion	Oxygen saturation < 92%
	Arrhythmia	PaO_2 < 8 kPa
	Low blood pressure	"Normal" $PaCO_2$
	Cyanosis	
	Silent chest	
	Poor respiratory effort	

(any one of)	Peak flow 33–50%
	Respiratory rate ≥ 25 breaths per minute
	Heart rate ≥ 110 beats per minute
	Unable to complete sentences in one breath
Moderate	Worsening symptoms
	Peak flow 50–80% best or predicted
	No features of acute severe asthma

An acute asthma exacerbation is commonly referred to as an *asthma attack*. The classic symptoms are shortness of breath, wheezing, and chest tightness. The wheezing is most often when breathing out. While these are the primary symptoms of asthma, some people present primarily with coughing, and in severe cases, air motion may be significantly impaired such that no wheezing is heard. In children, chest pain is often present.

Signs occurring during an asthma attack include the use of accessory muscles of respiration (sternocleidomastoid and scalene muscles of the neck), there may be a paradoxical pulse (a pulse that is weaker during inhalation and stronger during exhalation), and over-inflation of the chest. A blue color of the skin and nails may occur from lack of oxygen.[

In a mild exacerbation the peak expiratory flow rate (PEFR) is ≥200 L/min, or ≥50% of the predicted best. Moderate is defined as between 80 and 200 L/min, or 25% and 50% of the predicted best, while severe is defined as ≤ 80 L/min, or ≤25% of the predicted best.

Acute severe asthma, previously known as status asthmaticus, is an acute exacerbation of asthma that does not respond to standard treatments of bronchodilators and corticosteroids. Half of cases are due to infections with others caused by allergen, air pollution, or insufficient or inappropriate medication use.

Brittle asthma is a kind of asthma distinguishable by recurrent, severe attacks. Type 1 brittle asthma is a disease with wide peak flow variability, despite

intense medication. Type 2 brittle asthma is background well-controlled asthma with sudden severe exacerbations.

Exercise-induced

Main article: Exercise-induced bronchoconstriction

Exercise can trigger bronchoconstriction both in people with or without asthma. It occurs in most people with asthma and up to 20% of people without asthma. Exercise-induced bronchoconstriction is common in professional athletes. The highest rates are among cyclists (up to 45%), swimmers, and cross-country skiers. While it may occur with any weather conditions, it is more common when it is dry and cold.Inhaled beta2-agonists do not appear to improve athletic performance among those without asthma,however, oral doses may improve endurance and strength.

Occupational

Main article: Occupational asthma

Asthma as a result of (or worsened by) workplace exposures is a commonly reported occupational disease. Many cases, however, are not reported or recognized as such.It is estimated that 5–25% of asthma cases in adults are work-related. A few hundred different agents have been implicated, with the most common being: isocyanates, grain and wood dust, colophony, soldering flux, latex, animals, and aldehydes. The employment associated with the highest risk of problems include: those who spray paint, bakers and those who process food, nurses, chemical workers, those who work with animals, welders, hairdressers and timber workers.

Aspirin-induced asthma

Main article: Aspirin-induced asthma

Aspirin-exacerbated respiratory disease, also known as aspirin-induced asthma, affects up to 9% of asthmatics.Reactions may also occur to other NSAIDs.People affected often also have trouble with nasal polyps. In people who are affected, low doses paracetamol or COX-2 inhibitors are generally safe.

Alcohol-induced asthma

Main article: Alcohol-induced respiratory reactions

Alcohol may worsen asthmatic symptoms in up to a third of people.This may be even more common in some ethnic groups such as the Japanese and those with aspirin-induced asthma. Other studies have found improvement in asthmatic symptoms from alcohol.

Nonallergic asthma

Nonallergic asthma, also known as intrinsic or nonatopic asthma, makes up between 10 and 33% of cases. There is negative skin test to common inhalant

allergens and normal serum concentrations of IgE. Often it starts later in life, and women are more commonly affected than men. Usual treatments may not work as well.

Differential diagnosis

Many other conditions can cause symptoms similar to those of asthma. In children, other upper airway diseases such as allergic rhinitis and sinusitis should be considered as well as other causes of airway obstruction including foreign body aspiration, tracheal stenosis, laryngotracheomalacia, vascular rings, enlarged lymph nodes or neck masses.Bronchiolitis and other viral infections may also produce wheezing.In adults, COPD, congestive heart failure, airway masses, as well as drug-induced coughing due to ACE inhibitors should be considered. In both populations vocal cord dysfunction may present similarly.

Chronic obstructive pulmonary disease can coexist with asthma and can occur as a complication of chronic asthma. After the age of 65, most people with obstructive airway disease will have asthma and COPD. In this setting, COPD can be differentiated by increased airway neutrophils, abnormally increased wall thickness, and increased smooth muscle in the bronchi. However, this level of investigation is not performed due to COPD and asthma sharing similar principles of management: corticosteroids, long-acting beta-agonists, and smoking cessation. It closely resembles asthma in symptoms, is correlated with more exposure to cigarette smoke, an older age, less symptom reversibility after bronchodilator administration, and decreased likelihood of family history of atopy.

Prevention

The evidence for the effectiveness of measures to prevent the development of asthma is weak.The World Health Organization recommends decreasing risk factors such as tobacco smoke, air pollution, and the number of lower respiratory infections.Other efforts that show promise include: limiting smoke exposure in utero, breastfeeding, and increased exposure to daycare or large families, but none are well supported enough to be recommended for this indication.

Early pet exposure may be useful.Results from exposure to pets at other times are inconclusive and it is only recommended that pets be removed from the home if a person has allergic symptoms to said pet.

Dietary restrictions during pregnancy or when breast feeding have not been found to be effective and thus are not recommended.Reducing or eliminating compounds known to sensitive people from the work place may be effective.It is not clear if annual influenza vaccinations affects the risk of exacerbations. Immunization; however, is recommended by the World Health Organization.Smoking bans are effective in decreasing exacerbations of asthma.

Management

While there is no cure for asthma, symptoms can typically be improved.A specific, customized plan for proactively monitoring and managing symptoms should be created. This plan should include the reduction of exposure to allergens, testing to assess the severity of symptoms, and the usage of medications. The treatment plan should be written down and advise adjustments to treatment according to changes in symptoms.

The most effective treatment for asthma is identifying triggers, such as cigarette smoke, pets, or aspirin, and eliminating exposure to them. If trigger avoidance is insufficient, the use of medication is recommended. Pharmaceutical drugs are selected based on, among other things, the severity of illness and the frequency of symptoms. Specific medications for asthma are broadly classified into fast-acting and long-acting categories.

Bronchodilators are recommended for short-term relief of symptoms. In those with occasional attacks, no other medication is needed. If mild persistent disease is present (more than two attacks a week), low-dose inhaled corticosteroids or alternatively, an leukotriene antagonist or a mast cell stabilizer by mouth is recommended. For those who have daily attacks, a higher dose of inhaled corticosteroids is used. In a moderate or severe exacerbation, corticosteroids by mouth are added to these treatments.

Lifestyle modification

Avoidance of triggers is a key component of improving control and preventing attacks. The most common triggers include allergens, smoke (tobacco and other), air pollution, non selective beta-blockers, and sulfite-containing foods. Cigarette smoking and second-hand smoke (passive smoke) may reduce the effectiveness of medications such as corticosteroids. Laws that limit smoking decrease the number of people hospitalized for asthma. Dust mite control measures, including air filtration, chemicals to kill mites, vacuuming, mattress covers and others methods had no effect on asthma symptoms. Overall, exercise is beneficial in people with stable asthma. Yoga could provide small improvements in quality of life and symptoms in people with asthma.

Medications

Medications used to treat asthma are divided into two general classes: quick-relief medications used to treat acute symptoms; and long-term control medications used to prevent further exacerbation. Antibiotics are generally not needed for sudden worsening of symptoms.

Fast–acting

Salbutamol metered dose inhaler commonly used to treat asthma attacks.

- Short-acting beta$_2$-adrenoceptor agonists (SABA), such as salbutamol (*albuterol* USAN) are the first line treatment for asthma

symptoms. They are recommended before exercise in those with exercise induced symptoms.

- Anticholinergic medications, such as ipratropium bromide, provide additional benefit when used in combination with SABA in those with moderate or severe symptoms. Anticholinergic bronchodilators can also be used if a person cannot tolerate a SABA.If a child requires admission to hospital additional ipratropium does not appear to help over a SABA.
- Older, less selective adrenergic agonists, such as inhaled epinephrine, have similar efficacy to SABAs.They are however not recommended due to concerns regarding excessive cardiac stimulation.

Long–term control

Fluticasone propionate metered dose inhaler commonly used for long-term control.

- Corticosteroids are generally considered the most effective treatment available for long-term control.Inhaled forms such as beclomethasone are usually used except in the case of severe persistent disease, in which oral corticosteroids may be needed.It is usually recommended that inhaled formulations be used once or twice daily, depending on the severity of symptoms.
- Long-acting beta-adrenoceptor agonists (LABA) such as salmeterol and formoterol can improve asthma control, at least in adults, when given in combination with inhaled corticosteroids. In children this benefit is uncertain. When used without steroids they increase the risk of severe side-effects,and with corticosteroids they may slightly increase the risk.Evidence suggests that for children who have persistent asthma, a treatment regime that includes LABA added to inhaled corticosteroids may improve lung function but does not reduce the amount of serious exacerbations.Children who require LABA as part of their asthma treatment may need to go to the hospital more frequently.
- Leukotriene receptor antagonists (such as montelukast and zafirlukast) may be used in addition to inhaled corticosteroids, typically also in conjunction with a LABA.Evidence is insufficient to support use in acute exacerbations. In children they appear to be of little benefit when added to inhaled steroids, and the same applies in adolescents and adults. They are useful by themselves. In those under five years of age, they were the preferred add-on therapy after inhaled corticosteroids by the British Thoracic Society in 2009. A similar class of drugs, 5-LOX inhibitors, may be used as an alternative in the chronic treatment of mild to moderate asthma among older children and adults. As of 2013 there is one medication in this family known as zileuton.
- Intravenous administration of the drug aminophylline does not provide an improvement in bronchodilation when compared to standard inhaled beta-2 agonist treatment. Aminophylline treatment is associated with more adverse effects compared to inhaled beta-2 agonist treatment.
- Mast cell stabilizers (such as cromolyn sodium) are another non-preferred alternative to corticosteroids.

Delivery methods

Medications are typically provided as metered-dose inhalers (MDIs) in combination with an asthma spacer or as a dry powder inhaler. The spacer is a plastic cylinder that mixes the medication with air, making it easier to receive a full dose of the drug. A nebulizer may also be used. Nebulizers and spacers are equally effective in those with mild to moderate symptoms. However, insufficient evidence is available to determine whether a difference exists in those with severe disease.There is no strong evidence for the use of intravenous LABA for adults or children who have acute asthma.

Adverse effects

Long-term use of inhaled corticosteroids at conventional doses carries a minor risk of adverse effects.Risks include thrush, the development of cataracts, and a slightly slowed rate of growth. Higher doses of inhaled steroids may result in lower bone mineral density.

Others

When asthma is unresponsive to usual medications, other options are available for both emergency management and prevention of flareups. For emergency management other options include:

- Oxygen to alleviate hypoxia if saturations fall below 92%.
- Corticosteroid by mouth are recommended with five days of prednisone being the same 2 days of dexamethasone.One review recommended a seven-day course of steroids.
- Magnesium sulfate intravenous treatment increases bronchodilation when used in addition to other treatment in moderate severe acute asthma attacks. In adults it results in a reduction of hospital admissions.
- Heliox, a mixture of helium and oxygen, may also be considered in severe unresponsive cases.
- Intravenous salbutamol is not supported by available evidence and is thus used only in extreme cases.
- Methylxanthines (such as theophylline) were once widely used, but do not add significantly to the effects of inhaled beta-agonists. Their use in acute exacerbations is controversial.
- The dissociative anesthetic ketamine is theoretically useful if intubation and mechanical ventilation is needed in people who are approaching respiratory arrest; however, there is no evidence from clinical trials to support this.
- For those with severe persistent asthma not controlled by inhaled corticosteroids and LABAs, bronchial thermoplasty may be an option. It involves the delivery of controlled thermal energy to the airway wall during a series of bronchoscopies.While it may increase exacerbation frequency in the

first few months it appears to decrease the subsequent rate. Effects beyond one year are unknown.
- Evidence suggests that sublingual immunotherapy in those with both allergic rhinitis and asthma improve outcomes.
- Omalizumab may also be useful in those with poorly controlled allergic asthma.
- It is unclear if non-invasive positive pressure ventilation in children is of use as it has not been sufficiently studied.

Alternative medicine

Many people with asthma, like those with other chronic disorders, use alternative treatments; surveys show that roughly 50% use some form of unconventional therapy.There is little data to support the effectiveness of most of these therapies. Evidence is insufficient to support the usage of Vitamin C. There is tentative support for its use in exercise induced bronchospasm. In people with mild to moderate asthma, treatment with vitamin D supplementation is likely to reduce the risk of asthma exacerbations.

Acupuncture is not recommended for the treatment as there is insufficient evidence to support its use. Air ionisers show no evidence that they improve asthma symptoms or benefit lung function; this applied equally to positive and negative ion generators.

Manual therapies, including osteopathic, chiropractic, physiotherapeutic and respiratory therapeutic maneuvers, have insufficient evidence to support their use in treating asthma.[190]The Buteyko breathing technique for controlling hyperventilation may result in a reduction in medication use; however, the technique does not have any effect on lung function.[133]Thus an expert panel felt that evidence was insufficient to support its use.[187]

Epidemiology

As of 2011, 235–330 million people worldwide are affected by asthma, and approximately 250,000–345,000 people die per year from the disease. Rates vary between countries with prevalences between 1 and 18%.It is more common in developed than developing countries. One thus sees lower rates in Asia, Eastern Europe and Africa.Within developed countries it is more common in those who are economically disadvantaged while in contrast in developing countries it is more common in the affluent.The reason for these differences is not well known. Low and middle income countries make up more than 80% of the mortality.

While asthma is twice as common in boys as girls, severe asthma occurs at equal rates. In contrast adult women have a higher rate of asthma than men and it is more common in the young than the old.In children, asthma was the most common reason for admission to the hospital following an emergency department visit in the US in 2011.

Global rates of asthma have increased significantly between the 1960s and 2008 with it being recognized as a major public health problem since the 1970s. Rates of asthma have plateaued in the developed world since the mid-1990s with recent increases primarily in the developing world. Asthma affects approximately 7% of the population of the United States and 5% of people in the United Kingdom. Canada, Australia and New Zealand have rates of about 14–15%.

Practical lesson № 3. ACUTE RHEUMATIC FEVER

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method og teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Overview

Rheumatic fever is an inflammatory disease that can develop as a complication of inadequately treated strep throat or scarlet fever. Strep throat and scarlet fever are caused by an infection with streptococcus bacteria.

Rheumatic fever is most common in 5- to 15-year-old children, though it can develop in younger children and adults. Although strep throat is common, rheumatic fever is rare in the United States and other developed countries. However, rheumatic fever remains common in many developing nations.

Rheumatic fever can cause permanent damage to the heart, including damaged heart valves and heart failure. Treatments can reduce damage from inflammation, lessen pain and other symptoms, and prevent the recurrence of rheumatic fever.

Symptoms

Rheumatic fever symptoms vary. You can have few symptoms or several, and symptoms can change during the course of the disease. The onset of rheumatic fever usually occurs about two to four weeks after a strep throat infection.

Rheumatic fever signs and symptoms — which result from inflammation in the heart, joints, skin or central nervous system — can include:

- Fever
- Painful and tender joints — most often in the knees, ankles, elbows and wrists
- Pain in one joint that migrates to another joint
- Red, hot or swollen joints
- Small, painless bumps (nodules) beneath the skin
- Chest pain
- Heart murmur
- Fatigue
- Flat or slightly raised, painless rash with a ragged edge (erythema marginatum)
- Jerky, uncontrollable body movements (Sydenham chorea, or St. Vitus' dance) — most often in the hands, feet and face

- Outbursts of unusual behavior, such as crying or inappropriate laughing, that accompanies Sydenham chorea

When to see a doctor

Have your child see a doctor for signs or symptoms of strep throat. Proper treatment of strep can prevent rheumatic fever. Also, have your child see a doctor if he or she shows other indications of rheumatic fever.

Request an Appointment

Causes

Rheumatic fever can occur after an infection of the throat with a bacterium called group A streptococcus. Group A streptococcus infections of the throat cause strep throat or, less commonly, scarlet fever. Group A streptococcus infections of the skin or other parts of the body rarely trigger rheumatic fever.

The link between strep infection and rheumatic fever isn't clear, but it appears that the bacterium tricks the immune system. The strep bacterium contains a protein similar to one found in certain tissues of the body. So immune system cells that would normally target the bacterium may treat the body's own tissues as if they were infectious agents — particularly tissues of the heart, joints, skin and central nervous system. This immune system reaction results in inflammation.

If your child receives prompt treatment with an antibiotic to eliminate strep bacteria and takes all medication as prescribed, there's little chance of developing rheumatic fever. If your child has one or more episodes of strep throat or scarlet fever that aren't treated or not treated completely, he or she might develop rheumatic fever.

Risk factors

Factors that can increase the risk of rheumatic fever include:

- **Family history.** Some people carry a gene or genes that might make them more likely to develop rheumatic fever.
- **Type of strep bacteria.** Certain strains of strep bacteria are more likely to contribute to rheumatic fever than are other strains.
- **Environmental factors.** A greater risk of rheumatic fever is associated with overcrowding, poor sanitation and other conditions that can easily result in the rapid transmission or multiple exposures to strep bacteria.

Complications

Inflammation caused by rheumatic fever can last a few weeks to several months. In some cases, the inflammation causes long-term complications.

Rheumatic heart disease is permanent damage to the heart caused by rheumatic fever. It usually occurs 10 to 20 years after the original illness. Problems are most common with the valve between the two left chambers of the heart (mitral valve), but the other valves can be affected. The damage can result in:

- **Valve stenosis.** This narrowing of the valve decreases blood flow.
- **Valve regurgitation.** This leak in the valve allows blood to flow in the wrong direction.
- **Damage to heart muscle.** The inflammation associated with rheumatic fever can weaken the heart muscle, affecting its ability to pump.

Damage to the mitral valve, other heart valves or other heart tissues can cause problems with the heart later in life. Resulting conditions can include:

- An irregular and chaotic beating of the upper chambers of the heart (atrial fibrillation)
- An inability of the heart to pump enough blood to the body (heart failure)

Prevention

The only way to prevent rheumatic fever is to treat strep throat infections or scarlet fever promptly with a full course of appropriate antibiotics.

What is Rheumatic Heart Disease?

Rheumatic heart disease (RHD) is damage to one or more heart valves that remains after an episode of acute rheumatic fever (ARF) is resolved. It is caused by an episode or recurrent episodes of ARF, where the heart has become inflamed. The heart valves can remain stretched and/or scarred, and normal blood flow through damaged valves is interrupted. Blood may flow backward through stretched valves that do not close properly, or may be blocked due to scarred valves not opening properly. When the heart is damaged in this way, the heart valves are unable to function adequately, and heart surgery may be required.

Untreated, RHD causes heart failure and those affected are at risk of arrhythmias, stroke, endocarditis and complications of pregnancy. These conditions cause progressive disability, reduce quality of life and can cause premature death in young adults. Heart surgery can manage some of these problems and prolong life but does not cure RHD.

Rheumatic heart disease is a chronic, disabling and sometimes fatal disease. It is 100% preventable

What are the symptoms of rheumatic heart disease?
Symptoms of RHD may not be noticed for many years. When they do develop, symptoms depend on which heart valves are affected and the type and severity of the damage. Most people with RHD have a heart murmur which can be heard through a stethoscope. Symptoms of moderate to severe RHD can include chest pain, breathlessness with physical activity or when lying down, weakness and tiredness, and swelling of the legs and face.

Practical lesson № 4. MITRAL AND AORTIC HEART DEFECTS

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
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1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Mitral and aortic heart defects. Hemodynamic disorders. Diagnostics, clinical pattern.

The acquired valvular heart disease (valvular heart defects, lat. - vitium cordis) is observed approximately in 0,5-1 % of the population, combining approximately 20-25 % of all heart diseases and occupy the third place among the most wide-spread heart diseases after hypertonic and ischemic diseases. Acquired and congenital heart defects are distinguished. The incidence of acquired heart defects is much higer.

Congenital heart defects occur due to abnormal development of the heart and big vessels during the intrauterine growth of the foetus with preservation of residual elements of fetal circulation after birth.

Between the causes of acquired valvular heart disease (AVHD) the main part belong to rheumatic disease, sepsis, atherosclerosis; lues, lesions ets. are the rare causes of this disease. In adolescent patients /in the age of 10-20 years / heart lesions by rheumatic etiology occupy more than 4/5 of all cases of AVHD.

The valvular heart disease is the stable pathological changes in the structures of the heart that interfere with its normal function.

In according to datas by V.A.Tchernogubov the main cause of acquired valvular defects is rheumatic fever; it occupies for about 90 % of all cases of AVHD.

Acquired valvular heart defectts are divided on some groups:

1.. Defects of the mitral valve.

II. Defects of the aortic valve.

III. Defects of the trycuspid valve.

IV. Defects of the pulmonic valve.

The inflammatory process in the leaflets of the affected valve quite often is resulting in their sclerosis with deformation or shortening. Such valve does not obtures completely atrio-ventricular aperture, thus its incompletence develops.

If the leaflets of the valve are adhered on its edges, the orifice they obtured is narrowed. Such state is termed as the stenosis of the orifice.

The mitral heart defects are as follows: the stenosis of the left atrio-ventricular aperture or the mitral stenosis (lat. - stenosis valvulae mitalis) and incompletence of the mitral aperture or the mitral incompletence (lat. - insufficientia valvulae mitralis).

THE MITRAL INCOMPLETENCE. The mitral incompletence is the result of congenital or acquired abnormality in mitral leaflets, supporting structures of the mitral valve, the mitral valve annulus, or left ventricular myocardium. When one or more of these structures are abnormal, the valve may become incompetent, resulting in a systolic blood back-flow to the left atrium (regurgitation).

Etiology: there are organic and relative mitral defects. The organic defect more often is a result of rheumatic endocarditis. Rheumatic process produses development of of connecting tissue in the leaflets of the mitral valve, shriveling and shortening of valve's leaflets as well as

chordae tendinous, connected with leaflets. As a result the ability of the valve to close fails. During systole the edges of the leaflets don't meet completely each with other and the slit between leaflets occurs. Blood stream come through that slit from the left ventricle to the left atrium.

At the case of relative incompletence the mitral valve is not altered, however due to widening of the left atrio-ventricular aperture casps of the valve fail to close it completly in systole.

The relative mitral incompletence develops due to following causes:

a / dilatation of the left ventricle chamber becouse of uncomplete obturation of enlarged aperture with leaflets;

b/ leaflets of the mitral valve during systole of the left ventricle can bend to left atrium's cavity (prolapsed mitral valve);

c / dysfunction of papillary muscles due to their ischemia, cardiosclerosis;

d / breakage of chordas tendinous connecting valve with papillary muscles;

e/ due to calcification of valvular fibrous annulus, when mitral valve narrowing during ventricular systole occurs.

Clinical pattern.

The natural history and symptomatic course of a patient with mitral incompetence are related to the degree of mitral regurgitation, the rapidity with which it develops, and the status of the underlying left atrial and ventricular function. Patients with insidious onset and gradual progression of mitral regurgitation, as occurs in chronic rheumatic mitral incompetence, have a prolonged asymptomatic interval of up to 20 years or more after the initiating event, and symptoms first appear in middle age or beyond. In most cases, left atrium compliances and its size increases to accommodate the regurgitant volume and effectively protect against marked increase in pulmonary vascular pressures. Consequently, symptoms of pulmonary congestion are less prominent and occur late in the course of the disease.

As congestion in pulmonary circulation occurs, dyspnea, palpitation of the geart, cyanosis and other symptoms develop. When left ventricular function deteriorates, dyspnea, orthopnea, and paroxysmal nocturnal dyspnea become more prominent as well as a couph (dry or with small expectoration of sputum, sometimes with admixions of blood (haemoptoe)/ Quite often patients can feel pain in the heart area by various character: dull ache, strabbing or pressing pain of different intensity, which is not correspond th degree of overload. Palpitation, cyanosis may be revealed in such patients at rest or after physical examination. Peripheral edema may be apparent in patients with end-stage mitral incompetence/

Palpation. the apical impulce is displaced to the left and downwards. It is resistent, brief. and somewhat diffuse. Despite its brevity, it's amplitude is increased. Not infrequently, an abnormal left parasternal systolic impulse may be observed or palpated. The apical thrill may be present and usually indicates severe mitral incompetence.

Blood pressure an arterial pulse. Blood pressure is usually normal. The peripheral arterial pulse is often normal but may be of small amplitude.

Percussion – displacement of heart borders upwards and leftwards may be revealed (so-called "mitral heart configuration" with indistinct heart waist) becouse of the enlarged left atrium and ventricle. At hypertrophy of the right ventricle the right heart border is displaced rightwards due to hypertrophy of the right ventricle.

Auscultation. In chronic mitral incompetence, the first heart sound usually is decreased in intensity. The weakening of the first heart sound occures because of absence of period of closured valves. . In uncomplicated mitral insufficiency the first sound is either faint or inaudible. The second heart sound usually is normal Accent of the second heart sound above the pulmonary artery is caused by increased blood pressure in pulmonary veins.

The third heart sound heard at the apex with the bell of the stethoscope is common (protodiastolic gallop). It tends to occur especially in moderate or severe mitral incompetence, because of the high diastolic flow into the ventricle, and therefore does not necessarily imply significant left ventricular dysfunction or left ventricular filling pressures. It generally occurs 120 to 240 msec after the second heart sound.

The auscultatory hallmark of the mitral incompetence is a sytolic murmur that typically is holosystolic, starts with the first heart sound and remains at constant intensity throughout systole, ending at or after the aortic component of the second heart sound. Usually the murmur is medium to high pitched, soft, blowing in quality. The intensity of the murmur does not correlate well with the severity of regurgitant flow. The murmur is best heard with the diaphragm of the stethoscope placed firmly over the apex. Although in some patients the murmur may be located to one point, most frequently the apical murmur transmisses to the axilla. This murmur is usually transmitted to the left and toward the posterior axillary line.The murmur may be notably short, soft, or absent in acute severe mitral incompetence.

The systolic murmur is better heared if the patient lies down on his left side and stops breathing.

The datas revealed during auscultation have to be improved and confirmed by **fonocardiogram (FCG).**

On X-ray film the enlargement of heart sillhouette leftwards, upwards and downwards is observed. True cardiomegaly with left ventricular and left atrial enlargement is a common finding in significant chronic mitral incompetence. Left atrial enlargement may be recognized by straightening of the left heart border, by a characteristic right-sided double density (right and left atrial borders are superimposed), and, occasionally, by elevation of the left main-stem bronchus.

The radiographic size the left atrium provides a rough guide to the severity and duration of the mitral incompetence. The atrium generally is more enlarged in mitral incompetence than in mitral stenosis; it may be gigantic if both lesions are present.

In patients with mitral incompetence, the pulmonary vasculature is usually normal until late in the disease when significant venous pulmonary hypertension develops. When increased blood pressure in pulmonary circulation persists –dilatation of pulmonary arteria arch, hypertrophy,

dilatation of the right ventricle are detected. The resulting redistribution of blood flow to the upper lobes and interstitial edema causes Kerley B lines.

On ECG - hypertrophy of the left atrium may be revealed. About 75% of patients with moderate to severe mitral incompetence have atrial fibrillation, consistent with the presence of significantly enlarged left atrium. Patients with normal sinus rhythm nearly always have evidence of left atrial enlargement i.e., P mitrale configuration (broad notched P waves in lead II and biphasic P waves in lead V1). Left ventricular hypertrophy with leftward or normal axis has been said to be characteristic of mitral incompetence, but the QRS complex and axis usually are normal and associated with nonspecific ST-segment and T-wave alterations. Right ventricular hypertrophy is notably uncommon, and its presence indicates significant pulmonary hypertension.

Echocardiography reveales the enlargement of the left heart chambers, movement of the mitral valve cusps in the opposite direction, their thikening and the absence of full closure during systole. By Doppler mode turbulent blood stream into the cavity of the left atrium in the expressed cases of incompletence is recorded, that is the indirect sign of mitral incompletence.

STENOSIS OF THE LEFT ATRIOVENTRICULAR APERTURE (lat. - stenosis of the left atrioventricular aperture, stenosis ostii venosi sinisti). The rheumatic endocarditis occupies a leading place in it's etiology. Each 500-800 persons among 100000 in the population have mitral stenosis. Clinical and auscultatoly findings of the mitral stenosis become evident earlie than in incopmletence. Thay sometimes allow a precise diagnosis and semiquantitation of the severity of the defect at the bedside. Duroziez is credited with being the first to describe the crescendo presystolic murmur of mitral stenosis.

Three degrees of the mitral stenosis are distinguished:

1) severe mitral stenosis (the square of mitral orifice is 0,5 cm2 or less);

2) the moderate one / the square of mitral orifice is about 1-0,6 cm2),

3) mild stenosis (the square of a mitral orifice is 1,5-1,1 cm2).

In the advanced stages of the mitral stenosis pulmonary venous hypertension leads to progressive pulmonary arteriolar constriction associated with intimal and medial hyperplasia. Its development protects the pulmonary capillaries from excessive pressure which would result in transudation of fluid into the interstitial tissues and alveoli of the lung. However, it leads to pulmonary arterial hypertension with resultant right ventricular hypertrophy and eventually to right ventricular failure with tricuspid incompetence, hepatic congestion, visceral congestion, ascites, and edema.

In mitral stenosis the less volume of blood enters into the left ventricle, that is why the loading on it dcreases, that resulting in dimension of its sizes.

Clinical pattren.

Many patients with mitral stenosis have a classic history of acute rheumatic fever or a histoty of recurrent streptococcal tonsillitis or pharyngitis, suggesting that a smoldering type of rheumatic fever may have occurred.

When lung congestion drveelops, patients complain on evolving types of dyspnea, paroxysmal nocturnal dyspnea, orthopnea, as well as recumbent cough and hemoptysis that may be associated with rupture of bronchial veins during bronchitis or later be the frothy, bloody sputum or pulmonary edema. Effort fatigue predominates early, followed by symptoms related to the hepatic and visceral congestion.

The symptoms tend to progress gradually, but there will be brief periods of increased severity of symptoms due to respiratory infections, unusual physical or emotional stress, paroxysmal atrial fibrillation, pregnancy, or pulmonary embolism.

Inspection reveiles acrocyanosis or cyanosis of cheeks, tip of the nose and the area above the bridge, the malar erythrocyanosis may be noted (lat. - “facies mitrale”). Visual examination of the heart region often reveales a cardiac beat consequent upon dilatation and hypertrophy of the right ventricle (lat. - gibbus cardiacus).

The arterial pulse is usually normal, ex¬cept that in patients with a low cardiac output and atrial fibrillation it will be reduced.

If the defeat develops in childchood – patient’s growth slows down, infantilism develops /lat. - "mitral nanism”/.

In the case of severe left atrial enlargement the last one presses on the nervus larynageus (its ramus recurens), therefore paresis of phonatory bands develops and the patient loses voice /aphonia/.

Palpation: The left ventricular impulse is normal and somewhat diffi¬cult to detect except in the left lateral decubitus position. In presence of significant pulmonary hypertension, a hypertrophied right ventricle will produce an outward impulse that can be seen and palpated along the left sternal edge.

The diastolic (presystolic) trill /lat. - fremissement cataire/ best of all is determined in the position of the patient on the left side at maximal expiration. It is caused by transit of blood through reduced apertura from the left atrium to the left ventricle.

The pulse in mitral stenosis can be unequal on right and left arms. At considerable hypertrophy of the left atrium the left subclavial artery is pressed by the left ventricle and pulse filling on the left diminishes, (lat. - pulsus differens). If the left ventricle is not filled completely and the stroke volume is decreased, the pulse become small lat. - (pulsus parvus). At the case of arrhythmia pulse is atthythmic.

Blood pressure is normal, sometimes systolic pressure slightly decreases and diastolic one - increases.

Percussion: displasement of heart’s borders upwards and leftwards resulting in hypertrophy of the left atrium and right ventricle. Thus the heart is of “mitral” configuration.

Auscultation: The cardinal auscultatory features of initial stenosis consist of accentuation of the first heart sound, early diastolic opening snap, and early, middiastolic crescendo-descendo murmur with presystolic accentuation. Mitral stenosis in its early or milder form is often unrecognized unless the physician listens carefully at the apex, with the patient in the left lateral decubitus position, and uses the bell of the stethoscope to detect the low-

frequency diastolic murmurs. The patient should be examined both at rest and with exercise in order to estimate the severity of the stenosis property.

The first heart sound characteristically is very loud, it is the result of two factors: (1) thickened chordae which are less elastic than normal and therefore cause a more abrupt termination of valve motion, and (2) the mitral valve is close to being maximally open at the onset of systole. Due to delay in mitral valve closure the left ventricle is not completly filled with blood and heart contraction descends promptly. The 1 sound sometimesn resembles the hue of the "sound in the empty pot".

An adventitious sound due to opening of the mitral valve can be heard at the apex beat – so-called an opening snap sound which is an important auscultatory sign of mitral stenosis. This sound is heard between 30 and 120 msec after the aortic valve component of the second sound and occurs when left ventricular pressure drops below left atrial pressure in early diastole.

It is a brief, high-pitched sound with wide transmission. It is caused by the "tambourine effect" of the valve with fused commissures .snapping into the ventricle rather than opening to allow free flow of blood. It is best heard at the point of maximal apical impulse; it also is heard easily along the left sternal border with the patient in the recumbent position. In addition to the implication of disease of the mitral valve, almost always rheumatic, the relationship of this sound to the aortic valve component of the second sound is helpful in assessing the severity of the mitral valve stenosis.

The II sound normally occurs within 50 msec of the onset of the QRS. Because of the delay in mitral valve closure, the mitral component of the II sound is delayed. In mitral stenosis, it is usually delayed 70 msec or more. The delay of the II sound depends on the duration of the preceding cycle.

The intensity of the second heart sound usually is normal in patients with mitral stenosis. However, one have to separate it from the opening snap before one can reliably define the qualities of its components. With severe mitral stenosis and the appearance of pulmonary hypertension, the pulmonary component of the second sound will increase in intensity (accentuation of the second heart sound above pulmonic artery). The loud first sound, second sound, and the sound of mitral valve opening give a specific murmur which is characteristic of mitral stenosis and resembles the song of a quail.

A formula for estimating of the severity of the mitral stenosis is devised based on the delay in the first sound and the interval between the second sound and the opening snap of the mitral valve: the more severe the is stenosis, the greater the Q-to-first sound interval and the shoner the second sound-Q-to-opening snap interval. In calcific mitral stenosis, the first sound may be softer than normal, and then the opening snap is usually absent.

Murmurs. The characteristic murmur of the mitral stenosis is a low-pitched diastolic creschendo- deschendo murmur heard best with the bell applied lightly to the skin over the heart apex. The murmur varies in length and may be only presystolic, middiastolic, or holodiastolic, can be heared during all diastole, strengthening before a systole (presystolic accentuation) and immediately merging with clapping first sound.: A holodiastolic murmur during long diastolic

periods indicates a persisting gradient and hence severe stenosis. In the milder form of mitral stenosis it may be difficult to hear, and often the patient must exercise before it is clearly audible. The most characteristic murmur of mitral stenosis is one that begins immediately after the opening snap of the mitral valve, extends throughout diastole with presystolic accentuation, and ends with a loud first sound.

Finally, in the presence of pulmonary hypertension com¬plicating mitral stenosis, pulmonary valve incompetence will develop. Trills is associated with a high-pitched decrescendo diastolic murmur heared best along the left sternal border (Graham Steele murmur). When this murmur is present, it is associated with a. loud pulmonary component of the second sound that usually is palpable and implies severe mitral stenosis.

In the case of calcification of the mitral valve rasping systolic murmur gains "irony" shade and sometimes a high “murmur-squeak" may be revealed. In the case of appearance of ciliary arrhythmia in patients with mitral stenosis heart sounds become absolutely inordinate. S.P.Botkin compared them with "a forge hum".

On the **chest roentgenogram** –shows a specific enlargement of the left atrium, which leads to disappearance of the heart waist /the mitral heart configuration/ are detected. On the lateral film (the first oblique position) enlargement of the left atgrium is determined by the degree of displacement of the esophagus which is good visible after the patient have drunk baric suspension. The chest roentgenogram is helpful in both confirming the diagnosis and assessing the severity of the stenosis. A large left atrial sillhouette, dilated upper lobe veins, and evidence of alveolar or interstitial edema with 1- to 3-cm horizontal lines in the costophrenic angles (Kerley B lines) all are consistent with severe mitral stenosis.

In presence of pulmonary hypertension, the swelling of pulmonary artery arch and hypertrophy of the right ventricle are watched.The central pulmonary arteries are prominent, and there will be a sudden decrease in the vascular markings in the peripheral lung fields associated with right ventricular enlarge¬ment that will be seen best in the lateral film. Valvular calcification is visible on roentgenogram. At pulmonary prolonged hypertension pneumosclerosis develops.

The **electrocardiogram** in mitral stenosis maps signs of hypertrophy of the left atrium and left ventricle: deviation of heart electrical axis rightwards, high and prolonged waves P in the right thoracic leads and expressed waves f in the left thoracic leads may be detected. The ECG may be often normal except for a prolonged, bifid P wave in lead 2 and a prominent late negative deflection in V1 related to left atrial enlargement. Atrial fibrillation is the most common abnormal rhythm. Despite severe degrees of right ventricular hypertrophy, the ECG commonly will disclose only right axis deviation with S waves in leads 1 and V6 and an rSr in lead V1.

On the **phonocardiogram** taken from the apex high voltage of the I heart sound is often detected; the second sound is often followed with the opening snup and diastolic murmur, the last one is better heard above the pulmonary artery; voltage of the П sound is enlarged in comparing with those above the aorta. The interval Q-to-I sound is enlarged.

Echocardiography Pertinent information obtainable from echocardiographic examination of a patient with mitral stenosis includes extent of calcification and fibrosis of the mitral valve, presence of atrial thrombi, enlargement of chambers in size and disorders of contractility, presence of other valvular abnormalities.The hypertrophy and augmentation of the left atrium, change of the mitral valve leaflets /induration, adhesion, calcification) may be revealed, the locomotion of leaflets becomes undirectional, gains the Π-similar form.

As the **surgical treatment** of the acquired heart valvular disease is successful now, it is necessity to precise diagnostics of degree of narrowing or degree of the valvular failure and detection of prevalence of one of them.

AORTIC INCOMPETENCE

Aortic incompetence (aortic insufficiency) is the failure of the aortic valve to close completely during ventricular diastole; blood thus leaks back into the left ventricle. Aortic incompetence is usually secondary to rheumatic endocarditis, and less frequently bacterial (septic) endocarditis, syphilitic affection of the aorta, or atherosclerosis. Inflammatory and sclerotic changes occurring in the base of the cusps during rheumatic endocarditis make them shrink and shorten. Atherosclerosis and syphilis can affect only the aorta (to distend it), while the valve cusps are only shortened. The cicatricial changes may extend onto the cusps to disfigure them. Parts of the valve disintegrate in ulcerous endocarditis associated with sepsis and the cusps are affected with their subsequent cicatrization and shortening.

Clinical picture. Subjective condition of patients with aortic sncompetence may remain good for a long time because the defect is compensated for by harder work of the powerful left ventricle. Pain in the heart (anginal in character) may sometimes be felt; it is due to relative coronary insufficiency because of pronounced hypertrophy of the myocardium and inadequate filling of the coronary arteries under low diastolic pressure in the aorta. The patient may sometimes complain of giddiness which is the result of deranged blood supply to the brain (which is also due diastolic pressure).

If contractility of the left-ventricular myocardium is impaired, congestion in the lesser circulation develops and the patient complaints of dyspnoea, tachycardia, weakness, etc. The skin of the patient is pallid due to insufficient filling of the arterial system during diastole. Marked variations in the pressure in the arterial system during systole and diastole count for the appearance of some signs, such as pulsation of the perphieral arteries, the carotids (carotid shudder), subclavian, brachial, temporal and other arteries; rhythmical movements of the head synchronous with the pulse (Musset's sign), rhythmical change in the colour of the nail bed under a slight pressure on the nail end, the so-called capillary pulse (Quincke's pulse), rhythmical reddening of the skin after rubbing, etc.

The apex beat is almost always enlarged and shifted to the left and inferiorly. Sometimes, along with the elevation of the apex beat, a slight depression in the neighbouring intercostal spaces can be observed The apex beat is palpable in the sixth and sometimes seventh intercostal space laterally of the midclavicular line. The apex beat is diffuse, intense, rising like a dome. This indicates significant enlargement of the left ventracle. The border of cardiac dullness can be

found (by percussion) to shift to the left; the heart becomes "aortic" (with pronounced waist of the herat.

Auscultation reveals decreased first sound at the apex, since during left-ventricular systole the period when the valves are closed is absent. The second sound on the aorta is also weak, and if the valve is damaged significantly, it can be inaudible. The second sound can be quite loud in atherosclerotic affection of the aorta. Diastolic murmur heard oer the aorta and at the Botkin-Erb listening point is characteristic. This is a low blowing protodiastolic murmur which weakens by the end of diastole sa the blood pressure in the aorta drops and the blood-flow rate decreases. The described changes in the sounds and murmurs are clearly visible on phonocardiogram. Murmurs of functional aetiology can also be heard in aortic incompetence at the heart apex. If the left ventricle is markedly dilated, relative mitral incompetence develops and systolic murmur can be heard at the apex. Diastolic murmur (presystolic or Austin-Flint murmur) can sometimes be heard. It arises due to an intence regurgitation of the blood that moves aside the mitral valve cusp to account for functional mitral stenosis. Doubled sound (Traube souble sound) nd doubled Vinogradov-Durozierz murmur can sometimes be heard over the femoral artery in this disease.

The pulse is fast, full, and high, which is due to high pulse pressure and increased volume of blood deliverred into the aorta during systole. Arterial pressure constantly varies^ the systolic pressure rises and diastolic falls, and the pulse pressure is therefore high.

X-ray studies show an enlarged left ventricle with a distinct waist of the heart and dilatation of the aorta; pulsation of the aorta is intense.

The ECG also reveals various signs of hypertrophy of the left ventricle: the electrical axis is deviated to the left, the S waves in the right chest leads are deep and the amplitude of the R wave is higher in the left chest leads; these signs often combine with signs of overstrain in the left ventricle and relative coronary insufficiency (changes in the terminal part of the ventricular complex, displacement of the S-T interval, and the negative T wave).

Echocardiograms taken from patients with aortic failure show flutter of the anterior mitral cusp during diastole caused by the thrust of the blood regurgitated from the aorta into the ventricle.

Aortic incompetence can for a long time be compensated for by intensified work of the hypertrophied left ventricle. When its contractile force decreases, congestion in the lesser circulation develops. Acute weakness of the left ventricle sometimes develops and is manifested by an attack of cardiac asthma. Dilatation of the weakened left ventricle can cause relative mitral incompetence. This increases venous congestion in the lesser circulation associated with decompensated aortic incompetence and adds to the load on the right ventricle. This is mitralization of aortic incompetence, which may become the cause of venous congestion in the greater circulation.

AORTIC STENOSIS

The narroving of the aortic orifice (aortic stenosis) interferes with expulsion of blood into the aorta during contraction of the left ventricle. Aortic stenosis is usually caused by rheumatic

endocarditis; less frequently it develops due to bacterial endocarditis, atherosclerosis, or it may be congenital. Stenosis results from adhered aortic valve cusps or develops due to cicatricial narrowing of the aortic orifice.

Clinical picture. Aortic stenosis can remain compensated for years and would not cause any unpleasant sublective sensations (even during intense physical exertion). If obstruction of the aortic orifice is considerable, infufficient blood ejection into the arterial system upsets normal blood supply to the hypertrophied myocardium and the patient feels pain in the heart (angina pectoris-type pain). Disordered blood supply to the brain is manifested by giddiness, headache, and tendency to fainting. These symptoms like pain in the heart would more likely occur during physical and emotional stress.

The skin of the patient is pallid due to insufficient blood supply to the arterial system. The apex beat is displaced to the left, less frequently ineriorly; it is diffuse, high, and resistant. Systolic thrill (cat's purr) can be palpated in the region of the heart**. Percussion** reveals displacement of the left heart border; the heart is "aortic" due to hypertrophy of the left ventricle. **Auscultation** of the heart at its apex reveals diminished first sound due to overfilling of the left ventricle and prolongation of systole. The second sound is diminished over the aorta. If the aortic cusps adhere and are immobile, the second sound can be inaudible. Rough systolic murmur over the aorta is characteristic. This murmur is generated by the blood flow through the narrowed orifice. It is conducted by the blood onto the carotids and can sometimes be heard in the interscapular space. The pulse is small, slow, and rare, since the blood slowly passes into the aorta and its volume is decreased. Systolic arterial pressure is usually diminished, while diastolic remains normal or increases. The pulse pressure is therefore decreased.

X-ray examination shows hypertrophied left ventricle, "aortic" configuration of the heart, and dilatation of the ascending aorta (poststenotic); the cusps of the aortic valve are often calcified.

The ECG usually shows signs of hypertrophy of the left ventricle and sometimes of coronary insufficiency.

The phonocardiogram shows the specific changes in the heart sounds: diminished amplitudes of the first sound at the heart apex and of the second sound over the aorta. Systolic murmur over the aorta is typical; its oscillations are recorded in the form of -specific diamond-shaped figures.

Sphygmograms of the carotids reveal slowed ascent and descent of the pulse wave (slow pulse), small amplitude of the pulse waves, and specific serrated pattern of their peaks (sphygmograms in the form of a cock's comb) showing oscillations associated with conduction of systolic murmur onto the neck vessels.

Echocardiograms show decreased opening of the aortic valve during systole. Echoes from the cusps become more intense and signs of hypertrophy of the left ventricle appear.

Aortic stenosis remains compensated for a long time. Circulatory insuf¬ficiency develops in diminished contractility of the left ventricle and it is manifested as in aortic incompetence.

Treatment. Conservative treatment means management of heart failure. Operative treatment – implantation of artificial prostesis in incompetence or comissuritomy in stenosis.

Practical lesson № 5 . HEART ARRHYTHMIA

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Arrhythmia: Causes, symptoms, types, and treatment

Arrhythmias occur when the electrical signals to the heart that coordinate heartbeats are not working properly. For instance, some people experience irregular heartbeats, which may feel like a racing heart or fluttering.

Many heart arrhythmias are harmless; however, if they are particularly abnormal, or result from a weak or damaged heart, arrhythmias can cause serious and even potentially fatal symptoms.

Fast facts on arrhythmias:

- Some arrhythmias have no associated symptoms.
- Symptoms of arrhythmia often include dizziness, breathlessness, and palpitations.
- The causes of arrhythmia are varied and include diabetes, mental stress, and smoking.
- A slow heartbeat is not always a sign of illness.

What is arrhythmia?

Heart arrhythmia, also known as irregular heartbeat or cardiac dysrhythmia, is a group of conditions where the heartbeat is irregular, too slow, or too fast.

Arrhythmias are broken down into:

- Slow heartbeat: bradycardia.
- Fast heartbeat: tachycardia.
- Irregular heartbeat: flutter or fibrillation.
- Early heartbeat: premature contraction.

Most arrhythmias are not serious, but some can predispose the individual to stroke or cardiac arrest.

Causes of arrhythmia?

Any interruption to the electrical impulses that cause the heart to contract can result in arrhythmia.

For a person with a healthy heart, they should have a heart rate of between 60-100 beats per minute when resting.

The more fit a person is, the lower their resting heart rate.

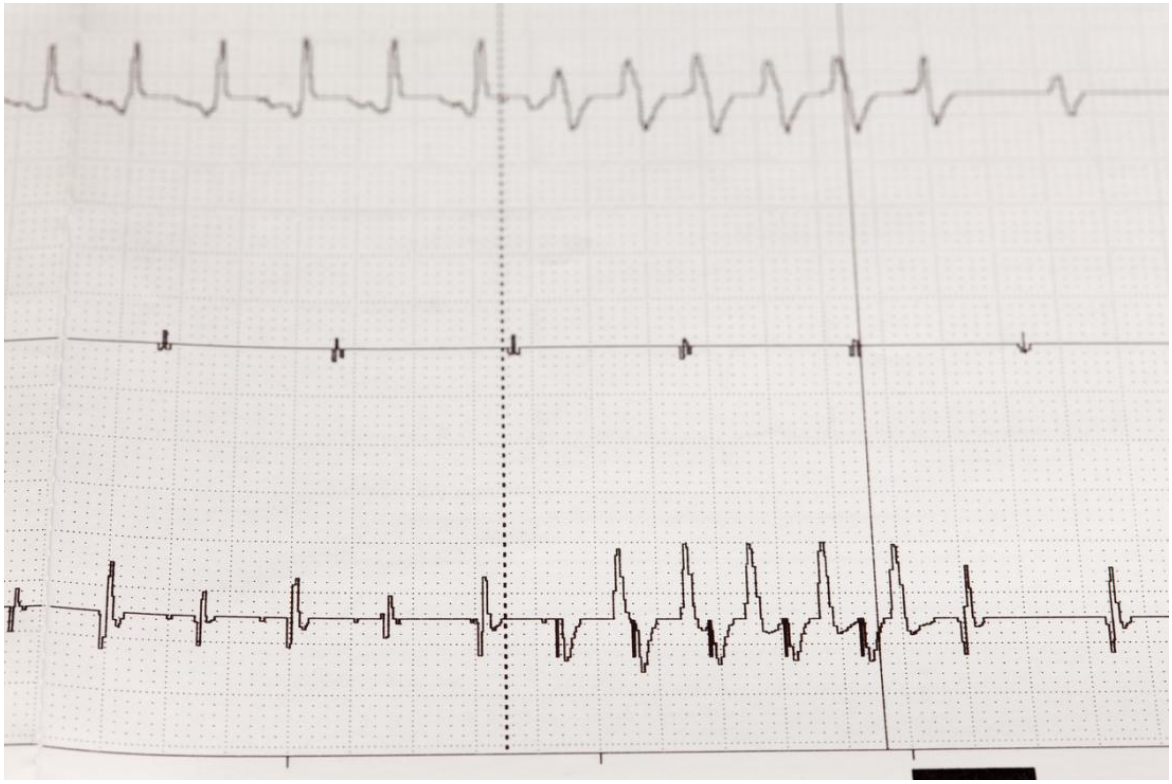
Olympic athletes, for example, will usually have a resting heart rate of under 60 beats per minute because their hearts are very efficient.

A number of factors can cause the heart to work incorrectly, they include:

- alcohol abuse
- diabetes
- drug abuse
- excessive coffee consumption
- heart disease like congestive heart failure
- hypertension (high blood pressure)
- hyperthyroidism (an overactive thyroid gland)
- mental stress
- scarring of the heart, often the result of a heart attack
- smoking
- some dietary supplements
- some herbal treatments
- some medications
- structural changes of the heart

A healthy person will hardly ever suffer from long-term arrhythmia unless they have an external trigger, such as drug abuse or an electric shock. If there is an underlying problem, however, the electrical impulses may not be able to travel through the heart correctly, increasing the likelihood of arrhythmia.

Symptoms of arrhythmia



Arrhythmia, or abnormal heart rate, has a variety of causes.

Some patients have no symptoms, but a doctor might detect an arrhythmia during a routine examination or on an EKG.

Even if a patient notices symptoms, it does not necessarily mean there is a serious problem; for instance, some patients with life-threatening arrhythmias may have no symptoms while others with symptoms may not have a serious problem.

Symptoms depend on the type of arrhythmia; we will explain the most common below:

Symptoms of tachycardia

Tachycardia is when the heart beats quicker than normal; symptoms include:

- breathlessness (dyspnea)
- dizziness
- syncope (fainting, or nearly fainting)
- fluttering in the chest
- chest pain
- lightheadedness
- sudden weakness

Symptoms of bradycardia

Bradycardia is when the heart beats slower than normal; symptoms include:

- angina (chest pain)
- trouble concentrating
- confusion
- difficulties when exercising
- dizziness
- fatigue (tiredness)
- lightheadedness
- palpitations
- shortness of breath
- syncope (fainting or nearly fainting)
- diaphoresis, or sweating

Symptoms of atrial fibrillation

Atrial fibrillation is when the upper chambers of the heart beat in an irregular pattern and out of synchrony with the lower chambers. Symptoms often develop rapidly, although sometimes, there are no symptoms:

- angina (chest pain)
- breathlessness (dyspnea)
- dizziness
- palpitations
- syncope (fainting, or nearly fainting)
- weakness

Treatments for arrhythmia

Treatment for arrhythmia is only required if the condition is putting the patient at risk of a more serious arrhythmia or a complication, or if the symptoms are very severe.

Treatments for bradycardia

If bradycardia is caused by an underlying condition, that condition needs to be treated first. If no underlying problem is found, the doctor may advise implanting a pacemaker.

A pacemaker is a small device that is placed under the skin of the chest or abdomen to help control abnormal heart rhythms. Pacemakers use electrical pulses to prompt the heart to beat at a normal minimum rate.

Treatments for tachycardia

There are several different treatments for tachycardia:

Vagal maneuvers - certain movements that the patient can do themselves might stop some types of arrhythmia that start above the lower half of the heart.

Medications - these will not cure the patient, but are usually effective in reducing episodes of tachycardia and can help with proper electrical conduction of the heart.

Cardioversion - the doctor may use an electric shock or medication to reset the heart to its regular rhythm.

Ablation therapy - one or more catheters go through blood vessels into the inner heart. They are placed in areas of the heart that are thought to be the source of the arrhythmia and destroy small sections of those tissues.

ICD (implantable cardioverter-defibrillator) - the device is implanted near the left collarbone and monitors heart rhythm; if it detects an abnormally fast rhythm, it stimulates the heart to return to a normal rhythm.

Maze procedure - a series of surgical incisions are made in the heart. They then heal into scars and form blocks. These blocks guide the electrical impulses, helping the heart to beat efficiently.

Ventricular aneurysm surgery - sometimes, an aneurysm (bulge) in a blood vessel that leads to the heart causes an arrhythmia. If other treatments do not work, a surgeon may remove the aneurysm.

Coronary bypass surgery - arteries or veins from elsewhere in the patient's body are grafted to the coronary arteries to bypass any regions that have become narrow, and improve the blood supply to the heart muscle (myocardium).

Types of arrhythmia

There are several types of arrhythmia:

Atrial fibrillation

This is irregular beating of the atrial chambers - nearly always too fast. Atrial fibrillation is common and mainly affects older patients. Instead of producing a single, strong contraction, the chamber fibrillates (quivers). In some cases, the atrium can fibrillate at 350 beats per minute and, in extreme cases, up to 600.

Atrial flutter

While fibrillation consists of many random and different quivers in the atrium, atrial flutter is usually from one area in the atrium that is not conducting properly, so the abnormal heart conduction has a consistent pattern. Neither are ideal for pumping blood through the heart.

Some patients may experience both flutter and fibrillation.Atrial flutter can be a serious condition, and untreated usually leads to fibrillation. A patient with atrial flutter will typically experience 250-350 beats per minute.

Supraventricular tachycardia (SVT)

A regular, abnormally rapid heartbeat. The patient experiences a burst of accelerated heartbeats that can last from a few seconds to a few hours. Typically, a patient with SVT will have a heart rate of 160-200 beats per minute. Atrial fibrillation and flutter are classified under SVTs.

Ventricular tachycardia

Abnormal electrical impulses that start in the ventricles and cause an abnormally fast heartbeat. This often happens if the heart has a scar from a previous heart attack. Usually, the ventricle will contract more than 200 times a minute.

Ventricular fibrillation

An irregular heart rhythm consisting of very rapid, uncoordinated fluttering contractions of the ventricles.The ventricles do not pump blood properly, they simply quiver. Ventricular fibrillation is life threatening and usually associated with heart disease. It is often triggered by a heart attack.

Long QT syndrome

A heart rhythm disorder that sometimes causes rapid, uncoordinated heartbeats. This can result in fainting, which may be life-threatening. It can be caused by a genetic susceptibility or certain medications.

Arrhythmia versus dysrhythmia

The words arrhythmia and dysrhythmia are interchangable. In other words, they mean the same thing. However, arrhythmia tends to be used more frequently.

Diagnosis of arrhythmia

The doctor will try to find out what triggers the patient's arrhythmia. This will involve a detailed interview, which may include the patient's medical history, family history, diet, and lifestyle.

The following tests might be ordered:

- blood and urine tests

- EKG (electrocardiogram)
- Holtermonitor - a wearable device that records the heart for 1-2 days
- echocardiogram
- chest X-ray
- tilt-table test
- electrophysiologic testing (or EP studies)
- heart catheterization

Risk factors for arrhythmia

The following are possible risk factors for arrhythmia:

- old age
- inherited gene defects
- heart problems
- hypothyroidism or hyperthyroidism
- some prescription medications, and over-the-counter drugs
- hypertension
- obesity
- uncontrolled diabetes
- obstructive sleep apnea
- electrolyte imbalances
- heavy and regular alcohol consumption
- too much caffeine
- illegal drugs

Complications of arrhythmia

Stroke - fibrillation (quivering) means that the heart is not pumping properly. This can cause blood to collect in pools and clots can form. If one of the clots dislodges it may travel to a brain artery, blocking it, and causing a stroke. Stroke can cause brain damage and can sometimes be fatal.

Heart failure - prolonged tachycardia or bradycardia can result in the heart not pumping enough blood to the body and its organs - this is heart failure. Treatment can usually help improve this.

Practical lesson № 6. BLOCKADE OF THE HEART

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

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Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Heart block

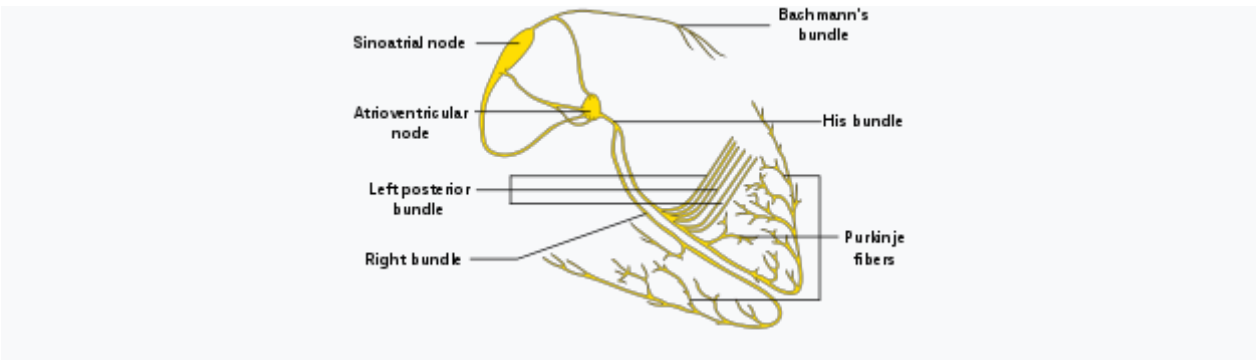
Heart block is a disease or inherited condition that causes a fault within the heart's natural pacemaker due to some kind of obstruction (or "block") in the electrical conduction system of the heart. Despite the severe-sounding name, heart block may often cause no symptoms at all in some cases, or occasional missed heartbeats in other cases (which can cause lightheadedness, syncope (fainting), and palpitations), or may require an artificial pacemaker to be implanted, depending upon exactly where in the heart conduction is being impaired and how significantly it is affected.

In severe cases where the heart's ability to control and trigger heartbeats may be completely ineffective or unreliable, heart block can usually be treated by inserting an artificial pacemaker, a medical device that provides correct electrical impulses to trigger heart beats, compensating for the natural pacemaker's unreliability. Therefore, heart block frequently has no effects, or mild and occasional effects, and is not life-threatening in the vast majority of cases, and is usually treatable in more serious cases.

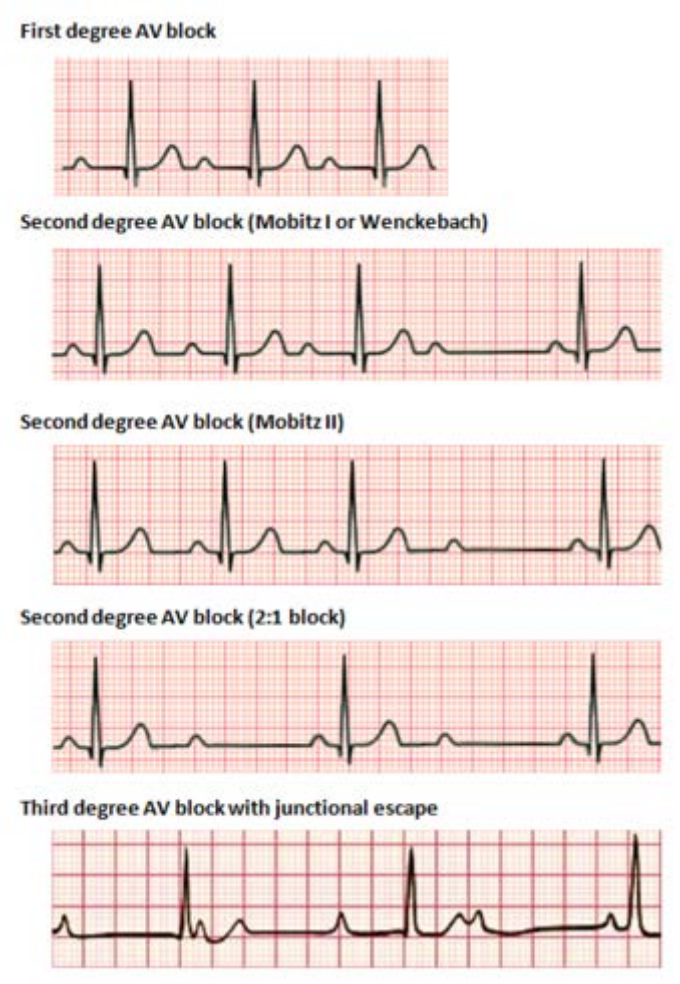
The human heart uses electrical signals to maintain and initiate the regular heart beat in a living person; incorrect conduction can lead to mild or serious symptoms depending upon the location of the blockage and how severely conduction is being blocked. Conduction is initiated by the sinoatrial node ("sinus node" or "SA node"), and then travels to the atrioventricular node ("AV node") which also contains a secondary "pacemaker" that acts as a backup for the SA nodes, then to the bundle of His and then via the bundle branches to the point of the apex of the fascicular branches (shown in the diagram on the right). Blockages are therefore classified based on where the blockage occurs - namely the SA node ("Sinoatrial block"), AV node ("AV block" or AVB), and at or below the bundle of His ("Intra-Hisian" or "Infra-Hisian block" respectively). Infra-Hisian blocks may occur at the left or right bundle branches ("bundle branch block") or the fascicles of the left bundle branch ("fascicular block" or "Hemiblock"). SA and AV node blocks are each divided into three degrees, with second degree blocks being divided into two types (written either "type I or II" or "type 1 or 2"). The term "Wenckebach block" is also used for second degree type 1 blocks of either the SA or AV node; in addition second degree blocks type 1 and 2 are also sometimes known as "Mobitz 1" and "Mobitz 2".

Clinically speaking, the blocks tend to have more serious potential the closer they are to the 'end' of the electrical path (the muscles of the heart regulated by the heartbeat), and less serious effects the closer they are to the 'start' (at the SA node), because the potential disruption becomes greater as more of the 'path' is 'blocked' from its 'end' point. Therefore, most of the important heart blocks are AV nodal blocks and infra-Hisian blocks. SA blocks are usually of lesser clinical significance, since in the event of SA block, the AV node contains a secondary pacemaker which would still maintain a heart rate of around 40 - 60 beats per minute, sufficient for consciousness and much of daily life in the majority of individuals.

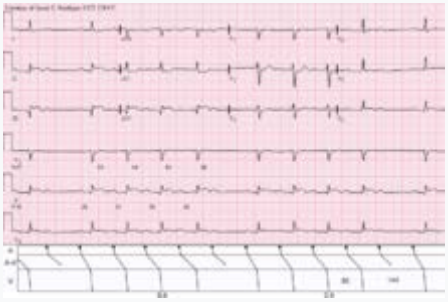
Types[edit]



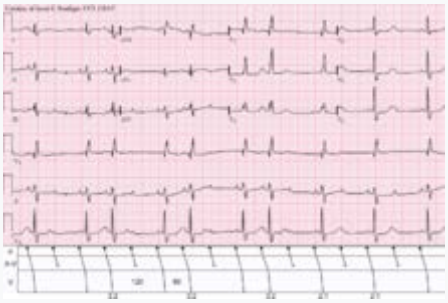
Conduction system of the heart



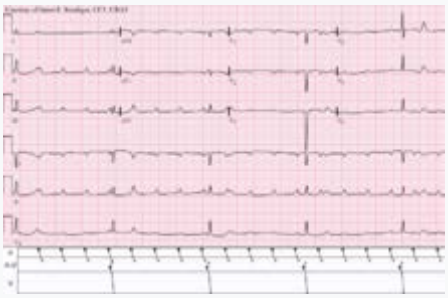
Types of heart block



Sinus rhythm with acute inferior infarction complicated by Type I AV block manifest in the form of 5:4 Wenckebach periods; R-P/P-R reciprocity.



Sinus rhythm (rate = 100/min) with 3:2 and 2:1 Type II AV block; right bundle branch block



Sinus tachycardia with complete AV block and resulting junctional escape

Following the path of the electrical signals, the places where conduction can be blocked give rise to different kinds of heart blocks:

Location	Name
Within the sinoatrial node (SA node or Sinus node), where the heart's signals originate	Sinoatrial nodal blocks (often abbreviated "SA nodal block" or "SA block", sometimes written "Sinuatrial block")
Within the atrioventricular node (AV node)	Atrioventricular block (often abbreviated "AV nodal block", "AV block" or AVB).
At and below the bundle of His	Intra-Hisian blocks and Infra-Hisian blocks respectively.
Within the left or right bundle branches	Bundle branch blocks.
Within the fascicles of the left bundle branch	"Fascicular block" or Hemiblocks.

SA and AV node blocks are each divided into three degrees, with second degree blocks being divided into two types (written either "type I or II" or "type 1 or 2"). In an SA block, the electrical impulse is delayed or blocked on the way to the atria, thus delaying atrial depolarization. By contrast, an AV block occurs in the AV node and delays ventricular depolarization. The term "Wenckebach block" is also used for some heart blocks, and can refer to a second degree type I block in *either the SA node or the AV node*, however the ECG features of the two are quite distinctly different.

SA nodal blocks[edit]

SA blocks rarely give severe symptoms, because even if an individual had complete block at this level of the conduction system (which is uncommon), the secondary pacemaker of the heart

would be at the AV node, which would fire at 40 to 60 beats a minute, which is enough to retain consciousness in the resting state. However SA block is capable of causing problematic symptoms even so, and may also hint at conduction issues elsewhere in the heart, and therefore SA blocks are - despite their lower level of life-threatening risk - still "the most common indication for pacemaker implantation in the US".[1]

Types of SA nodal blocks include:

- SA node Wenckebach (Mobitz I)[2]
- SA node Mobitz II
- SA node exit block

In addition to the above blocks, the SA node can be suppressed by any other arrhythmia that reaches it. This includes retrograde conduction from the ventricles, ectopic atrial beats, atrial fibrillation, and atrial flutter.

The difference between SA node block and SA node suppression is that in SA node block an electrical impulse is generated by the SA node that doesn't make the atria contract. In SA node suppression, on the other hand, the SA node doesn't generate an electrical impulse because it is reset by the electrical impulse that enters the SA node.

AV nodal blocks

There are three basic types of AV nodal block:

- First-degree AV block
- Second-degree AV block
  - Type I second-degree AV block (Mobitz I), also known as Wenckebach block[3]
  - Type 2 second-degree AV block (Mobitz II) - due to a block in or below the bundle of His[3]
- Third-degree AV block (complete heart block)

Infra-Hisian block

Infra-Hisian block is that of the distal conduction system. Types of infra-Hisian block include:

- Type 2 second degree heart block (Mobitz II) –a type of AV block due to a block within or below the bundle of His[3]
  - Left anterior fascicular block
  - Left posterior fascicular block
- Right bundle branch block

Of these types of infra-Hisian block, Mobitz II heart block is considered most important because of the possible progression to complete heart block.

Practical lesson № 7. HYPERTONIC DISEASE

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

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2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Hypertonia is a term sometimes used synonymously with **spasticity and rigidity** in the literature surrounding damage to the central nervous system, namely upper motor neuron lesions.Impaired ability of damaged motor neurons to regulate descending pathways gives rise to disordered spinal reflexes, increased excitability of muscle spindles, and decreased synaptic inhibition.These consequences result in abnormally increased muscle tone of symptomatic muscles.Some authors suggest that the current definition for spasticity, the velocity-dependent over-activity of the stretch reflex, is not sufficient as it fails to take into account patients exhibiting increased muscle tone in the absence of stretch reflex over-activity. They instead suggest that "**reversible hypertonia**" is more appropriate and represents a treatable condition that is responsive to various therapy modalities like drug and/or physical therapy.

Symptoms associated with central nervous systems disorders are classified into positive and negative categories. Positive symptoms include those that increase muscle activity through hyper-excitability of the stretch reflex (i.e., rigidity and spasticity) where negative symptoms include those of insufficient muscle activity (i.e. weakness) and reduced motor function. Often the two classifications are thought to be separate entities of a disorder; however, some authors propose that they may be closely related.

Pathophysiology

Hypertonia is caused by upper motor neuron lesions which may result from injury, disease, or conditions that involve damage to the central nervous system. The lack of or decrease in upper motor neuron function leads to loss of inhibition with resultant hyperactivity of lower motor neurons. Different patterns of muscle weakness or hyperactivity can occur based on the location of the lesion, causing a multitude of neurological symptoms, including spasticity, rigidity, or dystonia.[3]

Spastic hypertonia involves uncontrollable muscle spasms, stiffening or straightening out of muscles, shock-like contractions of all or part of a group of muscles, and abnormal muscle tone. It is seen in disorders such as cerebral palsy, stroke, and spinal cord injury. Rigidity is a severe state of hypertonia where muscle resistance occurs throughout the entire range of motion of the affected joint independent of velocity. It is frequently associated with lesions of the basal ganglia. Individuals with rigidity present with stiffness, decreased range of motion and loss of motor control. Dystonic hypertonia refers to muscle resistance to passive stretching (in which a therapist gently stretches the inactive contracted muscle to a comfortable length at very low speeds of movement) and a tendency of a limb to return to a fixed involuntary (and sometimes abnormal) posture following movement.

Management

Therapeutic interventions are best individualized to particular patients.

Basic principles of treatment for hypertonia are to avoid noxious stimuli and provide frequent range of motion exercise.

Physical interventions

Physiotherapy has been shown to be effective in controlling hypertonia through the use of stretching aimed to reduce motor neuron excitability. The aim of a physical therapy session could be to inhibit excessive tone as far as possible, give the patient a sensation of normal position and movement, and to facilitate normal movement patterns. While static stretch has been the classical means to increase range of motion, PNF stretching has been used in many clinical settings to effectively reduce muscle spasticity.

Icing and other topical anesthetics may decrease the reflexive activity for short period of time in order to facilitate motor function. Inhibitory pressure (applying firm pressure over muscle tendon) and promoting body heat retention and rhythmic rotation (slow repeated rotation of affected body part to stimulate relaxation)have also been proposed as potential methods to decrease hypertonia. Aside from static stretch casting, splinting techniques are extremely valuable to extend joint range of motion lost to hypertonicity.A more unconventional method for limiting tone is to deploy quick repeated passive movements to an involved joint in cyclical fashion; this has also been demonstrated to show results on persons without physical disabilitiesFor a more permanent state of improvement, exercise and patient education is imperative,Isokinetic,aerobic, and strength training exercises should be performed as prescribed by a physiotherapist, and stressful situations that may cause increased tone should be minimized or avoided.

Pharmaceutical interventions

Baclofen, diazepam and dantrolene remain the three most commonly used pharmacologic agents in the treatment of spastic hypertonia. Baclofen is generally the drug of choice for spinal cord types of spasticity, while sodium dantrolene is the only agent which acts directly on muscle tissue. Tizanidine is also available. Phenytoin with chlorpromazine may be potentially useful if sedation does not limit their use. Ketazolam, not yet available in the United States, may be a significant addition to the pharmacologic set of options. Intrathecaladministration of antispastic medications allows for high concentrations of drug near the site of action, which limits side effects.

Practical lesson № 8. IHD. ANGINA PECTORIS

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Ischemic heart disease

Ischemic heart disease is a condition of recurring chest pain or discomfort that occurs when a part of the heart does not receive enough blood. This condition occurs most often during exertion or excitement, when the heart requires greater blood flow. Ischemic heart disease, also called coronary heart disease, is common in the United States and is a leading cause of death worldwide.

Ischemic heart disease develops when cholesterol particles in the blood begin to accumulate on the walls of the arteries that supply blood to the heart. Eventually, deposits called plaques may form. These deposits narrow the arteries and eventually block the flow of blood. This decrease in blood flow reduces the amount of oxygen supplied to the heart muscle.

The signs and symptoms of ischemic heart disease may develop slowly as arteries gradually become blocked, or they may occur quickly if an artery suddenly becomes blocked. Some people with ischemic heart disease have no symptoms at all, while others may have severe chest pain (angina) and shortness of breath that can pose a risk of heart attack.

Fortunately, ischemic heart disease can be treated successfully with lifestyle changes, medicines, and surgical procedures. Even better, you can reduce your risk of ischemic heart disease by following heart-healthy practices, such as eating a low-fat, low-sodium diet, being physically active, not smoking, and maintaining a healthy body weight.

Left untreated, ischemic heart disease may lead to severe heart damage. Heart damage can result in heart attack and shock and may be life threatening. Seek immediate medical care (call 911) for serious symptoms, such as difficulty breathing, which may be accompanied by pale or blue lips, rapid heart rate (tachycardia), and severe chest pain. Seek prompt medical care if you are being treated for angina but have mild symptoms that recur or are persistent.

What are the symptoms of ischemic heart disease?

Ischemic heart disease reduces the flow of blood to the coronary arteries, which carry oxygen to the heart. This reduction in blood flow may result in a number of symptoms, which can vary in intensity among individuals.

Common symptoms of ischemic heart disease

You may experience ischemic heart disease symptoms daily or just occasionally. Common symptoms include chest pain, chest pressure, or shortness of breath that:

- Is relieved by rest or medicine
- May feel as if pain starting in the chest spreads to the arms, back, or other areas
- May feel like gas or indigestion (more common in women)
- Occurs repeatedly; episodes tend to be alike
- Occurs when the heart must work harder, usually during physical exertion
- Usually lasts a short time (five minutes or less)

Serious symptoms that might indicate a life-threatening condition

In some cases, ischemic heart disease can be life threatening. Seek immediate medical care (call 911) if you, or someone you are with, have any of these life-threatening symptoms including:

- Chest pain, typically on the left side of the body (angina pectoris)
- Clammy skin
- Nausea with or without vomiting
- Pain in the neck or jaw
- Rapid breathing (tachypnea) or shortness of breath
- Shoulder or arm pain

What causes ischemic heart disease?

Ischemic heart disease is caused by a decrease in blood flow through one or more of the blood vessels that carry oxygen to your heart (coronary arteries). When blood flow is reduced, the heart muscle does not receive the amount of oxygen it needs to function properly.

Ischemic heart disease may develop slowly, as plaque builds up over time, or it may occur quickly if an artery is suddenly blocked. For this reason, ischemic heart disease occurs most frequently in people who have atherosclerosis (buildup of plaque on the walls of the coronary arteries), blood clots, coronary artery spasm, or severe illnesses that increase the heart's need for oxygen.

What are the risk factors for ischemic heart disease?

A number of factors increase the risk of developing ischemic heart disease. Not all people with risk factors will get ischemic heart disease. Risk factors for ischemic heart disease include:

- Diabetes
- Family history of heart disease
- High blood cholesterol
- High blood pressure
- High blood triglycerides
- Obesity
- Physical inactivity
- Smoking and other tobacco use

Reducing your risk of ischemic heart disease

You may be able to lower your risk of ischemic heart disease by:

- Carefully managing your diabetes, if applicable
- Getting regular physical activity
- Keeping your cholesterol at a healthy level
- Maintaining normal blood pressure
- Quitting smoking and other tobacco use
- Reducing the amount of cholesterol and fat in your diet

How is ischemic heart disease treated?

Treatment for ischemic heart disease begins with seeking medical care from your health care provider. To determine if you have ischemic heart disease, your health care provider will ask you to undergo several diagnostic tests.

Medications used to treat ischemic heart disease

Drug therapy is commonly used for treatment of ischemic heart disease and includes:

- Angiotensin-converting enzyme (ACE) inhibitors, which relax the blood vessels and lower blood pressure
- Angiotensin receptor blockers (ARBs), which lower blood pressure
- Anti-ischemic agents such as ranolazine (Ranexa)
- Antiplatelet drugs, which prevent the formation of blood clots
- Beta-blockers, which lower the heart rate
- Calcium channel blockers, which reduce workload on the heart muscle
- Nitrates, which dilate the blood vessels
- Statins, which lower cholesterol

Many different medicines are available to treat ischemic heart disease. Your health care provider will work with you to select the appropriate medications, depending on your individual condition. It is important to follow your treatment plan for ischemic heart disease precisely and to take all of the medications as instructed.

Surgical procedures used to treat ischemic heart disease

Severe symptoms that are not relieved by medication alone are treated with surgical procedures including:

- Angioplasty and stent placement (procedure to remove plaque and restore blood flow in clogged arteries)
- Coronary artery bypass graft (procedure that helps restore blood flow to the heart by routing the flow through transplanted arteries)

What you can do to improve your ischemic heart disease

In addition to following your treatment plan, you may be able to improve your ischemic heart disease by:

- Carefully managing your diabetes, if applicable
- Getting regular physical activity
- Keeping your cholesterol at a healthy level
- Maintaining normal blood pressure
- Quitting tobacco use
- Reducing cholesterol and fat in your diet
-

What are the potential complications of ischemic heart disease?

You can help minimize your risk of serious complications by following the treatment plan you and your health care professional design specifically for you. Complications of ischemic heart disease include:

- Arrythmia (irregular heart rhythm)
- Chronic angina
- Congestive heart failure
- Heart damage
- Myocardial infarction (heart attack)

Stenocardia is a sudden shortage of oxygen in the heart muscle due to narrowing of the coronary arteries of the heart. This shortage, which is observed mainly during physical or emotional stress, is the cause of chest pain, or compression pressing nature. In addition, the feeling of tightness in the chest that occurs during the attack often makes people fear.

Symptoms

- Pain radiating to the arms, neck and abdomen.
- Shortness of breath.
- A feeling of tightness in the chest.
- Fear.

Causes

Blood supply to the heart muscle (myocardium) is done by coronary arteries. When they become narrow, blood flow to the heart muscle becomes insufficient. As a rule, the cause of narrowing is calcification of the arteries (atherosclerosis), in rare cases – heart disease (damaged heart valves).

Treatment

In each case, the using of therapeutic agents depends on the frequency and severity of attacks. Usually nitroglycerin tablets are prescribed to patients (nitroglycerin dilates blood vessels, and the pain in a few minutes pass). Patients with recurrent stenocardia, should take extra medication, the effect of which is longer. If stenocardia is not reduced with medical treatment, then the artery bypass surgery is done – imposing bypass graft lesions of the coronary arteries. Smokers should first of all stop smoking, limit consumption of fatty foods – and the first and the second contributes to atherosclerosis, in addition, when smoking there are more narrowing vessels. You should regularly move, but at a moderate pace, as too much exercise can be dangerous. If frequent stenocardia, for prevention before a planned physical activity you can take nitroglycerin

Myocardial infarction (MI)

Myocardial infarction (MI) (ie, heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia). Approximately 1.5 million cases of MI occur annually in the United States. See the images below.

Acute myocardial infarction, reperfusion type. In this case, the infarct is diffusely hemorrhagic. There is a rupture track through the center of this posterior left ventricular transmural infarct. The mechanism of death was hemopericardium

Acute anterior myocardial infarction.

Signs and symptoms

Patients with typical MI may have the following symptoms in the days or even weeks preceding the event (although typical STEMI may occur suddenly, without warning):

- Fatigue
- Chest discomfort
- Malaise

Typical chest pain in acute MI has the following characteristics:

- Intense and unremitting for 30-60 minutes
- Substernal, and often radiates up to the neck, shoulder, and jaw, and down the left arm
- Usually described as a substernal pressure sensation that also may be characterized as squeezing, aching, burning, or even sharp
- In some patients, the symptom is epigastric, with a feeling of indigestion or of fullness and gas

The patient's vital signs may demonstrate the following in MI:

- The patient's heart rate is often increased (tachycardic) secondary to a high sympathoadrenal discharge
- The pulse may be irregular because of ventricular ectopy, an accelerated idioventricular rhythm, ventricular tachycardia, atrial fibrillation or flutter, or other supraventricular arrhythmias; bradyarrhythmias may be present
- In general, the patient's blood pressure is initially elevated because of peripheral arterial vasoconstriction resulting from an adrenergic response to pain and ventricular dysfunction
- However, with right ventricular MI or severe left ventricular dysfunction, hypotension and cardiogenic shock can be seen
- The respiratory rate may be increased in response to pulmonary congestion or anxiety
- Coughing, wheezing, and the production of frothy sputum may occur

See Clinical Presentation for more detail.

Diagnosis

Laboratory studies

Laboratory tests used in the diagnosis of MI include the following:

- Cardiac biomarkers/enzymes: The American College of Cardiology/American Heart Association (ACC/AHA) and the European Society of Cardiology (ESC) guidelines recommend that cardiac biomarkers should be measured at presentation in patients with suspected MI, and that the only biomarker that is recommended to be used for the diagnosis of acute MI at this time is cardiac troponin due to its superior sensitivity and accuracy. [1, 2, 3, 4]
- Troponin levels: Troponin is a contractile protein that normally is not found in serum; it is released only when myocardial necrosis occurs
- Complete blood cell count
- Comprehensive metabolic panel
- Lipid profile

Electrocardiography

The ECG is the most important tool in the initial evaluation and triage of patients in whom an acute coronary syndrome (ACS), such as MI, is suspected. It is confirmatory of the diagnosis in approximately 80% of cases.

Cardiac imaging

For individuals with highly probable or confirmed acute MI, coronary angiography can be used to definitively diagnose or rule out coronary artery disease.

See Workup for more detail.

Management

Prehospital care

For patients with chest pain, prehospital care includes the following:

- Intravenous access, supplemental oxygen if SaO 2 is less than 90%, pulse oximetry
- Immediate administration of aspirin
- Nitroglycerin for active chest pain, given sublingually or by spray
- Telemetry and prehospital ECG, if available

Emergency department and inpatient care

Initial stabilization of patients with suspected MI and ongoing acute chest pain should include administration of sublingual nitroglycerin if patients have no contraindications to it.

The American Heart Association (AHA) recommends the initiation of beta blockers to all patients with STEMI (unless beta blockers are contraindicated). [1, 2]

If STEMI is present and the patient is within 90 minutes of a PCI-capable facility, the patient should undergo emergent coronary angiography and primary PCI. If the patient is longer than 120 minutes from a PCI-capable facility, fibrinolysis should be considered. [2]

Although patients presenting without ST-segment elevation (non-STE-ACS) are not candidates for immediate administration of thrombolytic agents, they should receive anti-ischemic therapy and may be candidates for PCI urgently or during admission.

Coronary care units have reduced early mortality rates from acute MI by approximately 50% by providing immediate defibrillation and by facilitating the implementation of beneficial interventions. These interventions include the administration of intravenous (IV) medications and therapy designed to do the following:

- Limit the extent of MI
- Salvage jeopardized ischemic myocardium
- Recanalize infarct-related arteria

Background

Myocardial infarction (MI) usually results from an imbalance in oxygen supply and demand, which is most often caused by plaque rupture with thrombus formation in an epicardial coronary artery, resulting in an acute reduction of blood supply to a portion of the myocardium. (See Etiology for details.)

The electrocardiographic (ECG) results of an acute MI are seen below.

Acute inferior myocardial infarction.

Although the clinical presentation of a patient is a key component in the overall evaluation of the patient with MI, many events are either "silent" or are not clinically recognized by patients, families, and health care providers. (See Presentation.) The appearance of cardiac biomarkers in the circulation generally indicates myocardial necrosis and is a useful adjunct to diagnosis. (See Workup.)

MI is considered part of a spectrum referred to as acute coronary syndrome (ACS). The ACS continuum representing ongoing myocardial ischemia or injury consists of unstable angina, non–ST-segment elevation MI (NSTEMI)—collectively referred to as non–ST-segment acute coronary syndrome (NSTE ACS)—and ST-segment elevation MI (STEMI). Patients with ischemic discomfort may or may not have ST-segment or T-wave changes denoted on the electrocardiogram (ECG). ST elevations seen on the ECG reflect active and ongoing transmural myocardial injury. Without immediate reperfusion therapy, most patients with STEMI develop Q waves, reflecting a dead zone of myocardium that has undergone irreversible damage and death.

Those without ST elevations are diagnosed either with unstable angina or NSTEMI—differentiated by the presence of cardiac enzymes. Both these conditions may or may not have changes on the surface ECG, including ST-segment depressions or T-wave morphological changes.
MI may lead to impairment of systolic or diastolic function and to increased predisposition to arrhythmias and other long-term complications.
Coronary thrombolysis and mechanical revascularization have revolutionized the primary treatment of acute MI, largely because they allow salvage of the myocardium when implemented early after the onset of ischemia. (See Treatment.)
The modest prognostic benefit of an opened infarct-related artery may be realized even when recanalization is induced only 6 hours or more after the onset of symptoms; that is, when the salvage of substantial amounts of jeopardized ischemic myocardium is no longer likely. The opening of an infarct-related artery may improve ventricular function and collateral blood flow; prevent ventricular remodeling, as well as decrease infarct expansion, ventricular aneurysm formation, and left ventricular dilatation; and reduce late arrhythmia associated with ventricular aneurysms, and mortality. [5, 6, 7]
Evidence suggests a benefit from the use of beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers, and statins.
The American College of Cardiology (ACC)/American Heart Association (AHA)/European Society of Cardiology/World Heart Federation released the Observations From the TRITON-TIMI 38 Trial (Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition With Prasugrel–Thrombolysis in Myocardial Infarction 38), which better outlines a universal definition of MI, along with a classification system and risk factors for cardiovascular death.

Definitions
The third universal definition of myocardial infarction
Myocardial infarction (MI), commonly known as a heart attack, is defined pathologically as the irreversible death of myocardial cells caused by ischemia. Clinically, MI is a syndrome that can be recognized by a set of symptoms, chest pain being the hallmark of these symptoms in most cases, supported by biochemical laboratory changes, electrocardiographic (ECG) changes, or findings on imaging modalities able to detect myocardial injury and necrosis.
According to the third universal definition of MI, implemented by a joint task force from the European Society of Cardiology (ESC), American College of Cardiology (ACC) Foundation, American Heart Association (AHA), and the World Heart Federation (WHF), MI is diagnosed when either of the following two criteria are met.
1. Detection of an increase or decrease in cardiac biomarker values (preferably using cardiac troponin [cTn]) with at least one value above the 99th percentile of the upper reference limit (URL) and with at least one of the following findings:
- Symptoms of ischemia
- New or presumed new significant ST-segment-T wave (ST-T) changes or new left bundle branch block (LBBB)
- Development of pathologic Q waves on the ECG
- Imaging evidence of new loss of viable myocardium or a new regional wall motion abnormality
- Identification of an intracoronary thrombus by angiography or autopsy

2. Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemic changes or injury or new BBB on ECG, but death occurred before cardiac biomarker levles were obtained, or before cardiac biomarker values would be increased.
Types of MI
The Joint ESC/ACCF/AHA/WHF Task Force further classified MI into 5 types on the basis of the underlying cause :

- Type 1 (spontaneous MI): Related to atherosclerotic plaque rupture, ulceration, fissuring, erosion, or dissection with intraluminal thrombus in one or more of the coronary arteries, leading to decreased myocardial blood flow or distal platelet emboli and thereby resulting in myocyte necrosis. The patient may or may not have underlying obstructive coronary artery disease (CAD).
- Type 2 (MI secondary to an ischemic imbalance): MI consequent to increased oxygen demand or a decreased supply (eg, coronary endothelial dysfunction, coronary artery spasm, coronary artery embolus, tachyarryhthmias/bradyarrhythmias, anemia, respiratory failure, hypertension, or hypotension).
- Type 3 (MI resulting in death when biomarker values are unavailable): Sudden, unexpected cardiac death before blood samples for biomarkers could be drawn or before their appearance in the circulation.
- Type 4a (MI related to percutaneous coronary intervention [PCI]): Elevation of biomarker values (cTn is preferred) to more than 5 times the 99 th percentile of the URL in patients with normal baseline values (<99 th percentile URL) or a rise of values over 20% if the baseline values are elevated but stable or falling. In addition, any of the following are required: (1) symptoms suggestive of myocardial ischemia; (2) new ischemic ECG changes or new BBB; (3) angiographic loss of patency of a major coronary artery or a side branch or persistent slow flow or no flow or embolization; or (4) demonstration of the new loss of viable myocardium or new regional wall motion abnormality by cardiac imaging.
- Type 4b (MI related to stent thrombosis): MI associated with stent thrombosis as detected by coronary angiography or autopsy in the setting of myocardial ischemia in combination with a rise and/or fall of cardiac biomarkers with at least one value above the 99 th percentile URL.
- Type 5 (MI related to coronary artery bypass grafting [CABG]): Elevation of cardiac biomarker values more than 10 times the 99 th percentile URL in patients with normal baseline cTn values. In addition, either (1) new pathologic Q waves or new BBB, (2) angiographic-documented new graft or native coronary artery occlusion, or (3) evidence of new loss of viable myocardium or new regional wall motion abnormality by cardiac imaging is required.

Acute coronary syndrome

The term "acute coronary syndrome" (ACS) refers to a spectrum of conditions that occur due to acute myocardial ischemia and/or infarction as a result of an abrupt reduction in blood flow through the coronary artery circulation.

ACS is divided into two main categories, non–ST elevation (NSTE) ACS and ST-elevation MI (STEMI)

Practical lesson № 9. IHD. MYOCARDIAL INFARCTION

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Myocardial infarction (**MI**), commonly known as a **heart attack**, occurs when blood flow decreases or stops to a part of the heart, causing damage to the heart muscle.The most common symptom is chest pain or discomfort which may travel into the shoulder, arm, back, neck, or jaw.Often it occurs in the center or left side of the chest and lasts for more than a few minutes.he discomfort may occasionally feel like heartburn.Other symptoms may include shortness of breath, nausea, feeling faint, a cold sweat, or feeling tired. About 30% of people have atypical symptoms.Women more often have atypical symptoms than men.Among those over 75 years old, about 5% have had an MI with little or no history of symptoms. An MI may cause heart failure, an irregular heartbeat, cardiogenic shock, or cardiac arrest.

Most MIs occur due to coronary artery disease.Risk factors include high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol intake, among others.The complete blockage of a coronary artery caused by a rupture of an atherosclerotic plaque is usually the underlying mechanism of an MI.MIs are less commonly caused by coronary artery spasms, which may be due to cocaine, significant emotional stress, and extreme cold, among others.A number of tests are useful to help with diagnosis, including electrocardiograms (ECGs), blood tests, and coronary angiography.An ECG, which is a recording of the heart's electrical activity, may confirm an ST elevation MI (STEMI) if ST elevation is present.Commonly used blood tests include troponin and less often creatine kinase MB.

Treatment of an MI is time critical. Aspirin is an appropriate immediate treatment for a suspected MI.Nitroglycerin or opioidsmay be used to help with chest pain; however, they do not improve overall outcomes.Supplemental oxygen should be used in those with low oxygen levels or shortness of breath.In a STEMI, treatments attempt to restore blood flow to the heart, and include percutaneous coronary intervention (PCI), where the arteries are pushed open and may be stented, or thrombolysis, where the blockage is removed using medications.People who have a non-ST elevation myocardial infarction (NSTEMI) are often managed with the blood thinner heparin, with the additional use of PCI in those at high risk. In people with blockages of multiple coronary arteries and diabetes, coronary artery bypass surgery (CABG) may be recommended rather than angioplasty.After an MI, lifestyle modifications, along with long term treatment with aspirin, beta blockers, and statins, are typically recommended.

Worldwide, about 15.9 million myocardial infarctions occurred in 2015.More than 3 million people had an ST elevation MI and more than 4 million had an NSTEMI.STEMIs occur about twice as often in men as women. About one million people have an MI each year in the United States.In the developed world the risk of death in those who have had an STEMI is about 10%. Rates of MI for a given age have decreased globally between 1990 and 2010.In 2011, AMI was one of the top five most expensive conditions during inpatient hospitalizations in the US, with a cost of about $11.5 billion for 612,000 hospital stays.

Terminology

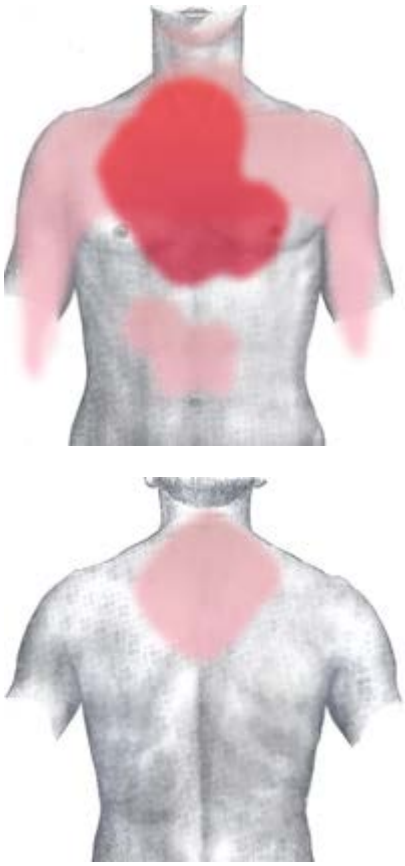
Main article: Acute coronary syndrome

Myocardial infarction (MI) refers to tissue death (infarction) of the heart muscle (myocardium). It is a type of acute coronary syndrome, which describes a sudden or short-term change in symptoms related to blood flow to the heart. Unlike other causes of acute coronary syndromes, such as unstable angina, a myocardial infarction occurs when there is cell death, as measured by a blood test for biomarkers (the cardiac protein troponin or the cardiac enzyme CK-MB).When there is evidence of an MI, it may be classified as an ST elevation myocardial infarction (STEMI) or Non-ST elevation myocardial infarction (NSTEMI) based on the results of an ECG.

The phrase "heart attack" is often used non-specifically to refer to a myocardial infarction and to sudden cardiac death. An MI is different from—but can cause—cardiac arrest, where the heart is

not contracting at all or so poorly that all vital organs cease to function, thus causing death. It is also distinct from heart failure, in which the pumping action of the heart is impaired. However, an MI may lead to heart failure.

Signs and symptoms



Areas where pain is experienced in myocardial infarction, showing common (dark red) and less common (light red) areas on the chest and back.

Pain

Chest pain is the most common symptom of acute myocardial infarction and is often described as a sensation of tightness, pressure, or squeezing. Pain radiates most often to the left arm, but may also radiate to the lower jaw, neck, right arm, back, and upper abdomen.[24] The pain most suggestive of an acute MI, with the highest likelihood ratio, is pain radiating to the right arm and shoulder.[Similarly, chest pain similar to a previous heart attack is also suggestive.The pain associated with MI is usually diffuse, does not change with position, and lasts for more than 20 minutes.Levine's sign, in which a person localizes the chest pain by clenching one or both fists over their sternum, has classically been thought to be predictive of cardiac chest pain, although a prospective observational study showed it had a poor positive predictive value.Pain that responds to nitroglycerin does not indicate the presence or absence of a myocardial infarction.

Other symptoms

Chest pain may be accompanied by sweating, nausea or vomiting, and fainting,and these symptoms may also occur without any pain at all.In women, the most common symptoms of myocardial infarction include shortness of breath, weakness, and fatigue.Shortness of breath is a common, and sometimes the only symptom, occurring when damage to the heart limits the output of the left ventricle, with breathlessness arising either from low oxygen in the blood, or pulmonary edema.Other less common symptoms include weakness, light-

headedness, palpitations, and abnormalities in heart rate or blood pressure.These symptoms are likely induced by a massive surge of catecholamines from the sympathetic nervous system, which occurs in response to pain and, where present, low blood pressure.[31] Loss of consciousness due to inadequate blood flow to the brain and cardiogenic shock, and sudden death, frequently due to the development of ventricular fibrillation, can occur in myocardial infarctions.Cardiac arrest, and atypical symptoms such as palpitations, occur more frequently in women, the elderly, those with diabetes, in people who have just had surgery, and in critically ill patients.

"Silent" myocardial infarctions can happen without any symptoms at all. These cases can be discovered later on electrocardiograms, using blood enzyme tests, or at autopsy after a person has died. Such silent myocardial infarctions represent between 22 and 64% of all infarctions,and are more common in the elderly,in those with diabetes mellitus and after heart transplantation. In people with diabetes, differences in pain threshold, autonomic neuropathy, and psychological factors have been cited as possible explanations for the lack of symptoms. In heart transplantation, the donor heart is not fully innervated by the nervous system of the recipient.

Causes

The most prominent risk factors for myocardial infarction are older age, actively smoking, high blood pressure, diabetes mellitus, and total cholesterol and high-density lipoproteinlevels.Many risk factors of myocardial infarction are shared with coronary artery disease, the primary cause of myocardial infarction, with other risk factors including male sex, low levels of physical activity, a past family history, obesity, and alcohol use.Risk factors for myocardial disease are often included in risk factor stratification scores, such as the Framingham risk score.At any given age, men are more at risk than women for the development of cardiovascular disease.High levels of blood cholesterol is a known risk factor, particularly high low-density lipoprotein, low high-density lipoprotein, and high triglycerides.

Many risk factors for myocardial infarction are potentially modifiable, with the most important being tobacco smoking (including secondhand smoke).Smoking appears to be the cause of about 36% and obesity the cause of 20% of coronary artery disease.Lack of physical activity has been linked to 7–12% of cases.Less common causes include stress-related causes such as job stress, which accounts for about 3% of cases,and chronic high stress levels.

Diet[edit]

There is varying evidence about the importance of saturated fat in the development of myocardial infarctions. Eating polyunsaturated fat instead of saturated fats has been shown in studies to be associated with a decreased risk of myocardial infarction, while other studies find little evidence that reducing dietary saturated fat or increasing polyunsaturated fatintake affects heart attack risk.Dietary cholesterol does not appear to have a significant effect on blood cholesterol and thus recommendations about its consumption may not be needed. Trans fats do appear to increase risk.Acute and prolonged intake of high quantities of alcoholic drinks (3–4 or more) increases the risk of a heart attack.

Genetics

Family history of ischemic heart disease or MI, particularly if one has a male first-degree relative (father, brother) who had a myocardial infarction before age 55 years, or a female first-degree relative (mother, sister) less than age 65 increases a person's risk of MI.

Genome-wide association studies have found 27 genetic variants that are associated with an increased risk of myocardial infarction.The strongest association of MI has been found with chromosome 9 on the short arm *p* at locus 21, which contains genes CDKN2A and 2B,

although the single nucleotide polymorphisms that are implicated are within a non-coding region.The majority of these variants are in regions that have not been previously implicated in coronary artery disease. The following genes have an association with

Other

The risk of having a myocardial infarction increases with older age, low physical activity, and low socioeconomic status.Heart attacks appear to occur more commonly in the morning hours, especially between 6AM and noon.Evidence suggests that heart attacks are at least three times more likely to occur in the morning than in the late evening.Shift work is also associated with a higher risk of MI.

Women who use combined oral contraceptive pills have a modestly increased risk of myocardial infarction, especially in the presence of other risk factors.The use of non-steroidal anti inflammatory drugs (NSAIDs), even for as short as a week, increases risk.

Endometriosis in women under the age of 40 is an identified risk factor.

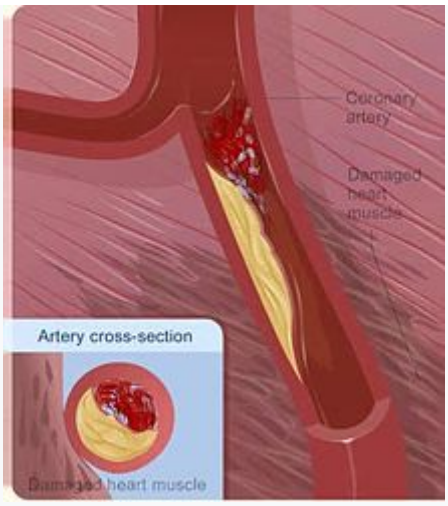
Short-term exposure to air pollution such as carbon monoxide, nitrogen dioxide, and sulfur dioxide (but not ozone) have been associated with MI.

A number of acute and chronic infections including *Chlamydophila pneumoniae*, influenza, *Helicobacter pylori*, and *Porphyromonas gingivalis* among others have been linked to atherosclerosis and myocardial infarction.As of 2013, there is no evidence of benefit from antibiotics or vaccination, however, calling the association into question.Myocardial infarction can also occur as a late consequence of Kawasaki disease.

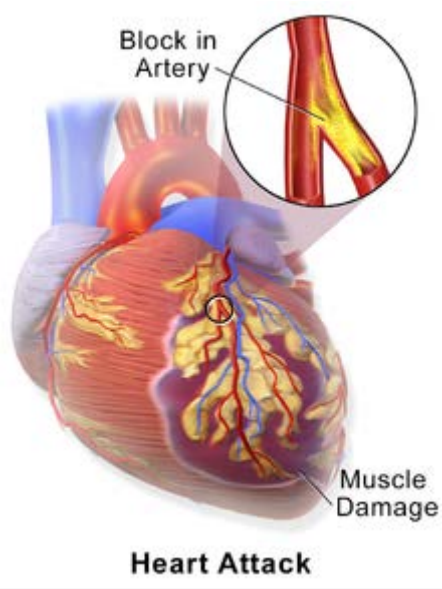
Calcium deposits in the coronary arteries can be detected with CT scans. Calcium seen in coronary arteries can provide predictive information beyond that of classical risk factors.High blood levels of the amino acid homocysteine is associated with premature atherosclerosis;whether elevated homocysteine in the normal range is causal is controversial.

Mechanism

Atherosclerosis



The animation shows how plaque buildup or a coronary artery spasm can lead to a heart attack and how blocked blood flow in a coronary artery can lead to a heart attack.



A myocardial infarction occurs when an atherosclerotic plaque slowly builds up in the inner lining of a coronary artery and then suddenly ruptures, causing catastrophic thrombusformation, totally occluding the artery and preventing blood flow downstream.

Further information: Atherosclerosis

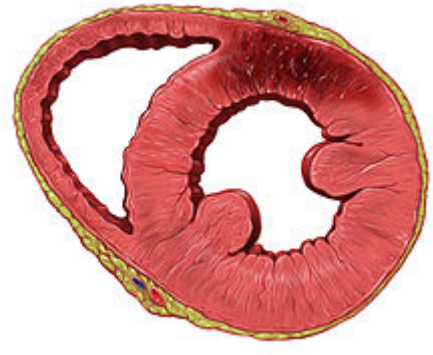
The most common cause of a myocardial infarction is the rupture of an atherosclerotic plaque on an artery supplying heart muscle.Plaques can become unstable, rupture, and additionally promote the formation of a blood clot that blocks the artery; this can occur in minutes. Blockage of an artery can lead to tissue death in tissue being supplied by that artery.Atherosclerotic plaques are often present for decades before they result in symptoms.

The gradual buildup of cholesterol and fibrous tissue in plaques in the wall of the coronary arteries or other arteries, typically over decades, is termed atherosclerosis.Atherosclerosis is characterized by progressive inflammation of the walls of the arteries.Inflammatory cells, particularly macrophages, move into affected arterial walls. Over time, they become laden with cholesterol products, particularly LDL, and become foam cells. A cholesterol core forms as foam cells die. In response to growth factors secreted by macrophages, smooth muscle and other cells move into the plaque and act to stabilize it. A stable plaque may have a thick fibrous cap with calcification. If there is ongoing inflammation, the cap may be thin or ulcerate. Exposed to the pressure associated with blood flow, plaques, especially those with a thin lining, may rupture and trigger the formation of a blood clot (thrombus).The cholesterol crystals have been associated with plaque rupture through mechanical injury and inflammation.

Other causes

Atherosclerotic disease is not the only cause of myocardial infarction, and it may exacerbate or contribute to other causes. A myocardial infarction may result from a heart with a limited blood supply subject to increased oxygen demands, such as in fever, a fast heart rate, hyperthyroidism, too few red blood cells in the bloodstream, or low blood pressure. Damage or failure of procedures such as percutaneous coronary intervention or coronary artery bypass grafts may cause a myocardial infarction. Spasm of coronary arteries, such as Prinzmetal's angina may cause blockage.

Tissue death



Drawing of the heart showing anterior left ventricle wall infarction

If impaired blood flow to the heart lasts long enough, it triggers a process called the ischemic cascade; the heart cells in the territory of the blocked coronary artery die (infarction), chiefly through necrosis, and do not grow back. A collagen scar forms in their place. When an artery is blocked, cells lack oxygen, needed to produce ATP in mitochondria. ATP is required for the maintenance of electrolyte balance, particularly through the Na/K ATPase. This leads to an ischemic cascade of intracellular changes, necrosis and apoptosis of affected cells.

Cells in the area with the worst blood supply, just below the inner surface of the heart (endocardium), are most susceptible to damage.schemia first affects this region, the *subendocardial* region, and tissue begins to die within 15–30 minutes of loss of blood supply.The dead tissue is surrounded by a zone of potentially reversible ischemia that progresses to become a full-thickness *transmural* infarct. The initial "wave" of infarction can take place over 3–4 hours.These changes are seen on gross pathology and cannot be predicted by the presence or absence of Q waves on an ECG.The position, size and extent of an infarct depends on the affected artery, totality of the blockage, duration of the blockage, the presence of collateral blood vessels, oxygen demand, and success of interventional procedures.

Tissue death and myocardial scarring alter the normal conduction pathways of the heart, and weaken affected areas. The size and location puts a person at risk of abnormal heart rhythms (arrhythmias) or heart block, aneurysm of the heart ventricles, inflammation of the heart wallfollowing infarction, and rupture of the heart wall that can have catastrophic consequences.

Diagnosis

Main article: Myocardial infarction diagnosis

Criteria

An acute myocardial infarction, according to current consensus, is defined by an elevated cardiac biomarker and at least one of the following:

- Symptoms relating to ischemia
- Changes on an electrocardiogram (ECG), such as ST segment changes, new left bundle branch block, or Q waves
- Changes in the motion of the heart wall on imaging
- Demonstration of a thrombus on angiogram or at autopsy.

Types

Myocardial infarctions are generally clinically classified into ST elevation MI (STEMI) and non-ST elevation MI (NSTEMI). These are based on changes to an ECG.STEMIs make up about 25

– 40% of myocardial infarctions.A more explicit classification system, based on international consensus in 2012, also exists. This classifies myocardial infarctions into five types:

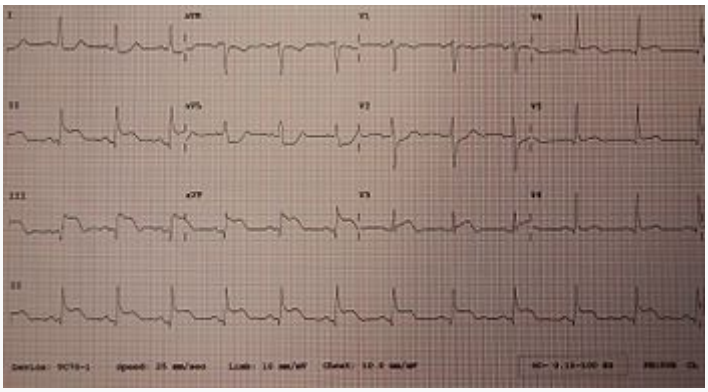
1. Spontaneous MI related to plaque erosion and/or rupture, fissuring, or dissection
2. MI related to ischemia, such as from increased oxygen demand or decreased supply, e.g. coronary artery spasm, coronary embolism, anemia, arrhythmias, high blood pressure or low blood pressure
3. Sudden unexpected cardiac death, including cardiac arrest, where symptoms may suggest MI, an ECG may be taken with suggestive changes, or a blood clot is found in a coronary artery by angiography and/or at autopsy, but where blood samples could not be obtained, or at a time before the appearance of cardiac biomarkers in the blood
4. Associated with coronary angioplasty or stents
   - Associated with percutaneous coronary intervention (PCI)
   - Associated with stent thrombosis as documented by angiography or at autopsy
5. Associated with CABG

Cardiac biomarkers

There are a number of different biomarkers used to determine the presence of cardiac muscle damage. Troponins, measured through a blood test, are considered to be the best,and are preferred because they have greater sensitivity and specificity for measuring injury to the heart muscle than other tests.A rise in troponin occurs within 2–3 hours of injury to the heart muscle, and peaks within 1–2 days. The level of the troponin, as well as a change over time, are useful in measuring and diagnosing or excluding myocardial infarctions, and the diagnostic accuracy of troponin testing is improving over time. One high-sensitivity cardiac troponin is able to rule out a heart attack as long as the ECG is normal.

Other tests, such as CK-MB or myoglobin, are discouraged.CK-MB is not as specific as troponins for acute myocardial injury, and may be elevated with past cardiac surgery, inflammation or electrical cardioversion; it rises within 4–8 hours and returns to normal within 2–3 days.Copeptin may be useful to rule out MI rapidly when used along with troponin.

Electrocardiogram



A 12-lead ECG showing a STEMI. Elevation of the ST segment can be seen in some leads.

Electrocardiograms (ECGs) are a series of leads placed on a person's chest that measure electrical activity associated with contraction of heart muscle.The taking of an ECG is an important part in the workup of an AMI,and ECGs are often not just taken once, but may be repeated over minutes to hours, or in response to changes in signs or symptoms.

ECG readouts product a waveform with different labelled features. In addition to a rise in biomarkers, a rise in the ST segment, changes in the shape or flipping of T waves, new Q waves, or a new left bundle branch block can be used to diagnose an AMI.In addition, ST elevation can

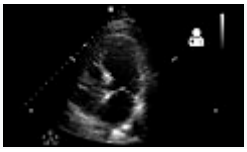
be used to diagnose an ST segment myocardial infarction (STEMI). A rise must be new, in two adjacent adjacent ECG leads, greater than 2 mm (0.2 mV) for males and greater than 1.5 mm (0.15 mV) in females in all leads except for V2 and V3, where it must be greater than 1 mm (0.1 mV).ST elevation is associated with infarction, and may be preceded by changes indicating ischemia, such as ST depression or inversion of the T waves. Abnormalities can help localize the location of an infarct, based on the leads that are affected by changes.Early STEMIs may be preceded by peaked T waves. Other ECG abnormalities relating to complications of acute myocardial infarctions may also be evident, such as atrial or ventricular fibrillation.[71]

Imaging

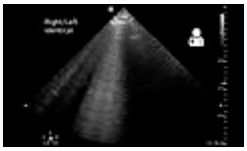
Noninvasive imaging plays an important role in the diagnosis and characterisation of myocardial infarction.Tests such as chest X-rays can be used to explore and exclude alternate causes of a person's symptoms.Tests such as stress echocardiography and myocardial perfusion imaging can confirm a diagnosis when a person's history, physical examination (including cardiac examination) ECG, and cardiac biomarkers suggest the likelihood of a problem.

Echocardiography, an ultrasound scan of the heart, is able to visualize the heart, its size, shape, and any abnormal motion of the heart walls as they beat that may indicate a myocardial infarction. The flow of blood can be imaged, and contrast dyes may be given to improve image.Other scans using radioactive contrast include SPECT CT-scans using thallium, sestamibi (MIBI scans) or tetrofosmin; or a PET scan using Fludeoxyglucose or rubidium-82.These nuclear medicine scans can visualize the perfusion of heart muscle. SPECT may also be used to determine viability of tissue, and whether areas of ischemia are inducible.

Medical societies and professional guidelines recommend that the physician confirm a person is at high risk for myocardial infarction before conducting imaging tests to make a diagnosis, as such tests are unlikely to change management and result in increased costs.Patients who have a normal ECG and who are able to exercise, for example, do not merit routine imaging.

- 

Poor movement of the heart due to an MI as seen on ultrasound

- 

Pulmonary edema due to an MI as seen on ultrasound

Differential diagnosis

There are many causes of chest pain, which can originate from the heart, lungs, gastrointestinal tract, aorta, and other muscles, bones and nerves surrounding the chest. In addition to myocardial infarction, other causes include angina, insufficient blood supply (ischemia) to the heart muscles without evidence of cell death, gastroesophageal reflux disease; pulmonary embolism, tumors of the lungs, pneumonia, rib fracture, costochondritis, and other musculoskeletal injuries. Rarer severe differential diagnoses includes aortic dissection, esophageal rupture, tension pneumothorax, and pericardial effusion causing cardiac tamponade.The chest pain in an MI may mimic heartburn.Causes of sudden-onset breathlessness generally involve the lungs or heart –

including pulmonary edema, pneumonia, allergic reactions and asthma, and pulmonary embolus, acute respiratory distress syndrome and metabolic acidosis. There are many different causes of fatigue, and myocardial infarction is not a common cause.

Management

Main article: Management of acute coronary syndrome

A myocardial infarction requires immediate medical attention. Treatment aims to preserve as much heart muscle as possible, and to prevent further complications.Treatment depends on whether the myocardial infarction is a STEMI or NSTEMI.Treatment in general aims to unblock blood vessels, reduce blot clot enlargement, reduce ischemia, and modify risk factors with the aim of preventing future MIs. In addition, the main treatment for myocardial infarctions with ECG evidence of ST elevation (STEMI) include thrombolysis or percutaneous coronary intervention, although PCI is also ideally conducted within 1–3 days for NSTEMI.[58] In addition to clinical judgement, risk stratification may be used to guide treatment, sometimes including systems such as the TIMI and GRACE (Global Registry of Acute Coronary Events) scoring systems.

Pain

The pain associated with myocardial infarction may be treated with nitroglycerin or morphine. Nitroglycerin (given under the tongue or intravenously) may improve the blood supply to the heart, and decrease the work the heart must do. It is an important part of therapy for its pain relief, despite there being no benefit to overall mortality. Morphine may also be used, and is effective for the pain associated with STEMI.The evidence for benefit from morphine on overall outcomes, however, is poor and there is some evidence of potential harm.

Anticoagulation

Aspirin, an antiplatelet anticoagulant, is given as a loading dose with the goal of reducing the clot size and reduce further clotting in the affected artery. It is known to decrease mortality associated with acute myocardial infarction by at least 50%.P2Y12 inhibitors such as clopidogrel, prasugrel and ticagrelor are given concurrently, also as a loading dose, with the dose depending on whether further surgical management or fibrinolysis is planned.Prasugrel and ticagrelor are recommended in European and American guidelines, as they are active more quickly and consistently than clopidogrel. P2Y12 inhibitors are recommended in both NSTEMI and STEMI, including in PCI, with evidence also to suggest improved mortality.Heparins, particularly in the unfractionated form, act at several points in the clotting cascade, help to prevent the enlargement of a clot, and are also given in myocardial infarction, owing to evidence suggesting improved mortality rates.[58] In very high-risk scenarios, inhibitors of the platelet glycoprotein $\alpha_{IIb}\beta_{3a}$ receptor such as eptifibatideor tirofiban may be used.

There is varying evidence on the mortality benefits in NSTEMI. A 2014 review of P2Y12 inhibitors such as clopidogrel found they do not change the risk of death when given to people with a suspected NSTEMI prior to PCI,nor do heparins change the risk of death.They do decrease the risk of having a further myocardial infarction.

Angiogram

Primary percutaneous coronary intervention (PCI) is the treatment of choice for STEMI if it can be performed in a timely manner, ideally within 90–120 minutes of contact with a medical provider. Some recommend it is also done in NSTEMI within 1–3 days, particularly when considered high-risk.A 2017 review, however, did not find a difference between early versus later PCI in NSTEMI.

PCI involves small probes, inserted through peripheral blood vessels such as the femoral artery or radial artery into the blood vessels of the heart. The probes are then used to identify and clear blockages using small balloons, which are dragged through the blocked segment, dragging away the clot, or the insertion of stents. Coronary artery bypass grafting is only considered when the affected area of heart muscle large, and PCI is unsuitable, for example with difficult cardiac anatomy.After PCI, people are generally placed on aspirin indefinitely and on dual antiplatelet therapy (generally aspirin and clopidogrel) for at least a year.

Fibrinolysis

If PCI cannot be performed within 90 to 120 minutes in STEMI then fibrinolysis, preferably within 30 minutes of arrival to hospital, is recommended. If a person has had symptoms for 12 to 24 hours evidence for effectiveness of thrombolysis is less and if they have had symptoms for more than 24 hours it is not recommended.Thrombolysis involves the administration of medication that activates the enzymes that normally dissolve blood clots. These medications include tissue plasminogen activator, reteplase, streptokinase, and tenecteplase.Thrombolysis is not recommended in a number of situations, particularly when associated with a high risk of bleeding or the potential for problematic bleeding, such as active bleeding, past strokes or bleeds into the brain, or severe hypertension. Situations in which thrombolysis may be considered, but with caution, include recent surgery, use of anticoagulants, pregnancy, and proclivity to bleeding. Major risks of thrombolysis are major bleeding and intracranial bleeding.Pre-hospital thrombolysis reduces time to thrombolytic treatment, based on studies conducted in higher income countries, however it is unclear whether this has an impact on mortality rates.

Other

In the past, high flow oxygen was recommended for everyone with a possible myocardial infarction. More recently, no evidence was found for routine use with potential of harm. Therefore, oxygen is currently only recommended if oxygen levels are found to be low or if someone is in respiratory distress.

If despite thrombolysis there is significant cardiogenic shock, continued severe chest pain, or less than a 50% improvement in ST elevation on the ECG recording after 90 minutes, then rescue PCI is indicated emergently.

Those who have had cardiac arrest may benefit from targeted temperature management with evaluation for implementation of hypothermia protocols. Furthermore, those with cardiac arrest, and ST elevation at any time, should usually have angiography.

Rehabilitation

Cardiac rehabilitation benefits many who have experienced myocardial infarction,even if there has been substantial heart damage and resultant left ventricular failure. It should start soon after discharge from the hospital. The program may include lifestyle advice, exercise, social support, as well as recommendations about driving, flying, sport participation, stress management, and sexual intercourse.

Prevention

There is a large crossover between the lifestyle and activity recommendations to prevent a myocardial infarction, and those that may be adopted as secondary prevention after an initial myocardial infarction, because of shared risk factors and an aim to reduce atherosclerosis affecting heart vessels.

Primary prevention

Physical activity can reduce the risk of cardiovascular disease, and people at risk are advised to engage in 150 minutes of moderate or 75 minutes of vigorous intensity aerobic exercise a

week.Keeping a healthy weight, drinking alcohol within the recommended limits, and quitting smoking reduce the risk of cardiovascular disease.

Substituting polyunsaturated fats such as olive oil and rapeseed oil instead saturated fats may reduce the risk of myocardial infarction,although there is not universal agreement. Dietary modifications are recommended by some national authorities, with recommendations including increasing the intake of wholegrain starch, reducing sugar intake (particularly of refined sugar), consuming five portions of fruit and vegetables daily, consuming two or more portions of fish per week, and consuming 4–5 portions of unsalted nuts, seeds, or legumes per week. The dietary pattern with the greatest support is the Mediterranean diet.Vitamins and mineral supplements are of no proven benefit,and neither are plant stanols or sterols.

Public health measures may also act at a population level to reduce the risk of myocardial infarction, for example by reduce unhealthy diets (excessive salt, saturated fat and trans fat) including food labeling and marketing requirements as well as requirements for catering and restaurants, and stimulating physical activity. This may be part of regional cardiovascular disease prevention programs, or through the health impact assessment of regional and local plans and policies.

Most guidelines recommend combining different preventive strategies. A 2015 Cochrane Review found some evidence that such an approach might help with blood pressure, body mass index and waist circumference. However, there was insufficient evidence to show an effect on mortality or actual cardio-vascular events.

Medication

Statins, drugs that act to lower blood cholesterol, decrease the incidence and mortality rates of myocardial infarctions.They are often recommended in those at an elevated risk of cardiovascular diseases.

Aspirin has been studied extensively in people considered at increased risk of myocardial infarction. Based on numerous studies in different groups (e.g. people with or without diabetes), there does not appear to be a benefit strong enough to outweigh the risk of excessive bleeding.Nevertheless, many clinical practice guidelines continue to recommend aspirin for primary prevention,and some researchers feel that those with very high cardiovascular risk but low risk of bleeding should continue to receive aspirin.

Secondary prevention

There is a large crossover between the lifestyle and activity recommendations to prevent a myocardial infarction, and those that may be adopted as secondary prevention after an initial myocardial infarct. Recommendations include stopping smoking, a gradual return to exercise, eating a healthy diet, low in saturated fat and low in cholesterol, and drinking alcohol within recommended limits, exercising, and trying to achieve a healthy weight.Exercise is both safe and effective even if people have had stents or heart failure,and is recommended to start gradually after 1–2 weeks.Counselling should be provided relating to medications used, and for warning signs of depression. Previous studies suggested a benefit from omega-3 fatty acid supplementation but this has not been confirmed.

Medications

Following a heart attack, nitrates, when taken for two days, and ACE-inhibitors decrease the risk of death. Other medications include:

Aspirin is continued indefinitely, as well as another antiplatelet agent such as clopidogrel or ticagrelor ("dual antiplatelet therapy" or DAPT) for up to twelve months. If someone has another medical condition that requires anticoagulation (e.g. with warfarin) this may need to be adjusted based on risk of further cardiac events as well as bleeding risk.In those who have had a stent,

more than 12 months of clopidogrel plus aspirin does not affect the risk of death. Beta blocker therapy such as metoprolol or carvedilol is recommended to be started within 24 hours, provided there is no acute heart failure or heart block.The dose should be increased to the highest tolerated. Contrary to what was long believed, the use of beta blockers does not appear to affect the risk of death, possibly because other treatments for MI have improved.When beta blocker medication is given within the first 24–72 hours of a STEMI no lives are saved. However, 1 in 200 people were prevented from a repeat heart attack, and another 1 in 200 from having an abnormal heart rhythm. Additionally, for 1 in 91 the medication causes a temporary decrease in the heart's ability to pump blood.

ACE inhibitor therapy should be started within 24 hours, and continued indefinitely at the highest tolerated dose. This is provided there is no evidence of worsening kidney failure, high potassium, low blood pressure, or known narrowing of the renal arteries.Those who cannot tolerate ACE inhibitors may be treated with an angiotensin II receptor antagonist.

Statin therapy has been shown to reduce mortality and subsequent cardiac events, and should be commenced with the aim of lowering LDL cholesterol. Other medications, such as ezetimibe, may also be added with this goal in mind.

Aldosterone antagonists (spironolactone or eplerenone) may be used if there is evidence of left ventricular dysfunction after an MI, ideally after beginning treatment with an ACE inhibitor.

Other

A defibrillator, an electric device connected to the heart and surgically inserted under the skin, may be recommended. This is particularly if there are any ongoing signs of heart failure, with a low left ventricular ejection fraction and a New York Heart Association grade II or III after 40 days of the infarction.Defibrillators detect potentially fatal arrhythmia and deliver an electrical shock to the person to depolarize a critical mass of the heart muscle.

Prognosis

The prognosis after myocardial infarction varies greatly depending on the extent and location of the affected heart muscle, and the development and management of complications.Prognosis is worse with older age, and social isolation. Anterior infarcts, persistent ventricular tachycardia or fibrillation, development of heart blocks, and left ventricular impairment are all associated with poorer prognosis.Without treatment, about a quarter of those affected by MI die within minutes, and about forty percent within the first month.Morbidity and mortality from myocardial infarction has however improved over the years due to earlier and better treatment:in those who have an STEMI in the United States, between 5 and 6 percent die before leaving the hospital and 7 to 18 percent die within a year.

Practical lesson № 10 . CHRONIC GASTRITIS

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Background

The term "gastritis" was first used in 1728 by the German Physician, Georg Ernst Stahl to describe the inflammation of the inner lining of the stomach- now known to be secondary to mucosal injury (ie, cell damage and regeneration). In the past, many considered gastritis a useful histological finding, but not a disease. This all changed with the discovery of Helicobacter pylori by Robin Warren and Barry Marshall in 1982 leading to the identification, description and classification of a multitude of different gastritides. This article focuses on the pathophysiology, etiology, epidemiology and prognosis of chronic gastritis.

The chronic gastritides are classified on the basis of their underlying cause (eg, H pylori, bile reflux, nonsteroidal anti-inflammatory drugs [NSAIDs], autoimmunity or allergic response) and histopathologic pattern, which may suggest the cause and the likely clinical course (eg, H pylori–associated multifocal atrophic gastritis). Other classifications are based on the endoscopic appearance of the gastric mucosa (eg, varioliform gastritis).

It is important to distinguish between gastritis and gastropathy (in which there is cell damage and regeneration, but minimal inflammation); these entities are discussed in this article because they are frequently included in the differential diagnosis of chronic gastritis.

Chemical or reactive gastritis is caused by injury to the gastric mucosa resulting from reflux of bile and pancreatic secretions into the stomach, but it can also be caused by exogenous substances, including NSAIDs, acetylsalicylic acid, chemotherapeutic agents, and alcohol. These chemicals cause epithelial damage, erosions, and ulcers that are followed by regenerative hyperplasia detectable as foveolar hyperplasia, and damage to capillaries, with mucosal edema, hemorrhage, and increased smooth muscle in the lamina propria with minimal or no inflammation.

Because there is minimal or no inflammation in these chemical-caused lesions, gastropathy or chemical gastropathy is a more appropriate description than chemical or reactive gastritis, as proposed by the updated Sydney classification of gastritis. It is important to keep in mind that mixed forms of gastropathy and other types of gastritis, especially H pylori gastritis, may coexist.

There is no universally accepted classification system (including the Sydney system and Olga staging system) that provides an entirely satisfactory description of all of the gastritides and gastropathies. [5] However, an etiologic classification at least provides a direct target toward which therapy can be directed, and for this reason, such a classification is used in this article. In many instances, chronic gastritis is a relatively minor manifestation of diseases that predominantly manifest in other organs or manifest systemically (eg, gastritis in individuals who are immunosuppressed).

H pylori gastritis is a primary infection of the stomach and is the most frequent cause of chronic gastritis, infecting 50% of the global population. Cases of histologically documented chronic gastritis are diagnosed as chronic gastritis of undetermined etiology or gastritis of

undetermined type when none of the findings reflect any of the described patterns of gastritis and a specific cause cannot be identified.

For patient education resources, see the Esophagus, Stomach, and Intestine Center, as well as Gastritis.

Pathophysiology

The pathophysiology of chronic gastritis complicating a systemic disease, such as hepatic cirrhosis, uremia, or an infection, is described in the articles specifically dealing with these diseases. The pathogenesis of the most common forms of gastritis is described below.

H pylori–associated chronic gastritis

Helicobacter pylori is the leading cause of chronic gastritis, peptic ulcer disease, gastric adenocarcinoma and primary gastric lymphoma. First described by Marshall and Warren in 1983, H pylori is a spiral gram-negative rod that has the ability to colonize and infect the stomach; the lipopolysaccharides on the outer membrane of H pylori are a major component of its ability for colonization and persistence. The bacteria survive within the mucous layer that covers the gastric surface epithelium and the upper portions of the gastric foveolae. The infection is usually acquired during childhood. Once present in the stomach, the bacteria passes through the mucous layer and becomes established at the luminal surface of the stomach causing an intense inflammatory response in the underlying tissue.

The presence of H pylori is associated with tissue damage and the histologic finding of both an active and a chronic gastritis. The host response to H pylori and its bacterial products is composed of T and B lymphocytes, denoting chronic gastritis, followed by infiltration of the lamina propria and gastric epithelium by polymorphonuclear leukocytes (PMNs) that eventually phagocytize the bacteria. The presence of PMNs in the gastric mucosa is diagnostic of active gastritis.

Interaction of H pylori with the surface mucosa results in the release of interleukin (IL)-8, which leads to the recruitment of PMNs and may begin the entire inflammatory process. Gastric epithelial cells express class II molecules, which may increase the inflammatory response by presenting H pylori antigens, leading to the activation of numerous transcription factors, including NF-kB, AP-1 and CREB-1. This in turn leads to further cytokine release and more inflammation. High levels of cytokines, particularly tumor necrosis factor-α (TNF-α) [15] and multiple interleukins (eg, IL-1β, IL-6, IL-8, IL-10, IL-12, IL-17 and IL-18), are detected in the gastric mucosa of patients with H pylori gastritis. Increased frequencies of IL-17a+ and interferon gamma (IFN-γ) cells have been found in the antrum, particularly in individuals with H pylori-induced gastric ulcers.

Leukotriene levels are also quite elevated, especially the level of leukotriene B4, which is synthesized by the host neutrophils and is cytotoxic to the gastric epithelium. This inflammatory response leads to functional changes in the stomach, depending on the areas of the stomach involved. When the inflammation affects the gastric corpus, parietal cells are inhibited, leading to reduced acid secretion. Continued inflammation results in loss of the parietal cells, and the reduction in acid secretion becomes permanent.

Antral inflammation alters the interplay between gastrin and somatostatin secretion, affecting G cells (gastrin-secreting cells) and D cells (somatostatin-secreting cells), respectively. Specifically, gastrin secretion is abnormal in individuals who are infected with H pylori, with an exaggerated meal-stimulated release of gastrin being the most prominent abnormality.

When the infection is cured, neutrophil infiltration of the tissue quickly resolves, with slower resolution of the chronic inflammatory cells. Paralleling the slow resolution of the monocytic infiltrates, meal-stimulated gastrin secretion returns to normal.

Various strains of H pylori exhibit differences in virulence factors, and these differences influence the clinical outcome of H pylori infection. People infected with H pylori strains that secrete the vacuolating toxin A (vacA) are more likely to develop peptic ulcers than people infected with strains that do not secrete this toxin.

Another set of virulence factors is encoded by the H pylori pathogenicity island (PAI). The PAI contains the sequence for several genes and encodes the CAGA gene. Strains that produce CagA protein (CagA+) are associated with a greater risk of development of gastric carcinoma and peptic ulcers. However, infection with CagA- strains also predisposes the person to these diseases.

H pylori- associated chronic gastritis progresses according to the following 2 main topographic patterns, which have different clinical consequences:

Antral predominant gastritis – This is characterized by inflammation that is mostly limited to the antrum; individuals with peptic ulcers usually demonstrate this pattern

Multifocal atrophic gastritis – This is characterized by the involvement of the corpus and gastric antrum with progressive development of gastric atrophy (loss of the gastric glands) and partial replacement of gastric glands by an intestinal-type epithelium (intestinal metaplasia); individuals who develop gastric carcinoma and gastric ulcers usually demonstrate this pattern.

As previously mentioned, 50% of the world's population is infected with H pylori. The overwhelming majority of those infected do not develop significant clinical complications and remain carriers with asymptomatic chronic gastritis. Some individuals who carry additional risk factors may develop peptic ulcers, gastric mucosa–associated lymphoid tissue (MALT) lymphomas, or gastric adenocarcinomas.

An increased duodenal acid load may precipitate and wash out bile salts, which normally inhibit the growth of H pylori. Progressive damage to the duodenum promotes gastric foveolar metaplasia, resulting in sites for H pylori growth and more inflammation. This cycle renders the duodenal bulb increasingly unable to neutralize acid entering from the stomach until changes in the bulb structure and function are sufficient for an ulcer to develop. H pylori can survive in areas of gastric metaplasia in the duodenum, contributing to the development of peptic ulcers.

MALT lymphomas may develop in association with chronic gastritis secondary to H pylori infection. The stomach usually lacks organized lymphoid tissue, but after infection with H pylori, lymphoid tissue is universally present. Acquisition of gastric lymphoid tissue is thought to be due to persistent antigen stimulation from byproducts of chronic infection with H pylori.

The continuous presence of H pylori results in the persistence of MALT in the gastric mucosa, which eventually may progress to form low- and high-grade MALT lymphomas. MALT lymphomas are monoclonal proliferations of neoplastic B cells that have the ability to infiltrate gastric glands. Gastric MALT lymphomas typically are low-grade T-cell–dependent B-cell lymphomas, and the antigenic stimulus of gastric MALT lymphomas is thought to be H pylori.

Another complication of H pylori gastritis is the development of gastric carcinomas, especially in individuals who develop extensive atrophy and intestinal metaplasia of the gastric mucosa. It is well accepted that a multistep process initiated by H pylori related chronic inflammation of the gastric mucosa progresses to chronic atrophic gastritis, intestinal metaplasia, dysplasia, and finally leading to the development adenocarcinoma. Although the relationship between H pylori and gastritis is constant, only a small proportion of individuals infected with H pylori develop gastric cancer; the exact mechanism for this relationship with gastric carcinogenesis remains unclear, but host genetic background may play a role. [8] The incidence of gastric cancer usually parallels the incidence of H pylori infection in countries with a high incidence of gastric cancer and is consistent with H pylori being the cause of the precursor lesion, chronic atrophic gastritis.

H pylori-related chronic gastritis may also increase the risk of endothelial dysfunction, and thus vascular disease, due to abnormalities in flow-mediated dilation and carotid intima media thickness, as well as elevated levels of soluble vascular cell adhesion molecule-1 (sVCAM-1) and intercellular adhesion molecule-1 (ICAM-1).

Persistence of the organisms and associated inflammation during long-standing infection is likely to permit the accumulation of mutations in the genome of the gastric epithelial cells, leading to an increased risk of malignant transformation and progression to adenocarcinoma. Studies have provided evidence of the accumulation of mutations in the gastric epithelium secondary to oxidative DNA damage associated with chronic inflammatory byproducts and secondary to deficiency of DNA repair induced by chronic bacterial infection.

Although the role of H pylori in peptic ulcer disease is well established, the role of the infection in non-ulcer or functional dyspepsia remains highly controversial. A recent meta-analysis demonstrates that H pylori eradication therapy is associated with improvement of dyspeptic symptoms in patients with functional dyspepsia in Asian, European, and American populations. [28] Although this study illustrates that H pylori eradication may be beneficial for symptom relief in some populations, routine H pylori testing and treatment in nonulcer dyspepsia are not currently widely accepted. Therefore, H pylori eradication strategies in patients with nonulcer dyspepsia must be considered on a patient-by-patient basis.

Infectious granulomatous gastritis

Granulomatous gastritis (see the image below) is a rare entity. Tuberculosis may affect the stomach and cause caseating granulomas. Fungi, including cryptococcus, can also cause caseating granulomas and necrosis, a finding that is usually observed in patients who are immunosuppressed. Granulomatous gastritis has also been associated with H pylori infection.

Granulomatous chronic gastritis. Noncaseating granulomas in the lamina propria. Image courtesy of Sydney Finkelstein, MD, PhD, University of Pittsburgh.

Gastritis in patients who are immunosuppressed

Cytomegalovirus (CMV) infection of the stomach is observed in patients with underlying immunosuppression, but it remains unclear whether CMV gastritis promotes the development of gastric carcinoma. [30] Histologically, a patchy, mild inflammatory infiltrate is observed in the lamina propria. Typical intranuclear eosinophilic inclusions and, occasionally, smaller intracytoplasmic inclusions are present in the gastric epithelial cells and in the endothelial or mesenchymal cells in the lamina propria. Severe necrosis may result in ulceration.

Other infectious causes of chronic gastritis in immunosuppressed patients, include the Herpes simplex virus (HSV), which causes basophilic intranuclear inclusions in epithelial cells. Mycobacterial infections involving Mycobacterium avium-intracellulare are characterized by diffuse infiltration of the lamina propria by histiocytes, which rarely form granulomas.

Autoimmune atrophic gastritis

Autoimmune atrophic gastritis is associated with serum anti-parietal and anti–intrinsic factor (IF) antibodies. The gastric corpus undergoes progressive atrophy, IF deficiency occurs, and patients may develop pernicious anemia.

The development of chronic atrophic gastritis (sometimes called type A gastritis) limited to corpus-fundus mucosa and marked diffuse atrophy of parietal and chief cells characterizes autoimmune atrophic gastritis. In addition to hypochlorhydria, autoimmune gastritis is associated with serum anti-parietal and anti-IF antibodies that cause IF deficiency, which, in turn, causes decreased availability of cobalamin, eventually leading to pernicious anemia in some patients. Hypochlorhydria induces G-Cell (Gastrin producing) hyperplasia, leading to hypergastrinemia. Gastrin exerts a trophic effect on enterochromaffin-like (ECL) cells and is hypothesized to be one of the mechanisms leading to the development of gastric carcinoid tumors (ECL tumors).

In autoimmune gastritis, autoantibodies are directed against at least 3 antigens, including IF, cytoplasmic (microsomal-canalicular), and plasma membrane antigens. There are two types of IF antibodies, types I and II. Type 1 antibody prevents the attachment of B12 to IF and Type II antibody prevents attachment of the vitamin B12-intrinsic factor complex to ileal receptors.

Cell-mediated immunity also contributes to the disease. T-cell lymphocytes infiltrate the gastric mucosa and contribute to the epithelial cell destruction and resulting gastric atrophy.

Chronic reactive chemical gastropathy

Chronic reactive chemical gastritis is associated with long-term intake of aspirin or NSAIDs. It also develops when bile-containing intestinal contents reflux into the stomach. Although bile reflux may occur in the intact stomach, most of the features associated with bile reflux are typically found in patients with partial gastrectomy, in whom the lesions develop near the surgical stoma.

The mechanisms through which bile alters the gastric epithelium involve the effects of several bile constituents. Both lysolecithin and bile acids can disrupt the gastric mucous barrier, allowing the back diffusion of positive hydrogen ions and resulting in cellular injury. Pancreatic juice enhances epithelial injury in addition to bile acids. In contrast to other chronic

gastropathies, minimal inflammation of the gastric mucosa typically occurs in chemical gastropathy.

Chronic noninfectious granulomatous gastritis

Noninfectious diseases are the usual cause of gastric granulomas; these include Crohn disease, sarcoidosis, and isolated granulomatous gastritis. Crohn disease demonstrates gastric involvement in approximately 33% of the cases. Granulomas have also been described in association with gastric malignancies, including carcinoma and malignant lymphoma. Sarcoidlike granulomas may be observed in people who use cocaine, and foreign material is occasionally observed in the granuloma. An underlying cause of chronic granulomatous gastritis cannot be identified in up to 25% of cases. These patients are considered to have idiopathic granulomatous gastritis (IGG).

Lymphocytic gastritis

Lymphocytic gastritis is a type of chronic gastritis characterized by dense infiltration of the surface and foveolar epithelium by T lymphocytes and associated chronic infiltrates in the lamina propria. Because its histopathology is similar to that of celiac disease, lymphocytic gastritis has been proposed to result from intraluminal antigens.

High anti–H pylori antibody titers have been found in patients with lymphocytic gastritis, and in limited studies, the inflammation disappeared after H pylori was eradicated. However, many patients with lymphocytic gastritis are serologically negative for H pylori. A number of cases may develop secondary to intolerance to gluten and drugs such as ticlopidine.

Eosinophilic gastritis

Large numbers of eosinophils may be observed with parasitic infections such as those caused by Eustoma rotundatum and Anisakis marina. Eosinophilic gastritis can be part of the spectrum of eosinophilic gastroenteritis. Although the gastric antrum is commonly affected and can cause gastric outlet obstruction, this condition can affect any segment of the GI tract and can be segmental. Patients frequently have peripheral blood eosinophilia.

In some cases, especially in children, eosinophilic gastroenteritis can result from food allergy, usually to milk or soy protein. Eosinophilic gastroenteritis can also be found in some patients with connective tissue disorders, including scleroderma, polymyositis, and dermatomyositis.

Radiation gastritis

Radiation gastritis usually occurs 2-9 mo after initial radiotherapy. The dose at which 5 percent of patients develop complications at five years, when the entire stomach is irradiated, is estimated to be 50 Gy. Small doses of radiation (up to 15 Gy) cause reversible mucosal damage, whereas higher doses cause irreversible damage with atrophy and ischemic-related ulceration. Reversible changes consist of degenerative changes in the epithelial cells and nonspecific chronic inflammatory infiltrate in the lamina propria. Higher amounts of radiation cause permanent mucosal damage, with atrophy of fundic glands, mucosal erosions, and capillary

hemorrhage. Associated submucosal endarteritis results in mucosal ischemia and secondary ulcer development.

Ischemic gastritis

Ischemic gastritis is believed to result from atherosclerotic thrombi arising from the celiac and superior mesenteric arteries.

Etiology

Chronic gastritis may be caused by either infectious or noninfectious conditions. Infectious forms of gastritis include the following:

Chronic gastritis caused by H pylori infection – This is the most common cause of chronic gastritis.

Gastritis caused by Helicobacter heilmannii infection

Granulomatous gastritis associated with gastric infections in mycobacteriosis, syphilis, histoplasmosis, mucormycosis, South American blastomycosis, anisakiasis, or anisakidosis

Chronic gastritis associated with parasitic infections - Strongyloides species, schistosomiasis, or Diphyllobothrium latum

Gastritis caused by viral (eg, CMV or herpesvirus) infection

Noninfectious forms of gastritis include the following:

Autoimmune gastritis

Chemical gastropathy- usually related to chronic bile reflux, NSAID and aspirin intake

Uremic gastropathy

Chronic noninfectious granulomatous gastritis – This may be associated with Crohn disease, sarcoidosis, Wegener granulomatosis, foreign bodies, cocaine use, isolated granulomatous gastritis, chronic granulomatous disease of childhood, eosinophilic granuloma, allergic granulomatosis and vasculitis, plasma cell granulomas, rheumatoid nodules, tumoral amyloidosis and granulomas associated with gastric carcinoma, gastric lymphoma, or Langerhans cell histiocytosis

Lymphocytic gastritis, including gastritis associated with celiac disease (also called collagenous gastritis) About 16% of patients with celiac disease have lymphocytic gastritis, which improves after a gluten-free diet, but there does not appear to be an association between lymphocytic gastritis and H pylori infection. Chronic gastritis, whether active or inactive, does not appear to be affected by a gluten-free diet.

Eosinophilic gastritis

Radiation injury to the stomach

Graft-versus-host disease (GVHD)

Ischemic gastritis

Gastritis secondary to drug therapy (NSAIDs and aspirin)

Some patients have chronic gastritis of undetermined etiology or gastritis of undetermined type (eg, autistic gastritis).

Epidemiology

United States statistics

H pylori is one most prevalent bacterial pathogen in humans and in the United States approximately 30-35% of adults are infected, but the prevalence of infection in minority groups and immigrants from developing countries is much higher. H pylori prevalence is higher in Hispanics (52%), black individuals (54%), in contrast to white persons (21%). Overall, the prevalence of H pylori is higher in developing countries and declining in the United States. The incidence of new infections in developing countries ranges from 3-10% of the population each year, compared to 0.5 percent in developed countries. Children aged 2-8 years in developing nations acquire the infection at a rate of about 10% per year, whereas in the United States, children become infected at a rate of less than 1% per year. This major difference in the rate of acquisition in childhood is responsible for the differences in the epidemiology between developed countries and developing countries.

Socioeconomic differences are the most important predictor of the prevalence of the infection in any group. Higher standards of living are associated with higher levels of education and better sanitation, thus the prevalence of infection is lower. Epidemiologic studies of H pylori-associated chronic gastritis have shown that the acquisition of the infection is associated with large, crowded households and lower socioeconomic status.

Well-defined preventive measures are not established. However, in the United States and in other countries with modern sanitation and clean water supplies, the rate of acquisition has been decreasing since 1950. In fact, the risk of H pylori infection in immigrants to the United States appears to be decreasing with each successive generation born in the United States. The rate of infection in people with several generations of their families living at a high socioeconomic status is in the range of 10-15%. This is probably the lowest level to which prevalence can decline spontaneously until eradication or vaccination programs are instituted.

Lymphocytic gastritis has an incidence of between 0.83% and 2.5% in patients undergoing endoscopy and of 4-5% in those with chronic gastritis. The disease has been reported in various parts of the world but more commonly in Europe, and it appears to be less common in the United States.

Chronic reactive chemical gastropathy is one of the most common and poorly recognized lesions of the stomach.

International statistics

An estimated 50% of the world population is infected with H pylori; consequently, chronic gastritis is extremely frequent. H pylori infection is highly prevalent in Asia and in developing countries, and multifocal atrophic gastritis and gastric adenocarcinomas are more prevalent in these areas.

Autoimmune gastritis is a relatively rare disease, most frequently observed in individuals of northern European descent and black people. The prevalence of pernicious anemia, resulting from autoimmune gastritis, has been estimated at 127 cases per 100,000 population in the United Kingdom, Denmark, and Sweden. The frequency of pernicious anemia is increased in patients with other immunologic diseases, including Graves disease, myxedema, thyroiditis, vitiligo and hypoparathyroidism.

Age-related demographics

Age is the most important variable relating to the prevalence of H pylori infection, with persons born before 1950 having a notably higher rate of infection than those born after 1950. For example, roughly 50% of people older than 60 years are infected, compared with 20% of people younger than 40 years.

However, this increase in infection prevalence with age is largely apparent rather than real, reflecting a continuing overall decline in the prevalence of H pylori infection. Because the infection is typically acquired in childhood and is life long, the high proportion of older individuals who are infected is the long-term result of infection that occurred in childhood when standards of living were lower. The prevalence will decrease as people who are currently aged 40 years and have a lower rate of infection grow older (a birth cohort phenomenon).

H pylori gastritis is usually acquired during childhood, and complications typically develop later.

Patients with autoimmune gastritis usually present with pernicious anemia, which is typically diagnosed in individuals aged approximately 60 years. However, pernicious anemia can be detected in children (juvenile pernicious anemia).

Lymphocytic gastritis can be observed in children but is usually detected in late adulthood. On average, patients are aged 50 years.

Eosinophilic gastroenteritis mostly affects people younger than 50 years.

Sex-related demographics

Chronic H pylori- associated gastritis affects both sexes with approximately the same frequency, though some studies have noted a slight male predominance. The female-to-male ratio for autoimmune gastritis has been reported to be 3:1. Lymphocytic gastritis affects men and women at similar rates.

Race-related demographics

H pylori -associated chronic gastritis appears to be more common among Asian and Hispanic people than in people of other races. In the United States, H pylori infection is more

common among black, Native American, and Hispanic people than among white people, a difference that has been attributed to socioeconomic factors.

Autoimmune gastritis is more frequent in individuals of northern European descent and in black people, and it is less frequent in southern European and Asian people.

Prognosis

The prognosis of chronic gastritis is strongly related to the underlying cause. Chronic gastritis as a primary disease, such as H pylori-associated chronic gastritis, may progress as an asymptomatic disease in some patients, whereas other patients may report dyspeptic symptoms. The clinical course may be worsened when patients develop any of the possible complications of H pylori infection, such as peptic ulcer or gastric malignancy.

H pylori gastritis is the most frequent cause of MALT lymphoma- occurring in 0.1% of those infected. Patients with chronic atrophic gastritis may have a 12- to 16-fold increased risk of developing gastric carcinoma, compared with the general population. Approximately 10% of infected persons develop peptic ulcer and the lifetime risk of gastric cancer is in the range of 1-3%.

Eradication of H pylori results in rapid cure of the infection with disappearance of the neutrophilic infiltration of the gastric mucosa. Disappearance of the lymphoid component of gastritis might take several months after treatment. Data on the evolution of atrophic gastritis after eradication of H pylori have been conflicting. Follow-up for as long as several years after H pylori eradication has not demonstrated regression of gastric atrophy in most studies, whereas others report improvement in the extent of atrophy and intestinal metaplasia.

Another important question is whether H pylori eradication in a patient with atrophic gastritis reduces the risk of gastric cancer development. Unfortunately, the data up to now has been mixed. A prospective study in a Japanese population reported that H pylori eradication in patients with endoscopically resected early gastric cancer resulted in the decreased appearance of new early cancers, whereas intestinal-type gastric cancers developed in the control group without H pylori eradication. This finding supports an intervention approach with eradication of H pylori if the organisms are detected in patients with atrophic gastritis; the goal is to prevent the development of gastric cancer. However, recent reports have shown that gastric cancers can still arise after adequate H pylori therapy.

In patients with autoimmune gastritis, the major effects are consequent to the loss of parietal and chief cells and include achlorhydria, hypergastrinemia, loss of pepsin and pepsinogen, anemia, and an increased risk of gastric neoplasms. The prevalence of gastric neoplasia in patients with pernicious anemia, is reported to be about 1-3% for adenocarcinoma and 1- 7% for gastric carcinoid.

History

H pyloriinfection

Acute H pylori infection usually is not detected clinically, but persistence of the organism causes H pylori chronic gastritis, which is usually asymptomatic but may manifest as epigastric

pain, nausea, vomiting, anorexia, early satiety or weight loss. Symptoms may occur with the development of complications of chronic H pylori gastritis, which include peptic ulcers, gastric adenocarcinoma, and mucosa-associated lymphoid tissue (MALT) lymphoma.

Autoimmune gastritis

The clinical manifestations of autoimmune gastritis are primarily related to the deficiency in cobalamin, which is not adequately absorbed because of intrinsic factor (IF) deficiency resulting from severe gastric parietal cell atrophy. The disease has an insidious onset and progresses slowly. Cobalamin deficiency affects the hematologic, gastrointestinal (GI), and neurologic systems.

The most significant hematologic manifestation is megaloblastic anemia, but on rare occasions, purpura due to thrombocytopenia may develop. Symptoms of anemia include weakness, light-headedness, vertigo, tinnitus, palpitations, angina and symptoms of congestive heart failure.

There are many gastrointestinal manifestations of cobalamin deficiency. Patients sometimes report having soreness of the tongue- called glossitis. Anorexia with moderate weight loss that is occasionally associated with diarrhea may result from malabsorption associated with megaloblastic changes of the small intestinal epithelial cells.

Neurologic manifestations result from demyelination, followed by axonal degeneration and neuronal death. Affected sites include the peripheral nerves, posterior and lateral columns of the spinal cord, and cerebrum. Signs and symptoms include numbness and paresthesias in the extremities, weakness, and ataxia. Sphincter disturbances may occur. Mental function disturbances range from mild irritability to severe dementia or psychosis. Neurologic disease may occur in a patient with hematocrit and red cell parameters within the reference range.

As previously mentioned, patients with pernicious anemia have an increased frequency of gastric polyps and gastric carcinoid, in addition to an increase in the frequency of gastric adenocarcinoma.

Granulomatous gastritis

In multisystemic diseases, specific symptoms related to gastric involvement may be minor. Caseating granulomas secondary to tuberculosis may be found in the absence of lung disease in patients who are malnourished, immunosuppressed, or alcoholic.

Patients with Crohn disease and gastric involvement may report abdominal pain, nausea, and vomiting. Gastric involvement in Crohn disease is almost invariably associated with intestinal disease, and intestinal manifestations predominate.

Sarcoidosis of the stomach is usually associated with granulomatous inflammation in other locations, especially the lungs, hilar nodes, or salivary glands. About 10% of patients with sarcoid involvement of the stomach are asymptomatic. Patients who are symptomatic present with gastric ulcers, hemorrhage, pyloric stricture, and gastric outlet obstruction.

Idiopathic isolated granulomatous gastritis

The diagnosis of idiopathic isolated granulomatous gastritis is established only when known entities associated with granulomas are excluded. Patients who are symptomatic usually are older than 40 years at presentation and have epigastric pain, weight loss, and vomiting secondary to pyloric obstruction.

Lymphocytic gastritis

Lymphocytic gastritis mostly affects middle-aged or elderly patients. It may be associated with chronic H pylori infection, gluten-sensitive enteropathy, and Menetrier disease. It may represent a hypersensitivity reaction involving the gastric body. Lymphocytic gastritis has been described as complicating MALT lymphoma and gastric carcinoma.

Eosinophilic gastroenteritis

Some patients with eosinophilic gastroenteritis have underlying connective tissue disorders. Those with predominant mucosal involvement may report nausea, vomiting, and abdominal pain related to the ingestion of specific foods. Those with involvement of the muscularis propria and resulting thickening and rigidity may present with outlet obstruction symptoms. Many patients have a history of allergy, peripheral eosinophilia, asthma, eczema, or food sensitivity. Some respond to removal of these items from the diet, and steroid treatment is often helpful.

Gastritis in graft versus host disease

Graft versus host disease (GVHD) follows allogeneic bone marrow transplantation or transfusions, especially in patients who are immunocompromised. Patients with isolated gastric GVHD have symptoms of nausea, vomiting, and upper abdominal pain without diarrhea.

Physical Examination

The physical examination contributes relatively little to the assessment and management of chronic gastritis. However, some findings are specifically associated with the particular complications of H pylori–associated gastritis and autoimmune gastritis.

In uncomplicated H pylori–associated atrophic gastritis, clinical findings are few and nonspecific. Epigastric tenderness may exist. If gastric ulcers coexist, guaiac-positive stool may result from occult blood loss. Bad breath (ie, halitosis) and abdominal pain or discomfort may occur, with bloating associated with bacterial overgrowth syndrome.

Physical findings may result from the development of pernicious anemia and neurologic complications in patients with autoimmune atrophic gastritis. With severe cobalamin deficiency, the patient is pale and has slightly icteric skin and eyes. The pulse is rapid, and the heart may be enlarged. Auscultation usually reveals a systolic flow murmur.

Practical lesson № 11. PEPTIC ULCER OF STOMACH AND DUODENUM

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Background

Gastric and duodenal ulcers usually cannot be differentiated based on history alone, although some findings may be suggestive (see DDx). Epigastric pain is the most common symptom of both gastric and duodenal ulcers. It is characterized by a gnawing or burning sensation and occurs after meals—classically, shortly after meals with gastric ulcer and 2-3 hours afterward with duodenal ulcer.

In uncomplicated peptic ulcer disease (PUD), the clinical findings are few and nonspecific. “Alarm features" that warrant prompt gastroenterology referral [1]include bleeding, anemia, early satiety, unexplained weight loss, progressive dysphagia or odynophagia, recurrent vomiting, and family history of gastrointestinal (GI) cancer. Patients with perforated PUD usually present with a sudden onset of severe, sharp abdominal pain. (See Presentation.)

In most patients with uncomplicated PUD, routine laboratory tests usually are not helpful; instead, documentation of PUD depends on radiographic and endoscopic confirmation. Testing for *H pylori* infection is essential in all patients with peptic ulcers. Rapid urease tests are considered the endoscopic diagnostic test of choice. Of the noninvasive tests, fecal antigen testing is more accurate than antibody testing and is less expensive than urea breath tests. A fasting serum gastrin level should be obtained in certain cases to screen for Zollinger-Ellison syndrome.

Upper GI endoscopy is the preferred diagnostic test in the evaluation of patients with suspected PUD. Endoscopy provides an opportunity to visualize the ulcer, to determine the presence and degree of active bleeding, and to attempt hemostasis by direct measures, if required. Perform endoscopy early in patients older than 45-50 years and in patients with associated so-called alarm features.

Most patients with PUD are treated successfully with cure of *H pylori* infection and/or avoidance of nonsteroidal anti-inflammatory drugs (NSAIDs), along with the appropriate use of antisecretory therapy. In the United States, the recommended primary therapy for *H pylori* infection is proton pump inhibitor (PPI)–based triple therapy. These regimens result in a cure of infection and ulcer healing in approximately 85-90% of cases. Ulcers can recur in the absence of successful *H pylori* eradication.

In patients with NSAID-associated peptic ulcers, discontinuation of NSAIDs is paramount, if it is clinically feasible. For patients who must continue with their NSAIDs, proton pump inhibitor (PPI) maintenance is recommended to prevent recurrences even after eradication

of *H pylori*. Prophylactic regimens that have been shown to dramatically reduce the risk of NSAID-induced gastric and duodenal ulcers include the use of a prostaglandin analog or a PPI. Maintenance therapy with antisecretory medications (eg, H2 blockers, PPIs) for 1 year is indicated in high-risk patients.

The indications for urgent surgery include failure to achieve hemostasis endoscopically, recurrent bleeding despite endoscopic attempts at achieving hemostasis (many advocate surgery after 2 failed endoscopic attempts), and perforation.

Patients with gastric ulcers are also at risk of developing gastric malignancy.

Anatomy

Because many surgical procedures for peptic ulcer disease (PUD) entail some type of vagotomy, a discussion concerning the vagal innervation of the abdominal viscera is appropriate (see image below). The left (anterior) and the right (posterior) branches of the vagus nerve descend along either side of the distal esophagus. As they enter the lower thoracic cavity, they can communicate with each other through several cross-branches that comprise the esophageal plexus. However, below this plexus, the 2 vagal trunks again become separate and distinct before the anterior trunk branches to form the hepatic, pyloric, and anterior gastric (also termed the anterior nerve of Latarjet) branches. The posterior trunk branches to form the posterior gastric branch (also termed the posterior nerve of Latarjet) and the celiac branch.

The parietal cell mass of the stomach is segmentally innervated by the terminal branches from each of the anterior and posterior gastric branches. These terminal branches are divided during highly selective vagotomy. The gallbladder is innervated from efferent branches of the hepatic division of the anterior trunk. Consequently, transection of the anterior vagus trunk (performed during truncal vagotomy) can result in a dilated gallbladder with inhibited contractility and subsequent cholelithiasis. The celiac branch of the posterior vagus innervates the entire midgut (with the exception of the gallbladder). Thus, division of the posterior trunk during truncal vagotomy may contribute to postoperative ileus.

Pathphysiology

Peptic ulcers are defects in the gastric or duodenal mucosa that extend through the muscularis mucosa. The epithelial cells of the stomach and duodenum secrete mucus in response to irritation of the epithelial lining and as a result of cholinergic stimulation. The superficial portion of the gastric and duodenal mucosa exists in the form of a gel layer, which is

impermeable to acid and pepsin. Other gastric and duodenal cells secrete bicarbonate, which aids in buffering acid that lies near the mucosa. Prostaglandins of the E type (PGE) have an important protective role, because PGE increases the production of both bicarbonate and the mucous layer.

In the event of acid and pepsin entering the epithelial cells, additional mechanisms are in place to reduce injury. Within the epithelial cells, ion pumps in the basolateral cell membrane help to regulate intracellular pH by removing excess hydrogen ions. Through the process of restitution, healthy cells migrate to the site of injury. Mucosal blood flow removes acid that diffuses through the injured mucosa and provides bicarbonate to the surface epithelial cells.

Under normal conditions, a physiologic balance exists between gastric acid secretion and gastroduodenal mucosal defense. Mucosal injury and, thus, peptic ulcer occur when the balance between the aggressive factors and the defensive mechanisms is disrupted. Aggressive factors, such as nonsteroidal anti-inflammatory drugs (NSAIDs), *H pylori* infection, alcohol, bile salts, acid, and pepsin, can alter the mucosal defense by allowing back diffusion of hydrogen ions and subsequent epithelial cell injury. The defensive mechanisms include tight intercellular junctions, mucus, mucosal blood flow, cellular restitution, and epithelial renewal.

The gram-negative spirochete *H pylori* was first linked to gastritis in 1983. Since then, further study of *H pylori* has revealed that it is a major part of the triad, which includes acid and pepsin, that contributes to primary peptic ulcer disease. The unique microbiologic characteristics of this organism, such as urease production, allows it to alkalinize its microenvironment and survive for years in the hostile acidic environment of the stomach, where it causes mucosal inflammation and, in some individuals, worsens the severity of peptic ulcer disease.

When *H pylori* colonizes the gastric mucosa, inflammation usually results. The causal association between *H pylori* gastritis and duodenal ulceration is now well established in the adult and pediatric literature. In patients infected with *H pylori*,high levels of gastrin and pepsinogen and reduced levels of somatostatin have been measured. In infected patients, exposure of the duodenum to acid is increased. Virulence factors produced by *H pylori*, including urease, catalase, vacuolating cytotoxin, and lipopolysaccharide, are well described.

Most patients with duodenal ulcers have impaired duodenal bicarbonate secretion, which has also proven to be caused by *H pylori* because its eradication reverses the defect. The combination of increased gastric acid secretion and reduced duodenal bicarbonate secretion lowers the pH in the duodenum, which promotes the development of gastric metaplasia (ie, the

presence of gastric epithelium in the first portion of the duodenum). *H pylori* infection in areas of gastric metaplasia induces duodenitis and enhances the susceptibility to acid injury, thereby predisposing to duodenal ulcers. Duodenal colonization by *H pylori* was found to be a highly significant predictor of subsequent development of duodenal ulcers in one study that followed 181 patients with endoscopy-negative, nonulcer dyspepsia.

Etiology

Peptic ulcer disease (PUD) may be due to any of the following:

- *H pylori* infection
- Drugs
- Lifestyle factors
- Severe physiologic stress
- Hypersecretory states (uncommon)
- Genetic factors

H pylori infection

H pylori infection and nonsteroidal anti-inflammatory drug (NSAID) use account for most cases of PUD. The rate of *H pylori* infection for duodenal ulcers in the United States is less than 75% for patients who do not use NSAIDs. Excluding patients who used NSAIDs, 61% of duodenal ulcers and 63% of gastric ulcers were positive for *H pylori* in one study. These rates were lower in whites than in nonwhites. Prevalence of *H pylori* infection in complicated ulcers (ie, bleeding, perforation) is significantly lower than that found in uncomplicated ulcer disease.

Drugs

NSAID use is a common cause of PUD. These drugs disrupt the mucosal permeability barrier, rendering the mucosa vulnerable to injury. As many as 30% of adults taking NSAIDs have GI adverse effects. Factors associated with an increased risk of duodenal ulcers in the setting of NSAID use include history of previous peptic ulcer disease, advanced age, female sex, high doses or combinations of NSAIDs, long-term NSAID use, concomitant use of anticoagulants, and severe comorbid illnesses.

A long-term prospective study found that patients with arthritis who were older than 65 years who regularly took low-dose aspirin were at an increased risk for dyspepsia severe enough to necessitate the discontinuation of NSAIDs. [7] This suggests that better management of NSAID use should be discussed with older patients in order to reduce NSAID-associated upper GI events.

A UK retrospective study of patients newly initiated on low-dose aspirin for secondary prevention of cardiovascular events identified risk factors for uncomplicated peptic ulcer disease in these patients that included the following :

- Previous history of peptic ulcer disease
- Current use of NSAIDs, oral steroid agents, or acid suppressive agents
- Tobacco use
- Stress
- Depression
- Anemia
- Social deprivation

Although the idea was initially controversial, most evidence now supports the assertion that *H pylori* and NSAIDs are synergistic with respect to the development of peptic ulcer disease. A meta-analysis found that *H pylori* eradication in NSAID-naive users before the initiation of NSAIDs was associated with a decrease in peptic ulcers. [9]

Although the prevalence of NSAID gastropathy in children is unknown, it seems to be increasing, especially in children with chronic arthritis treated with NSAIDs. Case reports have demonstrated gastric ulceration from low-dose ibuprofen in children, even after just 1 or 2 doses.

Corticosteroids alone do not increase the risk for PUD; however, they can potentiate ulcer risk in patients who use NSAIDs concurrently.

The risk of upper GI tract bleeding may be increased in users of the diuretic spironolactone or serotonin reuptake inhibitors with moderate to high affinity for serotonin transporter.

Lifestyle factors

Evidence that tobacco use is a risk factor for duodenal ulcers is not conclusive. Support for a pathogenic role for smoking comes from the finding that smoking may accelerate gastric emptying and decrease pancreatic bicarbonate production. However, studies have produced contradictory findings. In one prospective study of more than 47,000 men with duodenal ulcers, smoking did not emerge as a risk factor.[13] However, smoking in the setting of *H pylori* infection may increase the risk of relapse of PUD.[14] Smoking is harmful to the gastroduodenal mucosa, and *H pylori* infiltration is denser in the gastric antrum of smokers.

Ethanol is known to cause gastric mucosal irritation and nonspecific gastritis. Evidence that consumption of alcohol is a risk factor for duodenal ulcer is inconclusive. A prospective study of more than 47,000 men with duodenal ulcer did not find an association between alcohol intake and duodenal ulcer.

Little evidence suggests that caffeine intake is associated with an increased risk of duodenal ulcers.

Severe physiologic stress

Stressful conditions that may cause PUD include burns, central nervous system (CNS) trauma, surgery, and severe medical illness. Serious systemic illness, sepsis, hypotension, respiratory failure, and multiple traumatic injuries increase the risk for secondary (stress) ulceration.

Cushing ulcers are associated with a brain tumor or injury and typically are single, deep ulcers that are prone to perforation. They are associated with high gastric acid output and are located in the duodenum or stomach. Extensive burns are associated with Curling ulcers.

Stress ulceration and upper-gastrointestinal (GI) hemorrhage are complications that are increasingly encountered in critically ill children in the intensive care setting. Severe illness and a decreased gastric pH are related to an increased risk of gastric ulceration and hemorrhage.

Hypersecretory states (uncommon)

The following are among hypersecretory states that may, uncommonly, cause PUD:

- Gastrinoma (Zollinger-Ellison syndrome) or multiple endocrine neoplasia type I (MEN-I)
- Antral G cell hyperplasia

- Systemic mastocytosis
- Basophilic leukemias
- Cystic fibrosis
- Short bowel syndrome
- Hyperparathyroidism

Physiologic factors

In up to one third of patients with duodenal ulcers, basal acid output (BAO) and maximal acid output (MAO) are increased. In one study, increased BAO was associated with an odds ratio [OR] of up to 3.5, and increased MAO was associated with an OR of up to 7 for the development of duodenal ulcers. Individuals at especially high risk are those with a BAO greater than 15 mEq/h. The increased BAO may reflect the fact that in a significant proportion of patients with duodenal ulcers, the parietal cell mass is increased to nearly twice that of the reference range.

In addition to the increased gastric and duodenal acidity observed in some patients with duodenal ulcers, accelerated gastric emptying is often present. This acceleration leads to a high acid load delivered to the first part of the duodenum, where 95% of all duodenal ulcers are located. Acidification of the duodenum leads to gastric metaplasia, which indicates replacement of duodenal villous cells with cells that share morphologic and secretory characteristics of gastric epithelium. Gastric metaplasia may create an environment that is well suited to colonization by *H pylori*.

Seasonal changes and climate extremes may also affect gastric mucosa and cause damage to the gastric mucosa and its barrier function. In extreme cold climate, Yuan et al significantly lower expression of heat shock protein 70 (HSP70) as well as decreased mucosal thickness in the gastric antrum of patients with peptic ulcer disease who were at high risk of bleeding compared to those at low risk of bleeding.

Moreover, compared to extreme hot climate, extreme cold climate was associated with significantly lower levels of occluding, HSP70, nitric oxide synthase (NOS), and epidermal growth factor receptor (EGFR), but no statistically significant differences in these protein expression levels were found between patients at high and low risk of bleeding. The investigators also did not note any significant differences found in the rates of *H pylori* infection and pH levels of gastric juices between patients at high bleeding risk and low bleeding risk.

Genetics

More than 20% of patients have a family history of duodenal ulcers, compared with only 5-10% in the control groups. In addition, weak associations have been observed between duodenal ulcers and blood type O. Furthermore, patients who do not secrete ABO antigens in their saliva and gastric juices are known to be at higher risk. The reason for these apparent genetic associations is unclear.

A rare genetic association exists between familial hyperpepsinogenemia type I (a genetic phenotype leading to enhanced secretion of pepsin) and duodenal ulcers. However, *H pylori* can increase pepsin secretion, and a retrospective analysis of the sera of one family studied before the discovery of *H pylori* revealed that their high pepsin levels were more likely related to *H pylori* infection.

Additional etiologic factors

Any of the following may be associated with PUD:

- Hepatic cirrhosis
- Chronic obstructive pulmonary disease
- Allergic gastritis and eosinophilic gastritis
- Cytomegalovirus infection
- Graft versus host disease
- Uremic gastropathy
- Henoch-Schönlein gastritis
- Corrosive gastropathy
- Celiac disease
- Bile gastropathy
- Autoimmune disease
- Crohn disease
- Other granulomatous gastritides (eg, sarcoidosis, histiocytosis X, tuberculosis)

- Phlegmonous gastritis and emphysematous gastritis
- Other infections, including Epstein-Barr virus, HIV, *Helicobacter heilmannii*,herpes simplex, influenza, syphilis, *Candida albicans* , histoplasmosis,mucormycosis, and anisakiasis
- Chemotherapeutic agents, such as 5-fluorouracil (5-FU), methotrexate (MTX), and cyclophosphamide
- Local radiation resulting in mucosal damage, which may lead to the development of duodenal ulcers
- Use of crack cocaine, which causes localized vasoconstriction, resulting in reduced blood flow and possibly leading to mucosal damage

Epidemiology

United States statistics

In the United States, peptic ulcer disease (PUD) affects approximately 4.5 million people annually. Approximately 10% of the US population has evidence of a duodenal ulcer at some time. Of those infected with *H pylori*, the lifetime prevalence is approximately 20%. Only about 10% of young persons have *H pylori*infection; the proportion of people with the infection increases steadily with age.

Overall, the incidence of duodenal ulcers has been decreasing over the past 3-4 decades. Although the rate of simple gastric ulcer is in decline, the incidence of complicated gastric ulcer and hospitalization has remained stable, partly due to the concomitant use of aspirin in an aging population. The hospitalization rate for PUD is approximately 30 patients per 100,000 cases.

The prevalence of PUD has shifted from predominance in males to similar occurrences in males and females. Lifetime prevalence is approximately 11-14% in men and 8-11% in women. Age trends for ulcer occurrence reveal declining rates in younger men, particularly for duodenal ulcer, and increasing rates in older women. Trends reflect complex changes in risk factors for PUD, including age-cohort phenomena with the prevalence of *H pylori* infection and the use of nonsteroidal anti-inflammatory drugs (NSAIDs) in older populations.

International statistics

The frequency of PUD in other countries is variable and is determined primarily by association with the major causes of PUD: *H pylori* and NSAIDs.

Prognosis

When the underlying cause is addressed, the prognosis is excellent. Most patients are treated successfully with eradication of *H pylori* infection, avoidance of nonsteroidal anti-inflammatory agents (NSAIDs), and the appropriate use of antisecretory therapy. Eradication of *H pylori* infection changes the natural history of the disease, with a decrease in the ulcer recurrence rate from 60-90% to approximately 10-20%. However, this is a higher recurrence rate than previously reported, suggesting an increased number of ulcers not caused by *H pylori*infection.

With regard to NSAID-related ulcers, the incidence of perforation is approximately 0.3% per patient year, and the incidence of obstruction is approximately 0.1% per patient year. Combining both duodenal ulcers and gastric ulcers, the rate of any complication in all age groups combined is approximately 1-2% per ulcer per year.

The mortality rate for peptic ulcer disease (PUD), which has decreased modestly in the last few decades, is approximately 1 death per 100,000 cases. If one considers all patients with duodenal ulcers, the mortality rate due to ulcer hemorrhage is approximately 5%. Over the last 20 years, the mortality rate in the setting of ulcer hemorrhage has not changed appreciably despite the advent of histamine-2 receptor antagonists (H2RAs) and proton pump inhibitors (PPIs). However, evidence from meta-analyses and other studies has shown a decreased mortality rate from bleeding peptic ulcers when intravenous PPIs are used after successful endoscopic therapy.

Emergency operations for peptic ulcer perforation carry a mortality risk of 6-30%.[23] Factors associated with higher mortality in this setting include the following:

- Shock at the time of admission
- Renal insufficiency
- Delaying the initiation of surgery for more than 12 hours after presentation
- Concurrent medical illness (eg, cardiovascular disease, diabetes mellitus

- Age older than 70 years
- Cirrhosis
- Immunocompromised state
- Location of ulcer (mortality associated with perforated gastric ulcer is twice that associated with perforated duodenal ulcer.)

In a retrospective population-based study (2001-2014) that evaluated long-term mortality in 234 patients who underwent surgery for perforated peptic ulcer, mortality was 15.2% at 30 days, 19.2% at 90 days, 22.6% at 1 year, and 24.8% at 2 years.[24] When the 30-day mortality data were excluded, 36% of patients died during a median follow-up of 57 months. Independent factors associated with an increased risk of long-term mortality included age older than 60 years and the presence of comormidities such as active malignancy, hypoalbuminemia, pulmonary disease, cardiovascular disease, and severe postoperative complications during the initial stay.

Patient Education

Patients should be warned of known or potentially injurious drugs and agents. Some examples are as follows:

- nonsteroidal anti-inflammatory drugs (NSAIDs)
- Aspirin
- Alcohol
- Tobacco
- Caffeine (eg, coffee, tea, colas)

Obesity has been shown to have an association with peptic ulcer disease (PUD), and patients should be counseled regarding benefits of weight loss. Stress reduction counseling might be helpful in individual cases but is not needed routinely.

History

Obtaining a medical history, especially for peptic ulcer disease, *H pylori* infection, ingestion of nonsteroidal anti-inflammatory drugs (NSAIDs), or smoking, is essential in making the correct diagnosis. Gastric and duodenal ulcers usually cannot be differentiated based on history alone, although some findings may be suggestive.

Epigastric pain is the most common symptom of both gastric and duodenal ulcers. It is characterized by a gnawing or burning sensation and occurs after meals—classically, shortly after meals with gastric ulcer and 2-3 hours afterward with duodenal ulcer. Food or antacids relieve the pain of duodenal ulcers but provide minimal relief of gastric ulcer pain.

Duodenal ulcer pain often awakens the patient at night. About 50-80% of patients with duodenal ulcers experience nightly pain, as opposed to only 30-40% of patients with gastric ulcers and 20-40% of patients with nonulcer dyspepsia (NUD). Pain typically follows a daily pattern specific to the patient. Pain with radiation to the back is suggestive of a posterior penetrating gastric ulcer complicated by pancreatitis.

Patients who develop gastric outlet obstruction as a result of a chronic, untreated duodenal ulcer usually report a history of fullness and bloating associated with nausea and emesis that occurs several hours after food intake. A common misconception is that adults with gastric outlet obstruction present with nausea and emesis immediately after a meal.

Other possible manifestations include the following:

- Dyspepsia, including belching, bloating, distention, and fatty food intolerance
- Heartburn
- Chest discomfort
- Hematemesis or melena resulting from gastrointestinal bleeding. Melena may be intermittent over several days or multiple episodes in a single day.
- Rarely, a briskly bleeding ulcer can present as hematochezia.
- Symptoms consistent with anemia (eg, fatigue, dyspnea) may be present
- Sudden onset of symptoms may indicate perforation.
- NSAID-induced gastritis or ulcers may be silent, especially in elderly patients.
- Only 20-25% of patients with symptoms suggestive of peptic ulceration are found on investigation to have a peptic ulcer.

Alarm features that warrant prompt gastroenterology referral [1] include the following:

- Bleeding or anemia
- Early satiety
- Unexplained weight loss
- Progressive dysphagia or odynophagia
- Recurrent vomiting
- Family history of gastrointestinal cancer

Physical Examination

In uncomplicated peptic ulcer disease (PUD), the clinical findings are few and nonspecific and include the following:

- Epigastric tenderness (usually mild)
- Right upper quadrant tenderness may suggest a biliary etiology or, less frequently, PUD.
- Guaiac-positive stool resulting from occult blood loss
- Melena resulting from acute or subacute gastrointestinal bleeding
- Succussion splash resulting from partial or complete gastric outlet obstruction

Patients with perforated PUD usually present with a sudden onset of severe, sharp abdominal pain. Most patients describe generalized pain; a few present with severe epigastric pain. As even slight movement can tremendously worsen their pain, these patients assume a fetal position. Abdominal examination usually discloses generalized tenderness, rebound tenderness, guarding, and rigidity. However, the degree of peritoneal findings is strongly influenced by a number of factors, including the size of perforation, amount of bacterial and gastric contents contaminating the abdominal cavity, time between perforation and presentation, and spontaneous sealing of perforation.

These patients may also demonstrate signs and symptoms of septic shock, such as tachycardia, hypotension, and anuria. Not surprisingly, these indicators of shock may be absent in elderly or immunocompromised patients or in those with diabetes. Patients should be asked if retching and vomiting occurred before the onset of pain.

Diagnostic ConsiderationsNonulcer dyspepsia (NUD) or functional dyspepsiaCrohn diseaseZollinger-Ellison syndrome

Functional dyspepsia is a diagnosis of exclusion made in patients with chronic persistent epigastric pain in whom a thorough evaluation shows no organic disease. Patients may primarily have epigastric pain, which is referred to as ulcerlike dyspepsia, or they may have symptoms of postprandial bloating, which is referred to as motility-like dyspepsia.

Crohn ulceration can involve any part of the GI tract from the buccal mucosa to the rectum. Isolated Crohn ulceration of the stomach is rare, although it may cause duodenal or ileal ulcerations.

Zollinger-Ellison syndrome (ZES) is a rare disorder that can cause gastric or duodenal ulcers (usually multiple) from excessive acid secretion. Consider ZES if a patient has severe peptic ulceration, kidney stones, watery diarrhea, or malabsorption. ZES can also be associated with multiple endocrine neoplasia type I, which occurs earlier than isolated ZES. Patients with ZES usually have fasting serum gastrin levels of more than 200 pg/mL and basal gastric acid hypersecretion of more than 15 mEq/h. Proton pump inhibitor (PPI) therapy should be discontinued at least 2 weeks before the gastrin level is measured.

Differential Diagnoses

- Acute Cholangitis

- Acute Coronary Syndrome
- Acute Gastritis
- Cholecystitis
- Cholecystitis and Biliary Colic in Emergency Medicine
- Chronic Gastritis
- Diverticulitis
- Emergent Treatment of Gastroenteritis
- Esophageal Rupture and Tears in Emergency Medicine
- Esophagitis
- Gallstones (Cholelithiasis)
- Gastroesophageal Reflux Disease
- Inflammatory Bowel Disease
- Viral Hepatitis

Approach Considerations

The 2017 American College of Gastroenterology (ACG) guidelines for the treatment of *H pylori* infection (HPI) indicates that selection of an HPI management regimen should take into account any previous antibiotic exposure(s). The ACG also includes the following therapeutic strategies for first-line treatment [25]:

- 10-14 days of bismuth quadruple therapy (bismuth, proton pump inhibitor [PPI], tetracycline, and a nitroimidazole) (strong recommendation), particularly in those with previous macrolide exposure or are penicillin allergic
- (Recommended option) 10-14 days of concomitant PPI, clarithromycin, amoxicillin, and a nitroimidazole (strong recommendation)
- 14 days of clarithromycin triple therapy (clarithromycin, a PPI, and amoxicillin or metronidazole) should be reserved for patients with no previous history of macrolide exposure who live in regions where clarithromycin resistance among *H pylori* isolates is known to be low (<15%) (conditional recommendation)
- (Suggested option) 5-7 days of sequential therapy with a PPI and amoxicillin, followed by 5-7 days with clarithromycin, a PPI, and a nitroimidazole (conditional recommendation)
- (Suggested option) 7 days of a hybrid therapy with a PPI and amoxicillin, followed by 7 days with a PPI, amoxicillin, clarithromycin, and a nitroimidazole (conditional recommendation)
- (Suggested option) 10-14 days of levofloxacin triple therapy (levofloxacin, a PPI, and amoxicillin) (conditional recommendation)

- (Suggested option) 5-7 days of fluoroquinolone sequential therapy (a PPI and amoxicillin), followed by 5-7 days of a PPI, fluoroquinolone, and nitroimidazole (conditional recommendation)

Salvage treatment if first-line therapy fails and HPI persists include the following options [25]:

- Avoid previously used antibiotics, if feasible (strong recommendation)
- Preferred for patients who previously received first-line clarithromycin regimens: Bismuth quadruple therapy or levofloxacin salvage regimens (conditional recommendation)
- Preferred for patients who previously received first-line bismuth quadruple therapy: Clarithromycin or levofloxacin-containing salvage regimens (conditional recommendation)

Salvage treatment regimens include the following [25]:

- (Recommended) Bismuth quadruple therapy or levofloxacin triple therapy for 14 days (strong recommendations)
- Avoid clarithromycin triple therapy (conditional recommendation)
- (Suggested) Concomitant therapy for 10-14 days (conditional recommendation
- (Suggested) Rifabutin triple regimen (rifabutin, a PPI, and amoxicillin) for 10 days (conditional recommendation)
- (Suggested) High-dose dual therapy (a PPI and amoxicillin) for 14 days (conditional recommendation)

Treatment of peptic ulcers varies depending on the etiology and clinical presentation. The initial management of a stable patient with dyspepsia differs from the management of an unstable patient with upper gastrointestinal (GI) hemorrhage. In the latter scenario, failure of medical management not uncommonly leads to surgical intervention.

Treatment options include empiric antisecretory therapy, empiric triple therapy for *H pylori* infection, endoscopy followed by appropriate therapy based on findings, and *H pylori* serology followed by triple therapy for patients who are infected. Breath testing for active *H pylori* infection may be used.

Endoscopy is required to document healing of gastric ulcers and to rule out gastric cancer. This usually is performed 6-8 weeks after the initial diagnosis of peptic ulcer disease (PUD). Documentation of *H pylori* cure with a noninvasive test, such as the urea breath test or fecal antigen test, is appropriate in patients with complicated ulcers.

Given the current understanding of the pathogenesis of PUD, most patients with PUD are treated successfully with cure of *H pylori* infection and/or avoidance of nonsteroidal anti-inflammatory agents (NSAIDs), along with the appropriate use of antisecretory therapy. Computer models have suggested that obtaining *H pylori*serology followed by triple therapy for patients who are

infected is the most cost-effective approach; however, no direct evidence from clinical trials provides confirmation.

Endoscopy should be performed early in patients older than 45-50 years and in patients with associated so-called alarm symptoms, such as dysphagia, recurrent vomiting, weight loss, or bleeding. Age is an independent risk factor for the incidence and mortality from bleeding peptic ulcer, with the risk increasing in persons older than 65 years and increasing further in those older than age 75 years. In one study, at least 2 risk factors (previous duodenal ulcer, *H pylori*infection, use of acetylsalicylic acid (ASA)/NSAID, and smoking) were present in two thirds of persons with acute gastroduodenal bleeding.

The indications for urgent surgery include failure to achieve hemostasis endoscopically, recurrent bleeding despite endoscopic attempts at achieving hemostasis (many advocate surgery after 2 failed endoscopic attempts), and perforation. Many authorities recommend simple oversewing of the ulcer with treatment of the underlying *H pylori* infection or cessation of NSAIDs for bleeding PUD. Additional surgical options for refractory or complicated PUD include vagotomy and pyloroplasty, vagotomy and antrectomy with gastroduodenal reconstruction (Billroth I) or gastrojejunal reconstruction (Billroth II), or a highly selective vagotomy.

Bleeding Peptic Ulcers

The principles of management of bleeding peptic ulcers outlined below are equally applicable to both gastric and duodenal ulcers.

Endoscopic therapy

Upper gastrointestinal (GI) bleeding secondary to a bleeding peptic ulcer is a common medical condition. Endoscopic evaluation of the bleeding ulcer can decrease the duration of the hospital stay by identifying patients at low risk for rebleeding. Moreover, endoscopic therapy reduces the likelihood of recurrent bleeding and decreases the need for surgery.

A large international study demonstrated that following successful endoscopic hemostatis for Forresst IB (oozing) peptic ulcer bleeding, the risk of rebleeding at 72 hours was very low (4.9%) compared with other stigmata of recent hemorrhage, but was similar to that for patients treated with esomeprazole (5.4%) and placebo (4.9%).

Patients can be stratified as having high or low risk for rebleeding depending on the presence or absence of stigmata seen on the initial endoscopic examination.

High-risk stigmata are the following:

- Active hemorrhage (90% risk of rebleeding)
- A visible vessel (50% risk of rebleeding)

- A fresh overlying clot (30% risk of rebleeding)

Ulcers with such stigmata require endotherapy, while ulcers with a clean base need not be treated endoscopically. In the absence of these stigmata, patients can be discharged home on medical therapy within 48 hours.

Several modalities of endoscopic therapy are available, such as injection therapy, coagulation therapy, hemostatic clips, argon plasma coagulator, and combination therapy. Injection therapy is performed with epinephrine in a 1:10,000 dilution or with absolute alcohol. Thermal endoscopic therapy is performed with a heater probe, bipolar circumactive probe, or gold probe. Pressure is applied to cause coagulation of the underlying artery (coaptive coagulation). Combination therapy with epinephrine injection followed by thermal coagulation appears to be more effective than monotherapy for ulcers with a visible vessel, active hemorrhage, or adherent clot.

Hemoclips have been used successfully to treat an acutely bleeding ulcer by approximating 2 folds and clipping them together. Several clips may need to be deployed to approximate the gastric ulcer folds. In treating high-risk bleeding ulcers, combined therapy with epinephrine and hemoclips seems to be more efficacious than injection alone. However, it is not clear whether hemoclip use or thermal coagulation is more effective in treating an acutely bleeding ulcer; both modalities are used depending on physician experience and equipment availability.

Urgent esophagogastroduodenoscopy (EGD) is the treatment of choice in the setting of a bleeding peptic ulcer for diagnostic and therapeutic reasons. Endoscopy provides an opportunity to visualize the ulcer, to determine the degree of active bleeding, and to attempt hemostasis by direct measures. Primary endoscopic hemostatic therapy (EHT) is successful in about 90% of patients; when this fails, transcatheter embolization may be useful. Medical management usually serves as an adjunct to direct endoscopic therapy.

Risk factors that predict rebleeding following EHT for nonvariceal upper GI bleeding include the following:

- Failure to use a proton pump inhibitor (PPI) after the endoscopic procedure
- Endoscopically demonstrated bleeding, especially peptic ulcer bleeding
- EHT monotherapy
- Post-EHT use of heparin
- Bleeding in a patient with moderate-to-severe liver disease
- Pre-endoscopic hemodynamic instability
- Comorbid illness
- Large ulcer size
- Posterior wall duodenal ulcer

These high-risk persons may be considered for initial care in the ICU and follow-up (second-look) endoscopy, especially because many of these factors (advanced age, comorbidities, in-hospital bleeding, rebleeding, hypovolemic shock, need for surgery) are associated with hospital mortality.

Acid suppression

Acid suppression is the general pharmacologic principle of medical management of acute bleeding from a peptic ulcer. Reducing gastric acidity is believed to improve hemostasis primarily through the decreased activity of pepsin in the presence of a more alkaline environment. Pepsin is believed to antagonize the hemostatic process by degrading fibrin clots. By suppressing acid production and maintaining a pH above 6, pepsin becomes markedly less active. Concomitant *H pylori* infection in the setting of bleeding peptic ulcers should be eradicated, as this lowers the rate of rebleeding.

Two classes of acid-suppressing medications currently in use are histamine-2 receptor antagonists (H2RAs) and PPIs. Both classes are available in intravenous and oral preparations. Examples of H2RAs include ranitidine, cimetidine, famotidine, and nizatidine. Examples of PPIs include omeprazole, pantoprazole, lansoprazole, and rabeprazole.

H2RAs are an older class of medications, and in the setting of an actively bleeding duodenal ulcer, their use has been largely superseded by the use of PPIs. Many gastroenterologists assert that intravenous PPI therapy maintains hemostasis more effectively than intravenous H2RA. Thus, intravenous H2RA no longer has a role in the management of bleeding peptic ulcers.

PPIs have a very good safety profile, although attention must continue to be focused on adverse effects, especially with long-term and/or high-dose therapy, such as *Clostridium difficile* infection, community-acquired pneumonia, hip fracture, and vitamin B12 deficiency. Long-term use of PPIs is also associated with decreased absorption of some medications. PPIs impair gastric secretion of acid; thus, absorption of any medication that depends on gastric acidity, such as ketoconazole and iron salt, is impaired with long-term PPI therapy. In addition, achlorhydria (absence of intragastric acidity) may be associated with iron deficiency anemia, because the ferric form of iron must be converted to the ferrous form by gastric acid. Most iron absorbed is in the ferrous form.

Parenteral PPI administration is indicated after successful endoscopic therapy for ulcers with high-risk signs, such as active bleeding, visible vessels, and adherent clots. Parenteral PPI use before endoscopy is a common practice. Based on intragastric pH data, nonvomiting patients with bleeding ulcers may be treated with oral lansoprazole (120-mg bolus, followed by 30 mg every 3 h). When indicated, intravenous pantoprazole or omeprazole is administered as an 80-

mg bolus followed by a continuous 8-mg/h infusion for 72 hours. A study by Chan et al determined that intravenous, standard-dose omeprazole was inferior to high-dose omeprazole in preventing rebleeding after endoscopic therapy for peptic ulcer bleeding. This treatment is changed to oral PPI therapy after 72 hours if no rebleeding occurs.

In a study by Andriulli et al, standard-dose PPI infusion was found to be as effective as a high-dose regimen in reducing the risk of recurrent bleeding following endoscopic hemostasis of bleeding ulcers. The primary end point was the in-hospital rebleeding rate (determined on repeat endoscopy). Patients with actively bleeding ulcers and those with a nonbleeding visible vessel or an adherent clot were treated with (1) epinephrine injection and/or thermal coagulation, then randomized to receive an intensive regimen of 80-mg PPI bolus, followed by 8 mg/h as continuous infusion for 72 hours, or (2) a standard regimen of a 40-mg PPI bolus daily, followed by saline infusion for 72 hours. After the infusion, all patients were given 20 mg PPI twice daily orally.

In the intensive PPI regimen group, rebleeding recurred in 11.8%, whereas in the standard regimen group, rebleeding recurred in 8.1%. Most of the rebleeding episodes occurred during the initial 72-hour infusion. The duration of hospital stay was less than 5 days for 37.0% in the intensive regimen group and 47.0% in the standard group. There were fewer surgical interventions in the standard group. Five patients in each treatment group died.

A Canadian database (RUGBE) indicated some benefit for parenteral PPI in decreasing rebleed rates. No randomized, controlled trial has provided evidence to support the use of parenteral PPI in this setting, but giving oral PPI both before and after EHT for persons with peptic ulcers with signs of recent hemorrhage can be justified on the grounds of cost-effectiveness.

Whether acid suppression improves therapeutic outcomes of peptic ulcers compared with placebo may be more important than the issues raised above. Many researchers have compared parenteral PPI therapy with placebo, and overall, the results have demonstrated a shorter period of bleeding and a decreased incidence of rebleeding with PPI therapy. Some studies have demonstrated a decreased need for emergency surgery and blood transfusion; however, evidence that parenteral PPI reduces mortality from ulcer bleeding is relatively recent.

H pylori Infection

In the United States, the recommended primary therapy for *H pylori* infection is proton pump inhibitor (PPI)–based triple therapy. These regimens result in a cure of infection and ulcer healing in approximately 85-90% of cases. Ulcers can recur in the absence of successful *H pylori* eradication.

Dual therapies, which are alternative regimens for treating *H pylori* infection, are usually not recommended as first-line therapy, because of a variable cure rate that is significantly less than the cure rate achieved with triple therapy.

Spouses and *H pylori* –positive family members of *H pylori* –positive persons should be considered for testing and treatment of *H pylori* infection, since mother-to-child transmission may be a major route of *H pylori* infection.

Triple-therapy regimens

PPI-based triple therapy regimens for *H pylori* consist of a PPI, amoxicillin, and clarithromycin for 7-14 days. A longer duration of treatment (14 d vs 7 d) appears to be more effective and is currently the recommended treatment. Amoxicillin should be replaced with metronidazole in penicillin-allergic patients only, because of the high rate of metronidazole resistance. In patients with complicated ulcers caused by *H pylori*, treatment with a PPI beyond the 14-day course of antibiotics and until the confirmation of the eradication of *H pylori* is recommended.

PPI-based triple therapies are a 14-day regimen as outlined below.

Omeprazole (Prilosec): 20 mg PO bid *or*
Lansoprazole (Prevacid): 30 mg PO bid *or*
Rabeprazole (Aciphex): 20 mg PO bid *or*
Esomeprazole (Nexium): 40 mg PO qd
Plus
Clarithromycin (Biaxin): 500 mg PO bid
and
Amoxicillin (Amoxil): 1 g PO bid

Alternative triple-therapy regimens

The alternative triple therapies, also administered for 14 days, are as follows:

Omeprazole (Prilosec): 20 mg PO bid
or
Lansoprazole (Prevacid): 30 mg PO bid
or
Rabeprazole (Aciphex): 20 mg PO bid
or
Esomeprazole (Nexium): 40 mg PO qd
Plus
Clarithromycin (Biaxin): 500 mg PO bid

and

Metronidazole (Flagyl): 500 mg PO bid

Quadruple therapy

Quadruple therapies for *H pylori* infection are generally reserved for patients in whom the standard course of treatment has failed.

Quadruple treatment includes the following drugs, administered for 14 days:

- PPI, standard dose, or ranitidine 150 mg, PO bid
- Bismuth 525 mg PO qid
- Metronidazole 500 mg PO qid
- Tetracycline 500 mg PO qid

Consider maintenance therapy with half of the standard doses of H2-receptor antagonists at bedtime in patients with recurrent, refractory, or complicated ulcers, particularly if cure of *H pylori* has not been documented or if an *H pylori* –negative ulcer is present.

Medical Management of NSAID Ulcers

In 2009, the American College of Gastroenterology (ACG) issued a guideline for prevention of nonsteroidal anti-inflammatory agent (NSAID)-related ulcer complications that supports the recommendations in this section. According to the ACG guideline, all patients who are beginning long-term NSAID therapy should first be tested for *H pylori*. NSAIDs should be immediately discontinued in patients with positive *H pylori* test results if clinically feasible. The 2017 ACG guidelines for the treatment of *H pylori* infection (HPI) have reaffirmed testing for HPI before initiating NSAID therapy.

For patients who must continue with their NSAIDs, PPI maintenance is recommended to prevent recurrences even after eradication of *H pylori*. If NSAIDs must be continued, changing to a cyclooxygenase (COX)-2 selective inhibitor is an option. However, use of a traditional NSAID and once-daily proton pump inhibitor (PPI) is comparable to a selective COX-2 inhibitor with respect to ulcer bleeding in patients with a history of peptic ulcer disease. In general, 6-8 weeks of therapy with a PPI is required for complete healing of a duodenal ulcer.

Active ulcers associated with NSAID use are treated with an appropriate course of PPI therapy and the cessation of NSAIDs. For patients with a known history of ulcer and in whom NSAID use is unavoidable, the lowest possible dose and duration of the NSAID and co-therapy with a PPI or misoprostol are recommended.

Thus, the 2009 ACG guideline recommends that patients who are treated with NSAIDs and also require low-dose aspirin therapy for cardiovascular disease be treated with naproxen plus misoprostol or a PPI. Patients at moderate risk for gastrointestinal complications and at high

risk for cardiovascular disease should avoid NSAIDs or COX-2 inhibitors entirely and receive alternative therapy.

Deterrence and prevention

Primary prevention of NSAID-induced ulcers includes the following:

- Avoid unnecessary use of NSAIDs
- Use acetaminophen or nonacetylated salicylates when possible
- Use the lowest effective dose of an NSAID and switch to less toxic NSAIDs, such as the newer NSAIDs or COX-2 inhibitors, in high-risk patients without cardiovascular disease

Consider prophylactic or preventive therapy for the following patients:

- Patients with NSAID-induced ulcers who require chronic, daily NSAID therapy
- Patients older than 60 years
- Patients with a history of peptic ulcer disease (PUD) or a complication such as gastrointestinal bleeding
- Patients taking concomitant steroids or anticoagulants or patients with significant comorbid medical illnesses

Prophylactic regimens that have been shown to dramatically reduce the risk of NSAID-induced gastric and duodenal ulcers include the use of a prostaglandin analog or a PPI according to the following regimens:

- Misoprostol 100-200 mcg PO 4 times per day
- Omeprazole 20-40 mg PO every day
- Lansoprazole 15-30 mg PO every day

A 2005 study showed that in patients with aspirin-induced ulcer, contrary to popular belief, aspirin plus esomeprazole (Nexium) was superior to clopidogrel (Plavix) in preventing recurrent gastric ulcer bleeding. This was further confirmed in a double-blind randomized study in 2006 by Lai and colleagues.

In a study by Hsu et al, combining esomeprazole and clopidogrel reduced the recurrence of peptic ulcers in patients with atherosclerosis and a history of peptic ulcers more than the use of clopidogrel alone. This combination did not influence the action of clopidogrel on platelet aggregation.

Emergency Department Care

Presentations of peptic ulcer disease (PUD) and gastritis usually are indistinguishable in the emergency department (ED) and, thus, the management is generally the same. Treatment goals in the acute setting are the relief of discomfort and protection of the gastric mucosal barrier

to promote healing. Administer supportive therapy as needed. Most patients with gastritis or peptic ulcer disease do not require acute interventions.

High-risk patients include those with the following characteristics:

- Bleeding with hemodynamic instability
- Repeated hematemesis or any hematochezia
- Failure to clear with gastric lavage
- Coagulopathy
- Comorbid disease (especially cardiac, pulmonary, or renal)
- Advanced age

Drug treatments

Antacids or a gastrointestinal (GI) cocktail (typically an antacid with an anesthetic such as viscous lidocaine and/or an antispasmodic) may be used as symptomatic therapy; however, relief of symptoms with a GI cocktail is not a diagnostic indicator.

Empiric treatment of *H pylori* is not recommended. Therapy is indicated only after confirmation of infection. These tests are not performed in the ED. Empiric trial of acid suppression in patients younger than 55 years without alarm features may be initiated with a proton pump inhibitor (PPI) for 4-8 weeks. Appropriate follow-up is required to assess response in 2-4 weeks. Anticholinergic agents are contraindicated.

Bleeding

Massive gastric bleeds are the most difficult complication to treat. Mainstays of resuscitation include the following:

- Establishment of adequate intravenous (IV) access and volume replacement, initially with crystalloid; in the face of continued hypotension after 2 L, consider blood transfusion.
- A central venous catheter to monitor such resuscitation may be considered.
- Airway protection with intubation should be considered in the case of massive bleeding.
- Nasogastric suction helps to keep the stomach empty and contracted.
- IV PPI has been shown to reduce mortality in upper GI bleeds and reduces the incidence of rebleeding and the need for surgical intervention [54]; emergent surgical or endoscopic intervention may be required

Patients with significant or potentially significant hemorrhage require admission, usually to the intensive care unit.

Surgical Care for Perforated Peptic Ulcer

With the success of medical therapy, surgery has a very limited role in the management of PUD. Elective peptic ulcer surgery has been virtually abandoned. In the 1980s, the number of elective operations for peptic ulcer disease dropped more than 70%, and emergent operations accounted for more than 80%. In general, 5% of bleeding ulcers eventually require operative management. The indications for urgent surgery include the following:

- Failure to achieve hemostasis endoscopically
- Recurrent bleeding despite endoscopic attempts at achieving hemostasis (many advocate surgery after 2 failed endoscopic attempts)
- Perforation

The appropriate surgical procedure depends on the location and nature of the ulcer. Many authorities recommend simple oversewing of the ulcer with treatment of the underlying *H pylori* infection or cessation of NSAIDs for bleeding PUD. Additional surgical options for refractory or complicated PUD include vagotomy and pyloroplasty, vagotomy and antrectomy with gastroduodenal reconstruction (Billroth I) or gastrojejunal reconstruction (Billroth II), or a highly selective vagotomy.

Only one prospective randomized trial has compared laparoscopic surgery with open surgery for perforated ulcer. The study found that the only difference between the 2 groups was reduced need for analgesia and an increased operative time in the laparoscopic group. Contraindications for laparoscopic repair for perforated peptic ulcer include large perforations, a posterior location of the perforation, and a poor general state of health.

Surgical complications include pneumonia (30%), wound infection, abdominal abscess (15%), cardiac problems (especially in those >70 y), diarrhea (30% after vagotomy), and dumping syndromes (10% after vagotomy and drainage procedures).

To see complete information on Surgical Treatment of Perforated Peptic Ulcer, please go to the main article by clicking here.

Diet

A special diet is not indicated for patients with duodenal ulcers. It is a common-sense approach to avoid any food or beverages that may aggravate symptoms. Although the link between duodenal ulcers and alcohol is inconclusive, moderation of alcohol intake may be recommended for other health reasons.

Complications of Peptic Ulcer Disease

Refractory, symptomatic peptic ulcers, though rare after eradication of *H pylori*infection and the appropriate use of antisecretory therapy, are a potential complication of PUD.

Obstruction is particularly likely to complicate PUD in cases refractory to aggressive antisecretory therapy, *H pylori* eradication, or avoidance of NSAIDs. Obstruction may persist or recur despite endoscopic balloon dilation. Perforation is also a possibility. Penetration, particularly if not walled off or if a gastrocolic fistula develops, is a potential complication. In addition, ulcer bleeding, particularly in patients with a history of massive hemorrhage and hemodynamic instability, recurrent bleeding on medical therapy, and failure of therapeutic endoscopy to control bleeding is a serious complication.

Patients with gastric ulcers are also at risk of developing gastric malignancy. The risk is approximately 2% in the initial 3 years. One of the important risk factors is related to *H pylori* infection. *H pylori* is associated with atrophic gastritis, which, in turn, predisposes to gastric cancer. *H pylori* infection is associated with gastric lymphoma or mucosa-associated lymphoid tissue (MALT) lymphoma. Normal gastric mucosa is devoid of organized lymphoid tissue. *H pylori* infection promotes acquisition of lymphocytic infiltration and often the formation of lymphocytic aggregates and follicles from which MALT lymphoma develops. Eradication of *H pylori* is very important in this group of patients because eradication of *H pylori* has been shown to cause a remission of MALT lymphoma.

Malignancy should be strongly considered in the case of a persistent nonhealing gastric ulcer. Endoscopic ultrasound examination may be helpful for assessing mucosal invasion or detecting associated adenopathy in such patients. Surgical resection should be considered if evidence of cancerous transformation is present.

Consultations

Surgical consultation is recommended for all patients with bleeding ulcers, especially those patients who are at high risk of significant bleeding. Such ulcers include those that have caused hemodynamic instability, those that are actively bleeding, and those that show a visible vessel on endoscopy.

Long-Term Monitoring

Maintenance therapy with antisecretory medications (eg, H2 blockers, PPIs) for 1 year is indicated in high-risk patients. High-risk patients include those with recurrent ulcers and those with complicated or giant ulcers. If *H pylori* eradication is not achieved despite repeat treatment, maintenance antisecretory therapy should be recommended.

Consider maintenance therapy with half of the standard doses of H2-receptor antagonists at bedtime in patients with recurrent, refractory, or complicated ulcers, particularly if cure of *H pylori* has not been documented or if an *H pylori* –negative ulcer is present.

Patients with refractory ulcers may continue receiving once-daily PPI therapy indefinitely. In this setting, if *H pylori* is absent, consider a secondary cause of duodenal ulcer, such as Zollinger-Ellison syndrome.

Peptic ulcer rebleeding is extremely rare after *H pylori* eradication. The use of maintenance antisecretory therapy is not necessary if *H pylori* eradication has been achieved. However, NSAID use may cause rebleeding even in patients in whom *H pylori* has been eradicated.

Practical lesson № 12. IRRITABLE BOWEL SYNDROME

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Practice Essentials

Irritable bowel syndrome (IBS) is a functional gastrointestional (GI) disorder characterized by abdominal pain and altered bowel habits in the absence of a specific and unique organic pathology, although microscopic inflammation has been documented in some patients. Population-based studies estimate the prevalence of irritable bowel syndrome at 10-20% and the incidence of irritable bowel syndrome at 1-2% per year.

Signs and symptoms

Manifestations of IBS are as follows:

- Altered bowel habits
- Abdominal pain
- Abdominal bloating/distention

Altered bowel habits in IBS may have the following characteristics:

- Constipation variably results in complaints of hard stools of narrow caliber, painful or infrequent defecation, and intractability to laxatives
- Diarrhea usually is described as small volumes of loose stool, with evacuation preceded by urgency or frequent defecation
- Postprandial urgency is common, as is alternation between constipation and diarrhea
- Characteristically, one feature generally predominates in a single patient, but significant variability exists among patients

Abdominal pain in IBS is protean, but may have the following characteristics:

- Pain frequently is diffuse without radiation
- Common sites of pain include the lower abdomen, specifically the left lower quadrant
- Acute episodes of sharp pain are often superimposed on a more constant dull ache
- Meals may precipitate pain
- Defecation commonly improves pain but may not fully relieve it
- Pain from presumed gas pockets in the splenic flexure may masquerade as anterior chest pain or left upper quadrant abdominal pain

Additional symptoms consistent with irritable bowel syndrome are as follows:

- Clear or white mucorrhea of a noninflammatory etiology
- Dyspepsia, heartburn
- Nausea, vomiting
- Sexual dysfunction (including dyspareunia and poor libido)
- Urinary frequency and urgency have been noted
- Worsening of symptoms in the perimenstrual period
- Comorbid fibromyalgia
- Stressor-related symptoms

Symptoms not consistent with irritable bowel syndrome should alert the clinician to the possibility of an organic pathology. Inconsistent symptoms include the following:

- Onset in middle age or older
- Acute symptoms (irritable bowel syndrome is defined by chronicity)

- Progressive symptoms
- Nocturnal symptoms
- Anorexia or weight loss
- Fever
- Rectal bleeding
- Painless diarrhea
- Steatorrhea
- Gluten intolerance

Diagnosis

The Rome IV criteria for the diagnosis of irritable bowel syndrome require that patients have had recurrent abdominal pain on average at least 1 day per week during the previous 3 months that is associated with 2 or more of the following :

- Related to defecation (may be increased or unchanged by defecation)
- Associated with a change in stool frequency
- Associated with a change in stool form or appearance

The Rome IV criteria (May 2016) only require abdominal pain in defining this condition; "discomfort" is no longer a requirement owing to its nonspecificity, and the recurrent abdominal pain.

Supporting symptoms include the following:

- Altered stool frequency
- Altered stool form
- Altered stool passage (straining and/or urgency)
- Mucorrhea
- Abdominal bloating or subjective distention

Four bowel patterns may be seen with irritable bowel syndrome, and these remain in the Rome IV classification. These patterns include the following:

- IBS-D (diarrhea predominant)
- IBS-C (constipation predominant)
- IBS-M (mixed diarrhea and constipation)
- IBS-U (unclassified; the symptoms cannot be categorized into one of the above three subtypes)

The usefulness of these subtypes is debatable. Notably, within 1 year, 75% of patients change subtypes, and 29% switch between constipation-predominant IBS and diarrhea-predominant IBS. The Rome IV criteria differ from the Rome III criteria in basing bowel habits on stool forms solely during days with abnormal bowel movements rather than on the total number of bowel movements.

A comprehensive history, physical examination, and tailored laboratory and radiographic studies can establish a diagnosis of irritable bowel syndrome in most patients. The American College of Gastroenterologists does not recommend laboratory testing or diagnostic imaging in patients younger than 50 years with typical IBS symptoms and without the following “alarm features” :

- Weight loss
- Iron deficiency anemia
- Family history of certain organic GI illnesses (eg, inflammatory bowel disease, celiac sprue, colorectal cancer)

Screening studies to rule out disorders other than IBS include the following:

- Complete blood count with differential to screen for anemia, inflammation, and infection
- A comprehensive metabolic panel to evaluate for metabolic disorders and to rule out dehydration/electrolyte abnormalities in patients with diarrhea
- Stool examinations for ova and parasites, enteric pathogens, leukocytes,*Clostridium difficile* toxin, and possibly *Giardia* antigen

History-specific studies include the following:

- Hydrogen breath testing to exclude bacterial overgrowth in patients with diarrhea and to screen for lactose and/or fructose intolerance
- Tissue transglutaminase antibody testing and small bowel biopsy in IBS-D to diagnose celiac disease.
- Thyroid function tests
- Serum calcium testing to screen for hyperparathyroidism
- Erythrocyte sedimentation rate and C-reactive protein measurement are nonspecific screening tests for inflammation

Management

Management of irritable bowel syndrome consists primarily of providing psychological support and recommending dietary measures. Pharmacologic treatment is adjunctive and should be directed at symptoms.

Dietary measures may include the following:

- Fiber supplementation may improve the symptoms of constipation and diarrhea
- Polycarbophil compounds (eg, Citrucel, FiberCon) may produce less flatulence than psyllium compounds (eg, Metamucil)
- Judicious water intake is recommended in patients who predominantly experience constipation
- Caffeine avoidance may limit anxiety and symptom exacerbation
- Legume avoidance may decrease abdominal bloating
- Lactose, fructose, and/or FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) should be limited or avoided in patients with these contributing disorders
- Probiotics are being studied for their use in decreasing IBS symptoms

Although the evidence is mixed regarding long-term improvement in GI symptoms with successful treatment of psychiatric comorbidities, the American College of Gastroenterology has concluded the following:

- Psychological interventions, cognitive-behavioral therapy, dynamic psychotherapy, and hypnotherapy are more effective than placebo

- Relaxation therapy is no more effective than usual care

Pharmacologic agents used for the management of symptoms in IBS include the following:

- Anticholinergics (eg, dicyclomine, hyoscyamine)
- Antidiarrheals (eg, diphenoxylate, loperamide)
- Tricyclic antidepressants (eg, imipramine, amitriptyline)
- Prokinetics
- Bulk-forming laxatives
- Serotonin receptor antagonists (eg, alosetron)
- Chloride channel activators (eg, lubiprostone)
- Guanylate cyclase C (GC-C) agonists (eg, linaclotide)
- Antispasmodics (eg, peppermint oil, pinaverium, trimebutine, cimetropium/dicyclomine) [4]
- Potentially, rifaxamin (this is still investigational and not FDA approved)

What is irritable bowel syndrome (IBS)? IBS is a condition that involves recurrent abdominal pain as well as abnormal bowel motility, which can include diarrhea and/or constipation.

Background

Irritable bowel syndrome (IBS) is a functional gastrointestinal (GI) disorder characterized by abdominal pain and altered bowel habits in the absence of a specific and unique organic pathology. Osler coined the term *mucous colitis* in 1892 when he wrote of a disorder of mucorrhea and abdominal colic with a high incidence in patients with coincident psychopathology. Since then, the syndrome has been referred to by sundry terms, including spastic colon, irritable colon, and nervous colon.

In the past, irritable bowel syndrome has been considered a diagnosis of exclusion; however, it is no longer considered a diagnosis of exclusion, but it does have a broad differential diagnosis. [5] No specific motility or structural correlates have been consistently demonstrated; however, experts suggest the use of available guidelines can minimize testing and aid in the diagnosis.

Pathophysiology

Traditional theories regarding the pathophysiology of irritable bowel syndrome (IBS) may be visualized as a 3-part complex of altered gastrointestinal (GI) motility, visceral hyperalgesia, and psychopathology. A unifying mechanism is still unproven.

Altered GI motility

Altered GI motility includes distinct aberrations in small and large bowel motility. The myoelectric activity of the colon is composed of background slow waves with superimposed spike potentials. Colonic dysmotility in irritable bowel syndrome manifests as variations in slow-wave frequency and a blunted, late-peaking, postprandial response of spike potentials. Patients who are prone to diarrhea demonstrate these alterations to a greater degree than patients who are prone to constipation.

Small bowel dysmotility manifests in delayed meal transit in patients prone to constipation and in accelerated meal transit in patients prone to diarrhea. In addition, patients exhibit shorter intervals between migratory motor complexes (the predominant interdigestive small bowel motor patterns).

Current theories integrate these widespread motility aberrations and hypothesize a generalized smooth muscle hyperresponsiveness. They describe increased urinary symptoms, including frequency, urgency, nocturia, and hyperresponsiveness to methacholine challenge.

Visceral hyperalgesia

Visceral hyperalgesia is the second part of the traditional 3-part complex that characterizes irritable bowel syndrome.

Enhanced perception of normal motility and visceral pain characterizes irritable bowel syndrome. Rectosigmoid and small bowel balloon inflation produces pain at lower volumes in patients than in controls. Notably, hypersensitivity appears with rapid but not with gradual distention.

Patients who are affected describe widened dermatomal distributions of referred pain. Sensitization of the intestinal afferent nociceptive pathways that synapse in the dorsal horn of the spinal cord provides a unifying mechanism.

Psychopathology

Psychopathology is the third aspect. Associations between psychiatric disturbances and irritable bowel syndrome pathogenesis are not clearly defined.

Patients with psychological disturbances relate more frequent and debilitating illness than control populations. Patients who seek medical care have a higher incidence of panic disorder, major depression, anxiety disorder, and hypochondriasis than control populations. A study has suggested that patients with irritable bowel syndrome may have suicidal ideation and/or suicide attempts strictly as a result of their bowel symptoms.[8] Clinical alertness to depression and hopelessness is mandatory. This is underscored by another study that revealed that patient complaints that relate to functional bowel disorders may be trivialized.

An Axis I disorder coincides with the onset of GI symptoms in as many as 77% of patients. A higher prevalence of physical and sexual abuse has been demonstrated in patients with irritable bowel syndrome. Whether psychopathology incites the development of irritable bowel syndrome or vice versa remains unclear.

Microscopic inflammation

Microscopic inflammation has been documented in some patients. This concept is groundbreaking in that irritable bowel syndrome had previously been considered to have no demonstrable pathologic alterations.

Both colonic inflammation and small bowel inflammation have been discovered in a subset of patients with irritable bowel syndrome, as well as in patients with the onset of irritable bowel syndrome after infectious enteritis (postinfectious irritable bowel

syndrome). Risk factors for developing postinfectious irritable bowel syndrome include longer duration of illness, the type of pathogen involved, smoking, female gender, an absence of vomiting during the infectious illness, and young age.

Laparoscopic full-thickness jejunal biopsy samples revealed infiltration of lymphocytes into the myenteric plexus and intraepithelial lymphocytes in a subset of patients in one study. Neuronal degeneration of the myenteric plexus was also present in some patients.

Patients with postinfectious irritable bowel syndrome may have increased numbers of colonic mucosal lymphocytes and enteroendocrine cells. Enteroendocrine cells in postinfectious irritable bowel syndrome appear to secrete high levels of serotonin, increasing colonic secretion and possibly leading to diarrhea.

Alterations in the intestinal biome

Small bowel bacterial overgrowth has been heralded as a unifying mechanism for the symptoms of bloating and distention, common to patients with irritable bowel syndrome. This has led to proposed treatments with probiotics and antibiotics.

The fecal microflora also differs among patients with irritable bowel syndrome versus controls. A sophisticated molecular analysis suggested an alteration in the patterns and the contents of gut bacteria.

Etiology

The causes of irritable bowel syndrome remain poorly defined, but they are being avidly researched.

Postulated etiologies of irritable bowel syndrome

Abnormal transit profiles and an enhanced perception of normal motility may exist. Up to one third of patients with irritable bowel syndrome may have altered colonic transit. Delayed colonic motility may be more common in patients with constipation-predominant irritable bowel syndrome than in healthy controls. Similarly, accelerated colonic transit may be more common in patients with diarrhea-predominant disease than in healthy controls. Local histamine sensitization of the afferent neuron causing earlier depolarization may occur.

Causes related to enteric infection

Colonic muscle hyperreactivity and neural and immunologic alterations of the colon and small bowel may persist after gastroenteritis. Psychological comorbidity independently predisposes the patient to the development of postinfectious irritable bowel syndrome. Psychological illness may create a proinflammatory cytokine milieu, leading to irritable bowel syndrome through an undefined mechanism after acute infection.

Infection with *Giardia lamblia* has been shown to lead to an increased prevalence of irritable bowel syndrome, as well as chronic fatigue syndrome. In a historic cohort study of patients with *G lamblia* infection as detected by stool cysts, the prevalence of irritable bowel syndrome was 46.1% as long as 3 years after exposure, compared with 14% in controls. [13]

Central neurohormonal mechanisms

Abnormal glutamate activation of *N*- methyl-*D*- aspartate (NMDA) receptors, activation of nitric oxide synthetase, activation of neurokinin receptors, and induction of calcitonin gene–related peptide have been observed.

The limbic system mediation of emotion and autonomic response enhances bowel motility and reduces gastric motility to a greater degree in patients who are affected than in controls. Limbic system abnormalities, as demonstrated by positron emission tomography, have been described in patients with irritable bowel syndrome and in those with major depression.

The hypothalamic-pituitary axis may be intimately involved in the origin. Motility disturbances correspond to an increase in hypothalamic corticotropin-releasing factor (CRF) production in response to stress. CRF antagonists eliminate these changes.

Additional etiologic factors

Intestinal permeability

Intestinal permeability appears to be increased, especially in diarrhea-predominant irritable bowel syndrome. [14]

Alterations in the intestinal biome

As discussed in Pathophysiology, Pimentel and colleagues have proposed that small bowel bacterial overgrowth provides a unifying mechanism for the common symptoms of bloating and gaseous distention in patients with irritable bowel syndrome. [15]

There is a relationship between the organisms that live in the intestine and the immune system, and this relationship is not yet fully understood. [14]

Dietary intolerance

Bloating and distention may also occur from intolerance to dietary fats. Reflex-mediated small bowel gas clearance is more impaired by ingestion of lipids in patients with irritable bowel syndrome than in patients without the disorder.

Studies of elimination and challenge diets have suggested that poorly absorbed short-chain carbohydrates, in the form of fructose and fructans, may create symptoms among patients with irritable bowel syndrome, as measured by a visual analogue scale. [16]

Research suggests that neuronal degeneration and myenteric plexus lymphocytosis may exist in the proximal jejunum. Additionally, colonic lymphocytosis and enteroendocrine cell hyperplasia have been demonstrated in some patients.

Epidemiology

Population-based studies estimate the prevalence of irritable bowel syndrome (IBS) at 10-20% [17] and the incidence of irritable bowel syndrome at 1-2% per year. However, when a 2016 population-based study compared the prevalence of irritable bowel syndrome with the Rome IV criteria versus the Rome III criteria in the United States, Canada, and the United Kingdom, investigators reported a nearly 50% reduction in its prevalence in these countries—potentially attributable to removing "discomfort" from the definition. [18]

Of people with irritable bowel syndrome, approximately 10-20% seek medical care. An estimated 20-50% of gastroenterology referrals relate to this symptom complex. The incidence is markedly different among countries.

American and European cultures demonstrate similar frequencies of irritable bowel syndrome across racial and ethnic lines. However, within the United States, survey questionnaires indicate a lower prevalence of irritable bowel syndrome in Hispanics in Texas and Asians in California. Populations of Asia and Africa may have a lower prevalence of irritable bowel syndrome. The role of different cultural influences and varying health care–seeking behaviors is unclear.

In Western countries, women are 2-3 times more likely to develop irritable bowel syndrome than men, although males represent 70-80% of patients with irritable bowel syndrome in the Indian subcontinent. Women seek health care more often, but the irritable bowel syndrome–specific influence of this occurrence remains unknown. Other factors, such as a probably greater incidence of abuse in women, may confound interpretation of this statistic.

Patients often retrospectively note the onset of abdominal pain and altered bowel habits in childhood. Approximately 50% of people with irritable bowel syndrome report symptoms beginning before age 35 years. The development of symptoms in people older than 40 years does not exclude irritable bowel syndrome but should prompt a closer search for an underlying organic etiology.

Prognosis

Irritable bowel syndrome is a chronic relapsing disorder characterized by recurrent symptoms of variable severity; however, life expectancy remains similar to that of the general population. Clinicians must be forthcoming with patients because knowledge of the condition may help allay undue fears as their disease waxes and wanes. Irritable bowel syndrome (IBS) does not increase the mortality or the risk of inflammatory bowel disease or cancer.

Patients with irritable bowel syndrome may carry an increased risk of ectopic pregnancy and miscarriage, but not stillbirth. The reasons for this are unknown. Whether the risk increases because of IBS itself, or because of another factor such as medications used for irritable bowel syndrome, is also unknown. [19]

The principal associated physical morbidities of irritable bowel syndrome include abdominal pain and lifestyle modifications secondary to altered bowel habits. Work absenteeism resulting in lost wages is more frequent in patients with irritable bowel syndrome.

Patient Education

Patient education remains the cornerstone of successful treatment of irritable bowel syndrome. Teach the patient to identify stressors and to develop avoidance techniques. Many patients successfully manage their symptoms with attention to dietary triggers.

For patient education resources, see Digestive Disorders Center, as well as Irritable Bowel Syndrome (IBS), Inflammatory Bowel Disease (IBD), and Chronic Pain.

Clinicians may also wish to refer patients to the following short video, which provides a simplified but clear and concise overview about what irritable bowel syndrome is, and its epidemiology, risk factors, and management options, as well as a brief explanation of the difference between irritable bowel syndrome and inflammatory bowel disease.

History and Physical Examination

History

A meticulous history is the key to establish a diagnosis of irritable bowel syndrome. The Rome criteria provide the construct upon which questions are based (see Diagnostic Considerations).

Altered bowel habits

Constipation results in complaints of hard stools of narrow caliber, painful or infrequent defecation, and intractability to laxatives. Diarrhea usually is described as small volumes of loose stool, with evacuation preceded by urgency or frequent defecation. Postprandial urgency is common, as is alternation between constipation and diarrhea. Characteristically, one feature predominates in a single patient, but significant variability exists among patients.

Abdominal pain

Descriptions are protean. Pain frequently is diffuse without radiation. Common sites of pain include the lower abdomen, specifically the left lower quadrant. Acute episodes of sharp pain are often superimposed on a more constant dull ache. Meals may precipitate pain, and defecation commonly improves pain. Defecation may not fully relieve pain, however.

Pain from presumed gas pockets in the splenic flexure may masquerade as anterior chest pain or left upper quadrant abdominal pain. This splenic flexure syndrome is demonstrable by balloon inflation in the splenic flexure and should be considered in the differential of chest or left upper quadrant abdominal pain.

Abdominal bloating/distention

Patients frequently report increased amounts of bloating and gas. Quantitative measurements fail to support this claim. People with irritable bowel syndrome may manifest increasing abdominal circumference throughout the day, as assessed by CT scan. They may also demonstrate intolerance to otherwise normal amounts of abdominal distention.

Additional symptoms consistent with irritable bowel syndrome

Clear or white mucorrhea of a noninflammatory etiology is commonly reported. Epidemiologic associations with dyspepsia, heartburn, nausea, vomiting, sexual dysfunction (including dyspareunia and poor libido), and urinary frequency and urgency have been noted. Symptoms may worsen in the perimenstrual period, and fibromyalgia is a common comorbidity. Stressor-related symptoms may be revealed with careful questioning (emphasize avoidance of stressors).

Symptoms inconsistent with irritable bowel syndrome

Symptoms not consistent with irritable bowel syndrome should alert the clinician to the possibility of an organic pathology. Inconsistent symptoms include the following:

- Onset in middle or older age
- Acute symptoms (irritable bowel syndrome is defined by chronicity)
- Progressive symptoms
- Nocturnal symptoms
- Anorexia or weight loss
- Fever
- Rectal bleeding
- Painless diarrhea
- Steatorrhea
- Gluten intolerance

Physical examination

The patient with irritable bowel syndrome has an overall healthy appearance but may be tense or anxious. The patient may present with sigmoid tenderness or a palpable sigmoid cord.

Criteria for Diagnosis

A consensus panel created and continually updates the Rome diagnostic criteria to provide a standardized diagnosis for research and clinical practice. The Rome IV criteria for the diagnosis of irritable bowel syndrome (IBS) were released in 2016 and require that patients have had recurrent abdominal pain on average at least 1 day per week during the previous 3 months that is associated with 2 or more of the following [2]:

- Related to defecation (may be increased or unchanged by defecation)
- Associated with a change in stool frequency
- Associated with a change in stool form or appearance

Unlike the Rome III criteria, the Rome IV criteria only require abdominal pain in defining this condition; "discomfort" is no longer included owing to its ambiguity and different meanings across cultures and languages. [2]

Supporting symptoms include the following:

- Altered stool frequency
- Altered stool form
- Altered stool passage (straining and/or urgency)
- Mucorrhea
- Abdominal bloating or subjective distention

Four bowel patterns may be seen with irritable bowel syndrome, and these remain unchanged in the Rome IV classification. [2] These patterns include the following:

- IBS-D (diarrhea predominant)
- IBS-C (constipation predominant)
- IBS-M (mixed diarrhea and constipation)

- IBS-U (unclassified; the symptoms cannot be categorized into one of the above three subtypes)

The usefulness of these subtypes is debatable. Notably, within 1 year, 75% of patients change subtypes, and 29% switch between constipation-predominant IBS and diarrhea-predominant IBS. The Rome IV criteria differ from the Rome III criteria in basing bowel habits on stool forms solely during days with abnormal bowel movements rather than on the total number of bowel movements.

Diagnostic Considerations

Manning and associates established 6 criteria to distinguish irritable bowel syndrome from organic bowel disease.[20] Although historically important, these criteria are insensitive (58%), nonspecific (74%), and less reliable in men. The Manning criteria are as follows:

- Onset of pain associated with more frequent bowel movements
- Onset of pain associated with looser bowel movements
- Pain relieved by defecation
- Visible abdominal bloating
- Subjective sensation of incomplete evacuation more than 25% of the time
- Mucorrhea more than 25% of the time

Other problems to consider include the following:

- Fructose intolerance
- Gastrinoma
- Infectious colitis
- Medication adverse effects
- Secretory diarrhea
- VIPoma
- Food intolerances, including lactose, fructose, and FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols)

Differential Diagnoses

- Abdominal Angina
- Acute Intermittent Porphyria
- Anxiety Disorders
- Bacterial Gastroenteritis
- Bacterial Overgrowth Syndrome
- Biliary Colic
- Biliary Disease
- Celiac Disease (Sprue)
- Chronic Mesenteric Ischemia
- Chronic Pancreatitis
- Collagenous and Lymphocytic Colitis
- Colon Cancer

- Emergent Management of Lead Toxicity
- Endometriosis
- Food Allergies
- Giardiasis
- Hypercalcemia
- Hyperthyroidism and Thyrotoxicosis
- Hypothyroidism
- Inflammatory Bowel Disease
- Lactose Intolerance
- Malignant Neoplasms of the Small Intestine
- Mesenteric Artery Thrombosis
- Mesenteric Venous Thrombosis
- Pancreatic Cancer
- Pheochromocytoma
- Postcholecystectomy Syndrome
- Somatostatinomas
- Ulcerative Colitis
- Viral Gastroenteritis

1. Homemade Yogurt Resolves Irritable Bowel Symptoms

2. Surprising Number of Conditions Linked to Celiac Disease
3. Start Colon Cancer Screening at Age 45, Evidence Suggests
4. Feeding the Microbiota: Transducer of Nutrient Signals for the Host
5. Suspect Supplements: Unregulated OTC Meds and Liver Injury

Approach Considerations

Management of irritable bowel syndrome consists primarily of providing psychological support and recommending dietary measures. Pharmacologic treatment is adjunctive and should be directed at symptoms, such as modulation of persistent visceral hyperalgesia. [7]

The 2009 American College of Gastroenterologists (ACG) position statement recommends addressing nongastrointestinal symptoms and comorbidities to improve health-related quality of life as well as to reduce symptom severity. Evidence considered in the position statement was insufficient to recommend exclusion diets or food allergy testing. [3]

The 2014 ACG monograph on the management of irritable bowel syndrome and chronic idiopathic constipation found insufficient evidence to recommend prebiotics or synbiotics, or loperamide, in irritable bowel syndrome, and no evidence that polyethylene glycol improved overall symptoms and pain in affected patients. [22] There was high quality of evidence to support the use of antidepressants as a class, and moderate quality of evidence of with fiber and psyllium, for overall symptomatic relief in irritable bowel

syndrome. Strong recommendations were reported for linaclotide and lubiprostone each being superior to placebo in treating the constipation-predominant disease subtype. [22]

Successful management relies on a strong patient-provider relationship. Reassure the patient that the absence of an organic pathology indicates a normal life expectancy. Emphasize the expected chronicity of symptoms with periodic exacerbations. Teach the patient to identify stressors and to use avoidance techniques.

Dietary Measures

Fiber supplementation may improve symptoms of constipation and diarrhea. Individualize the treatment because a few patients experience exacerbated bloating and distention with high-fiber diets. Polycarbophil compounds (eg, Citrucel, FiberCon) may produce less flatulence than psyllium compounds (eg, Metamucil).

The data regarding the effectiveness of fiber are controversial because 40-70% of patients improve with placebo. A Cochrane systematic review found no benefit of fiber/bulking agents on irritable bowel syndrome symptoms or global assessment.[4]

Judicious water intake is recommended in patients who predominantly experience constipation.

Caffeine avoidance may limit anxiety and symptom exacerbation. Legume avoidance may decrease abdominal bloating. Lactose and/or fructose should be limited or avoided in patients with these contributing disorders. Take care to supplement calcium in patients limiting their lactose intake.

Gluten intolerance has been associated with irritable bowel syndrome. In a small but important study, patients with irritable bowel syndrome who were well-controlled on a gluten-free diet were rechallenged in a double-blind fashion. [23]Approximately two thirds of these patients had poor symptom control with rechallenge. As with many irritable bowel syndrome studies, the placebo response was high (40%). Notably, neither intestinal inflammation nor permeability was different among the groups, and no difference in the positivity rate for celiac disease–related HLA haplotypes or antibody markers was noted. Volta et al evaluated the current evidence and suggest that patients with gluten/wheat sensitivity may be a subset of those with irritable bowel syndrome. [24]

Many patients are interested in dietary manipulation to decrease their symptoms. Several different diets have been proposed. [25] Diets low in FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) hold particular interest in reducing symptoms of irritable bowel syndrome. [26]

Probiotics are very interesting for treating symptoms, but it is unclear for which patients probiotics are helpful, and in what form, dose, combination, or strain. [27, 28]A meta-analysis concluded that *Bifidobacterium infantis* may help alleviate some symptoms of irritable bowel syndrome. [29]

A systematic review and meta-analysis of 13 articles that assessed the differential expression of intestinal microbiota in 360 patients with this condition compared to 268 healthy controls found downregulation of bacterial colonization of *Lactobacillus*, *Bifidobacterium*, and *Faecalibacterium prausnitzii* in patients with irritable bowel syndrome. [30] Those with the diarrhea-predominant subtype had

significantly different expression of *Lactobacillus* and *Bifidobacterium*. A different systematic review and meta-analysis evaluated 43 articles on probiotics and showed that probiotics helped relieve pain, bloating, and gas [31]; however, again, it remains unknown which probiotic is best.

A European multicenter pilot study that evaluated the effectiveness of palmithoylethanolamide/polydatin in 54 patients with irritable bowel syndrome compared to 12 healthy controls did not show any significant changes in modifying the biologic profile of the condition (eg, mast cell count); however, this combination significantly improved the severity of abdominal pain when compared to placebo.[32]

Psychological Therapy

Consider psychiatric referral. Previous evidence supported improvement in gastrointestinal (GI) symptoms with successful treatment of psychiatric comorbidities, but studies by Zijdenbos et al and Ford et al indicate that caution should be used when interpreting such data. [33, 34]

In a meta-analysis by Zijdenbos et al of 25 randomized trials consisting of single psychological interventions with usual care or mock intervention in patients older than 16 years, the authors found that although cognitive-behavioral therapy and interpersonal psychotherapy were effective immediately after treatment completion, there was no convincing evidence for sustained benefits with any treatment modality. Thus, Zijdenbos et al recommended that future research should focus on current irritable bowel syndrome treatment guidelines and their long-term effects. [33]

Ford et al reached similar conclusions regarding the use of psychological interventions in irritable bowel syndrome. The authors concluded that antidepressants are effective in the treatment of irritable bowel syndrome, but although the available data suggest that psychological therapies may be of comparable efficacy, there is less high-quality evidence for the routine use of psychological therapies in patients with IBS. They performed a systematic review and meta-analysis of randomized controlled trials in adults with IBS; however, their selection criteria included trials comparing antidepressants with placebo as well as those comparing psychological therapies with control therapy or usual care. The investigators noted that the quality of studies were generally good for those involving antidepressants but poor for those involving psychological therapy. [34]

A Cochrane systematic review determined that antidepressants improved both irritable bowel symptoms and global assessment scores compared with placebo. Selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants were both shown to be effective in subgroup analyses. [4]

The 2009 American College of Gastroenterologists (ACG) position statement concluded that psychological interventions, cognitive behavioral therapy, dynamic psychotherapy, and hypnotherapy, are more effective than placebo. Relaxation therapy was no more effective than usual care. In agreement with the above analysis, study quality was described as low. [3]

More recent studies suggest targeting the mediating psychological process involved in patients with irritable bowel syndrome, such as illness perceptions, maladaptive coping, and visceral sensitivity. [17]

Long-term Monitoring

Frequent visits with the clinician enhance the patient-provider relationship, especially in patients who were recently diagnosed with irritable bowel syndrome. Visits can become less frequent as patients are educated and reassured.

Medication SummaryInvestigational use

The selection of pharmacologic treatment remains symptom directed. Agents used for the management of symptoms in irritable bowel syndrome (IBS) include anticholinergics, antidiarrheals, tricyclic antidepressants, prokinetics, bulk-forming laxatives, serotonin receptor antagonists, chloride channel activators, and guanylate cyclase C (GC-C) agonists.

A Cochrane systematic review found that several antispasmodics, including peppermint oil, pinaverium, trimebutine, and cimetropium/dicyclomine, significantly outperformed placebo at improving irritable bowel syndrome symptom and global assessment scores. [4]

The 2009 American College of Gastroenterologists (ACG) position statement on management of irritable bowel syndrome noted that the antidiarrheal agent loperamide effectively reduced stool frequency and improved stool consistency, but it did not relieve pain, bloating, or other global irritable bowel syndrome symptoms. [3] As noted earlier, The 2014 ACG monograph on the management of irritable bowel syndrome and chronic idiopathic constipation found insufficient evidence to recommend prebiotics or synbiotics, or loperamide, in irritable bowel syndrome, and no evidence that polyethylene glycol improved overall symptoms and pain in affected patients. [22]

A Spanish expert consensus panel on functional digestive disorders have made evidence-based recommendations on the use of linaclotide, a GC-C receptor agonist, for the management of the constipation-predominant disease (IBS-C) subtype. [35] Their recommendations include continuous (not sporadic) use of linaclotide therapy for moderate to severe IBS-C, patient education regarding the risk of diarrhea and its management options, and the maintenance of linaclotide therapy for potentially long periods on the basis of the lack of tachyphylaxis or potential risks. [35]

A total of 1260 patients with IBS without constipation were enrolled in the TARGET 1 and TARGET 2 phase III trials at 179 investigative sites in the United States and Canada. Results showed that treatment with rifaximin (550 mg PO tid for 14 d) provided better symptom relief (eg, bloating, abdominal pain, loose/watery stools) compared with placebo, although the placebo effect was tremendous. Similarly, a 2012 meta-analysis of 5 studies, incorporating 1,803 patients, determined that rifaximin is more effective than placebo for global symptom relief and bloating. Adverse event rates were similar to placebo. Rifaximin is not yet approved by the US Food and Drug Administration for IBS.

Practical lesson № 13. CHRONIC HEPATITIS

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Background

Hepatitis, a general term referring to inflammation of the liver, may result from various causes, both infectious (ie, viral, bacterial, fungal, and parasitic organisms) and noninfectious (eg, alcohol, drugs, autoimmune diseases, and metabolic diseases); this article focuses on viral hepatitis, which accounts for more than 50% of cases of acute hepatitis in the United States, primarily in the emergency department setting.

In the United States, viral hepatitis is most commonly caused by hepatitis A virus(HAV), hepatitis B virus (HBV), and hepatitis C virus (HCV). These three viruses can all result in acute disease with symptoms of nausea, abdominal pain, fatigue, malaise, and jaundice. [1] Additionally, acute infection with HBV and HCV can lead to chronic infection. Patients who are chronically infected may go on to develop cirrhosis and hepatocellular carcinoma (HCC). Furthermore, chronic hepatitis carriers remain infectious and may transmit the disease for many years.

Other hepatotropic viruses known to cause hepatitis include hepatitis D virus (HDV) and hepatitis E virus (HEV). However, the term hepatotropic is itself a misnomer. Infections with hepatitis viruses, especially HBV and HBC, have been associated with a wide variety of extrahepatic manifestations. Infrequent causes of viral hepatitis include adenovirus, cytomegalovirus (CMV), Epstein-Barr virus (EBV) and, rarely, herpes simplex virus (HSV). Other pathogens (eg, virus SEN-V) may account for additional cases of non-A/non-E hepatitis.

Acute versus chronic viral hepatitis

The term viral hepatitis can describe either a clinical illness or the histologic findings associated with the disease. Acute infection with a hepatitis virus may result in conditions ranging from subclinical disease to self-limited symptomatic disease to fulminant hepatic failure. Adults with acute hepatitis A or B are usually symptomatic. Persons with acute hepatitis C may be either symptomatic or asymptomatic (ie, subclinical).

Typical symptoms of acute hepatitis are fatigue, anorexia, nausea, and vomiting. Very high aminotransferase values (>1000 U/L) and hyperbilirubinemia are often observed. Severe cases of acute hepatitis may progress rapidly to acute liver failure, marked by poor hepatic synthetic function. This is often defined as a prothrombin time (PT) of 16 seconds or an international normalized ratio (INR) of 1.5 in the absence of previous liver disease.

Fulminant hepatic failure (FHF) is defined as acute liver failure that is complicated by hepatic encephalopathy. In contrast to the encephalopathy associated with cirrhosis, the encephalopathy of FHF is attributed to increased permeability of the blood-brain barrier and to impaired osmoregulation in the brain, which leads to brain-cell swelling. The resulting brain edema is a potentially fatal complication of fulminant hepatic failure.

FHF may occur in as many as 1% of cases of acute hepatitis due to hepatitis A or B. Hepatitis E is a common cause in Asia; whether hepatitis C is a cause remains controversial. Although FHF may resolve, more than half of all cases result in death unless liver transplantation is performed in time.

Providing that acute viral hepatitis does not progress to FHF, many cases resolve over a period of days, weeks, or months. Acute HBV infection is generally considered resolved once an individual has developed antibodies to the hepatitis B surface antigen (anti-HBs) and has cleared hepatitis B surface antigen (HBsAg) from their serum. Alternatively, acute viral hepatitis may evolve into chronic hepatitis. HBV infection is considered to have progressed to chronic

infection when HBsAg, hepatitis B e antigen (HBeAg), and high titers of hepatitis B viral DNA are found to persist in the serum for longer than 6 months. Hepatitis C infection is considered to have progressed to chronic infection when HCV RNA persists in the blood for longer than 6 months. Hepatitis A and hepatitis E never progress to chronic hepatitis, either clinically or histologically.

The likelihood of progressing to chronic hepatitis B infection varies with the age at the time of infection. Chronic hepatitis B infection develops in up to 90% of individuals infected as neonates; however only 1-5% of individuals infected with HBV as adults develop chronic hepatitis B infection. Chronic hepatitis C infection develops in 75-85% of patients infected with hepatitis C. Individuals infected with HCV at a younger age are less likely to develop chronic hepatitis C infection.Some patients with chronic hepatitis remain asymptomatic for their entire lives. Other patients report fatigue (ranging from mild to severe) and dyspepsia.

Individuals with chronic hepatitis B or hepatitis C infection may go on to develop cirrhosis, with histologic changes of severe fibrosis and nodular regeneration. In their study of serologic markers in patients with cirrhosis and hepatocellular carcinoma, Perz et al estimated that 57% of cirrhosis and 78% of hepatocellular carcinoma worldwide was attributable to chronic infection with either hepatitis B or C.

Although some patients with cirrhosis are asymptomatic, others develop life-threatening complications. The clinical illnesses of chronic hepatitis and cirrhosis may take months, years, or decades to evolve.

Pathophysiology

Hepatitis A

The incubation period of hepatitis A virus (HAV) is 15-45 days (average, 4 weeks). The virus is excreted in stool during the first few weeks of infection, before the onset of symptoms. Young children who are infected with HAV usually remain asymptomatic. Acute hepatitis A is more severe and has higher mortality in adults than in children. The explanation for this is unknown.

Typical cases of acute HAV infection are marked by several weeks of malaise, anorexia, nausea, vomiting, and elevated aminotransferase levels. Jaundice develops in more severe cases. Some patients experience a cholestatic hepatitis, marked by the development of an elevated alkaline phosphatase (ALP) level, in contrast to the classic picture of elevated aminotransferase levels. Other patients may experience several relapses during the course of a year. Less than 1% of cases result in fulminant hepatic failure (FHF). HAV infection does not persist and does not lead to chronic hepatitis.

Hepatitis B

Hepatitis B virus (HBV) may be directly cytopathic to hepatocytes. However, immune system–mediated cytotoxicity plays a predominant role in causing liver damage. The immune assault is driven by human leukocyte antigen (HLA) class I–restricted CD8 cytotoxic T lymphocytes that recognize hepatitis B core antigen (HBcAg) and hepatitis B e antigen (HBeAg) on the cell membranes of infected hepatocytes.

Acute infection

The incubation period of HBV infection is 40-150 days (average, approximately 12 weeks). As with acute HAV infection, the clinical illness associated with acute HBV infection may range from mild disease to a disease as severe as FHF (<1% of patients). After acute

hepatitis resolves, 95% of adult patients and 5-10% of infected infants ultimately develop antibodies against hepatitis B surface antigen (HBsAg)—that is, anti-HBs—clear HBsAg (and HBV virions), and fully recover. About 5% of adult patients, 90% of infected infants, and 30-50% of children infected at age 1-5 years develop chronic infection.

Some patients, particularly individuals who are infected as neonates or as young children, have elevated serum levels of HBV DNA and a positive blood test for the presence of HBeAg but have normal alanine aminotransferase (ALT) levels and show minimal histologic evidence of liver damage. These individuals are in the so-called "immune-tolerant phase" of disease. Years later, some but not all of these individuals may enter the "immune-active phase" of disease, in which the HBV DNA may remain elevated as the liver experiences active inflammation and fibrosis. An elevated ALT level is also noted during this period. Typically, the immune-active phase ends with the loss of HBeAg and the development of antibodies to HBeAg (anti-HBe).

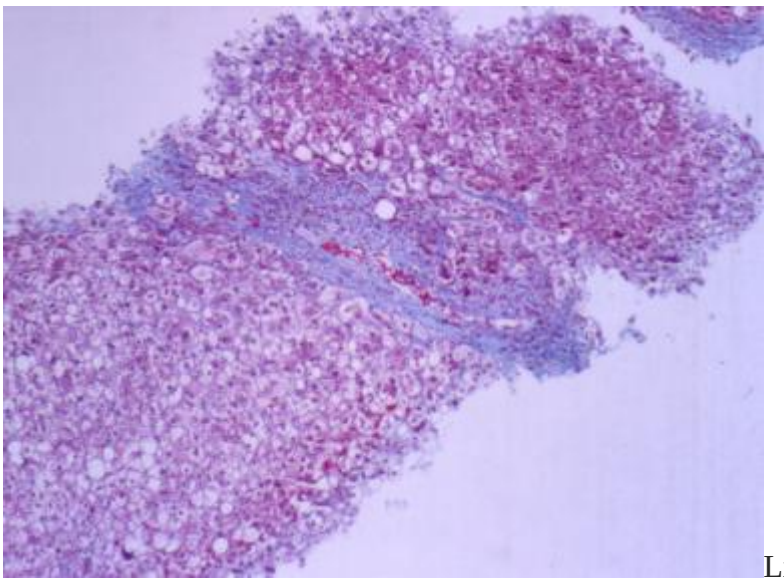
Individuals who seroconvert from an HBeAg-positive state to an HBeAg-negative state may enter the "inactive carrier state" (previously known as the "healthy carrier state"). Such individuals are asymptomatic, have normal liver chemistry test results, and have normal or minimally abnormal liver biopsy results. Blood test evidence of HBV replication should be nonexistent or minimal, with a serum HBV DNA level in the range of 0 to 2000 IU/mL.

Inactive carriers remain infectious to others through parenteral or sexual transmission. Inactive carriers may ultimately develop anti-HBs and clear the virus. However, some inactive carriers develop chronic hepatitis, as determined by liver chemistry results, liver biopsy findings, and HBV DNA levels. Inactive carriers remain at risk for hepatocellular carcinoma (HCC), although the risk is low. At this point, no effective antiviral therapies are available for patients in an inactive carrier state.

Other patients who seroconvert may enter the "reactivation phase" of disease. These individuals remain HBeAg-negative but have serum HBV DNA levels higher than 2000 IU/mL and show evidence of active liver inflammation. These patients are said to have HBeAg-negative chronic hepatitis.

Chronic infection

The 10-30% of HBsAg carriers who develop chronic hepatitis are often symptomatic. Fatigue is the most common symptom of chronic hepatitis B. Acute disease flares occasionally occur, with symptoms and signs similar to those of acute hepatitis. Extrahepatic manifestations of the disease (eg, polyarteritis nodosa, cryoglobulinemia, and glomerulonephritis) may develop. Chronic hepatitis B patients have abnormal liver chemistry results, blood test evidence of active HBV replication, and inflammatory or fibrotic activity on liver biopsy specimens (see the images below).

 Liver biopsy with trichrome stain showing stage 3 fibrosis in patient with hepatitis B.

Patients with chronic hepatitis may be considered either HBeAg-positive or HBeAg-negative. In North America and Northern Europe, about 80% of chronic hepatitis B cases are HBeAg positive and 20% HBeAg negative. In Mediterranean countries and in some parts of Asia, 30-50% of cases are HBeAg positive and 50-80% HBeAg negative.

Patients with HBeAg-positive chronic hepatitis have signs of active viral replication, with an HBV DNA level greater than 2×10^4 IU/mL. HBV DNA levels may be as high as 10^{11} IU/mL.

Patients with HBeAg-negative chronic hepatitis were presumably infected with wild-type virus at some point. Over time, they acquired a mutation in either the precore or the core promoter region of the viral genome. In such patients with a precore mutant state, HBV continues to replicate, but HBeAg is not produced. Patients with a core mutant state appear to have downregulated HBeAg production.

The vast majority of patients with HBeAg-negative chronic hepatitis B have a serum HBV DNA level greater than 2000 IU/mL. Typically, HBeAg-negative patients have lower HBV DNA levels than HBeAg-positive patients do. Commonly, the HBV DNA level is no higher than 2×10^4 IU/mL.

HBV and HCC

An approximately 8-20% of untreated adults with chronic hepatitis B go on to develop cirrhosis within 5 years; of these individuals, 20% annually develop hepatic decompensation and 2-5% annually develop HCC (see the image below). Globally, an estimated 30% of cases of cirrhosis and 45% of cases of HCC are attributed to HBV. The incidence of HCC parallels the incidence of HBV infection in various countries around the world. Worldwide, up to 1 million cases of HCC are diagnosed each year. Most appear to be related to HBV infection.

In HBV-induced cirrhosis, as in cirrhosis due to other causes, hepatic inflammation and regeneration appear to stimulate mutational events and carcinogenesis. However, in HBV infection, in contrast to other liver diseases, the presence of cirrhosis is not a prerequisite for the development of HCC. The integration of HBV into the hepatocyte genome may lead to the activation of oncogenes or the inhibition of tumor suppressor genes. As an example, mutations or deletions of the *p53* and *RB* tumor suppressor genes are seen in many cases of HCC.

Multiple studies have demonstrated an association between elevated serum HBV DNA levels and an increased risk for the development of HCC. Conversely, successful suppression of HBV infection by antiviral therapy can decrease the risk of developing HCC.

HCC is a treatable and potentially curable disease, whether the treatment entails tumor ablation (eg, with percutaneous injection of ethanol into the tumor), liver resection, or liver transplantation. The American Association for the Study of Liver Diseases (AASLD) and the World Health Organization (WHO) recommend screening for HBV-infected individuals who are at high risk for HCC, including men older than 40 years, individuals with HBV-induced cirrhosis, and persons with a family history of HCC.

For these patients, ultrasonography of the liver and alpha-fetoprotein (AFP) testing every 6 months are recommended. No specific recommendations have been made for patients at low risk for HCC. Some clinicians recommend that low-risk patients (including inactive carriers) undergo only AFP and liver chemistry testing every 6 months. Other clinicians' practice is to screen all chronic hepatitis B patients with ultrasonography and AFP testing every 6 months, with inactive carriers undergoing liver chemistry and AFP testing every 6 months; however, this is controversial.

Hepatitis C

HCV has a viral incubation period of approximately 8 weeks. Most cases of acute HCV infection are asymptomatic. Even when it is symptomatic, acute HCV infection tends to follow a mild course, with aminotransferase levels rarely higher than 1000 U/L. Whether acute HCV infection is a cause of FHF remains controversial.

Approximately 15-45% of patients acutely infected with HCV lose virologic markers for HCV. Thus, about 55-85% of newly infected patients remain viremic and may develop chronic liver disease. In chronic hepatitis C, patients may or may not be symptomatic, with fatigue being the predominant reported symptom. Aminotransferase levels may range from reference values (<40 U/L) to values as high as 300 U/L. However, no clear-cut association exists between aminotransferase levels and symptoms or risk of disease progression.

An estimated 15-30% of patients with chronic hepatitis C experience progression to cirrhosis. This process may take decades. All patients who are newly diagnosed with well-compensated cirrhosis must be counseled regarding their risk of developing symptoms of liver failure (ie, decompensated cirrhosis). Only 30% of patients with well-compensated cirrhosis are anticipated to decompensate over a 10-year follow-up period.

Patients with HCV-induced cirrhosis are also at increased risk for the development of HCC (see the image below), especially in the setting of HBV coinfection. In the United States, HCC arises in 1-5% of patients with HCV-induced cirrhosis each year.] Accordingly, routine screening (eg, ultrasonography and AFP testing every 6 months) is recommended in patients with HCV-induced cirrhosis to rule out the development of HCC. Nearly 20,000 deaths each year are attributable to HCV as an underlying or contributing cause of death.

Hepatitis D

Simultaneous introduction of HBV and HDV into a patient results in the same clinical picture as acute infection with HBV alone. The resulting acute hepatitis may be mild or severe. Similarly, the risk of developing chronic HBV and HDV infection after acute exposure to both viruses is the same as the rate of developing chronic HBV infection after acute exposure to HBV

(approximately 5% in adults [5]). However, chronic HBV and HDV disease tends to progress more rapidly to cirrhosis than chronic HBV infection alone does. [5]

Introduction of HDV into an individual already infected with HBV may have dramatic consequences. Superinfection may give HBsAg-positive patients the appearance of a sudden worsening or flare of hepatitis B. HDV superinfection may result in FHF. [5]

Hepatitis E

HEV has an incubation period of 2-10 weeks. [21] Acute HEV infection is generally less severe than acute HBV infection and is characterized by fluctuating aminotransferase levels. However, pregnant women, especially when infected during the third trimester, have a greater than 25% risk of mortality associated with acute HEV infection. [22] In a number of cases, FHF caused by HEV has necessitated liver transplantation.

Traditionally, HEV was not believed to cause chronic liver disease. However, several reports have described chronic hepatitis due to HEV in organ transplant recipients.[23] Liver histology revealed dense lymphocytic portal infiltrates with interface hepatitis, similar to the findings seen with hepatitis C infection. Some cases have progressed to cirrhosis. [24, 25]

Etiology

Hepatitis viruses A, B, C, D (HAV, HBV, HCV, HDV [which requires coexisting HBV infection]), and E (HEV) cause the majority of clinical cases of viral hepatitis. Whether hepatitis G virus (HGV) is pathogenic in humans remains unclear. HAV, HBV, HCV, and HDV are the only hepatitis viruses endemic to the United States; HAV, HBV, and HCV are responsible for more than 90% of US cases of acute viral hepatitis. Whereas HAV and HBV are the most common causes of acute hepatitis in the United States, HCV is the most common cause of chronic hepatitis. [26]

The following are typical patterns by which hepatitis viruses are transmitted, with + symbols indicating the frequency of transmission (ie, more + symbols indicate increased frequency).

Fecal-oral transmission frequency is as follows:

- HAV (+++)
- HEV (+++)

Parenteral transmission frequency is as follows:

- HBV (+++)
- HCV (+++)
- HDV (++)
- HGV (++)
- HAV (+)

Sexual transmission frequency is as follows:

- HBV (+++)
- HDV (++)
- HCV (+)

Perinatal transmission frequency is as follows:

- HBV (+++)
- HCV (+)
- HDV (+)

Sporadic (unknown) transmission frequency is as follows:

- HBV (+)

- HCV (+)

Hepatitis A

HAV (see the image below), a member of the Picornaviridae family, is an RNA virus with a size of 7.5 kb and a diameter of 27 nm. It has one serotype but multiple genotypes. Classic findings of acute HAV infection include a mononuclear cell infiltrate, interface hepatitis, focal hepatocyte dropout, ballooning degeneration, and acidophilic (Councilman-like) bodies. HAV is present in the highest concentration in the feces of infected individuals; the greatest fecal viral load tends to occur near the end of the HAV incubation period.

Most commonly, the virus spreads from person to person via the fecal-oral route. Contaminated water and food, including shellfish collected from sewage-contaminated water, have also resulted in epidemics of HAV infection. The virus may also be spread through sexual (anal-oral) contact. [27] Transmission by blood transfusion is rare. Maternal-neonatal transmission has not been established.

Although HAV infection occurs throughout the world, the risk is highest in developing countries, areas of low socioeconomic status, and regions without sufficient sanitation. Higher infection rates also exist in settings where fecal-oral spread is likely, such as daycare centers. [28]

Other groups at high risk for HAV infection include international travelers, users of injection and noninjection drugs, and men who have sex with men. [27] International travel is the most frequently identified risk factor reported by case patients in the United States. [29] Close contacts of infected individuals are also at risk. [27] The secondary infection rate for hepatitis A virus in household contacts of patients with acute HAV infection is around 20%. Thus, secondary infection plays a significant role in the maintenance of HAV outbreaks.

Hepatitis B

HBV, a member of the Hepadnaviridae family, is a 3.2-kb partially doubled-stranded DNA virus. The positive strand is incomplete. The complete negative strand has four overlapping genes, as follows:

- Gene *S* codes for hepatitis B surface antigen (HBsAg), a viral surface polypeptide
- Gene *C* codes for hepatitis B core antigen (HBcAg), the nucleocapsid protein; it also codes for hepatitis B e antigen (HBeAg), whose function is unknown
- Gene *P* codes for a DNA polymerase that has reverse transcriptase activity
- Gene *X* codes for the X protein that has transcription-regulating activity

The viral core particle consists of a nucleocapsid, HBcAg, which surrounds HBV DNA, and DNA polymerase. The nucleocapsid is coated with HBsAg. The intact HBV virion is known as the Dane particle. Dane particles and spheres and tubules containing only HBsAg are found in the blood of infected patients. In contrast, HBcAg is not detected in the circulation. It can be identified by immunohistochemical staining of infected liver tissue.

HBV is known to have eight genotypic variants (genotypes A-H). Although preliminary studies suggest that particular HBV genotypes may predict the virus’s response to therapy or may be associated with more aggressive disease, it would be premature to incorporate HBV genotype testing into clinical practice on a routine basis.

HBV is readily detected in serum, and it is seen at very low levels in semen, vaginal mucus, saliva, and tears. The virus is not detected in urine, stool, or sweat. HBV can survive storage at –

20°C (–4°F) and heating at 60°C (140°F) for 4 hours. It is inactivated by heating at 100°C (212°F) for 10 minutes or by washing with sodium hypochlorite (bleach).

The major reservoir of HBV in the United States consists of the 850,000 to 2.2 million people with chronic HBV infection. [26] In this group, those with HBeAg in their serum tend to have higher viral titers and thus greater infectivity.

HBV is transmitted both parenterally and sexually, most often by mucous membrane exposure or percutaneous exposure to infectious body fluids. Saliva, serum, and semen all have been determined to be infectious. [26, 30] Percutaneous exposures leading to the transmission of HBV include transfusion of blood or blood products, injection drug use with shared needles, hemodialysis, and needlesticks (or other wounds caused by sharp implements) in healthcare workers. [26, 30]

Globally and in the United States, perinatal transmission is one of the major modes of HBV transmission. The greatest risk of perinatal transmission occurs in infants of HBeAg-positive women. By age 6 months, these children have a 70-90% risk of infection, and of those who become infected, about 90% will go on to develop chronic infection with HBV. [9]

For infants born to HBeAg-negative women, the risk of infection is approximately 10-40%, with a chronic infection rate of 40-70%. Even if transmission does not occur in the perinatal period, these children are still at significant risk for the development of infection during early childhood.

Groups at high risk for HBV infection include intravenous (IV) drug users, persons born in endemic areas, and men who have sex with men. [26, 30] Others at risk include healthcare workers exposed to infected blood or bodily fluids, recipients of multiple blood transfusions, patients undergoing hemodialysis, heterosexual persons with multiple partners or a history of sexually transmitted disease, institutionalized persons (eg, prisoners), and household contacts or sexual partners of HBV carriers. [26, 30]

Hepatitis C

HCV, a member of the Flaviviridae family, is a 9.4-kb RNA virus with a diameter of 55 nm. It has one serotype, but at least six major genotypes and more than 80 subtypes are described, with as little as 55% genetic sequence homology. Genotype 1b is the genotype most commonly seen in the United States, Europe, Japan, and Taiwan. Genotypes 1b and 1a (also common in the United States) are less responsive to interferon (IFN) therapy than other HCV genotypes are. The wide genetic variability of HCV hampers the efforts of scientists to design an effective anti-HCV vaccine.

HCV can be transmitted parenterally, perinatally, and sexually. Transmission occurs by percutaneous exposure to infected blood and plasma. [18, 26] The virus is transmitted most reliably through transfusion of infected blood or blood products, transplantation of organs from infected donors, and sharing of contaminated needles among IV drug users. [18, 26] Transmission by sexual activity and household contact occurs less frequently. Perinatal transmission occurs but is uncommon.

Genetic variations and HCV clearance

Genetic polymorphisms involving the *IL28B* gene have been found to affect the odds that HCV can be cleared in a given patient. The *IL28B* gene encodes IFN lambda-3. A single nucleotide polymorphism 3 kb upstream of the *IL28B* gene was associated with patients' ability to clear HCV spontaneously.

In a study, about 53% of patients with the favorable C/C genotype and 23% of patients with the less favorable T/T genotype spontaneously cleared the virus.[31]Of the patients who were chronically infected with HCV, those with the C/C genotype were more likely to see viral eradication after treatment with pegylated IFN (Peg-IFN) plus ribavirin.[32] In the same study, the C/C genotype was more common in persons of European ancestry than in those of African ancestry. In contrast, the T/T genotype was more common in persons of African ancestry.[31]These observations may help to explain why black individuals typically exhibit lower sustained virologic response (SVR) rates than white persons when treated with Peg-IFN plus ribavirin.

Hepatitis D

HDV, the single species in the *Deltavirus* genus, is a 1.7-kb single-stranded RNA virus. The viral particle is 36 nm in diameter and contains hepatitis D antigen (HDAg) and the RNA strand. It uses HBsAg as its envelope protein; thus, HBV coinfection is necessary for the packaging and release of HDV virions from infected hepatocytes.

Modes of transmission for HDV are similar to those for HBV. HDV is transmitted by exposure to infected blood and blood products. It can be transmitted percutaneously and sexually.[33] Perinatal transmission is rare.

Hepatitis E

HEV, the single species in the *Hepevirus* genus, is a 7.5-kb single-stranded RNA virus that is 32-34 nm in diameter. It is transmitted primarily via the fecal-oral route, with fecally contaminated water providing the most common means of transmission.[21, 34] Person-to-person transmission is rare, though maternal-neonatal transmission does occur. Zoonotic spread is possible because some nonhuman primates (cows, pigs and wild boar, sheep, goats, rodents, deer) are susceptible to the disease.

Other viruses

Hepatitis G virus (HGV) (also known as human pegivirus [HPgV]) is similar to viruses in the Flaviviridae family, which includes HCV.[36] (It is an RNA virus within the *Pegivirus A* species of the Flaviviridae family.[36]) The HGV genome codes for 2900 amino acids.[34] The virus has 95% homology (at the amino acid level) with hepatitis GB virus C (HGBV-C) and 26% homology (at the amino acid level) with HCV.

Approximately 750 million people worldwide have HPgV viremia, with an estimated 1.5-2.5 billion people currently infected or with evidence of prior infection.[36] It can be transmitted through blood and blood products.[34] HGV coinfection is observed in 6% of chronic HBV infections and in 10% of chronic HCV infections.[34] About 75% of HPgV infections clear within 2 years of infection, and 25% persist.[36] HGV is associated with acute and chronic liver disease, but it has not been clearly implicated as an etiologic agent of hepatitis.

Other known viruses (eg, cytomegalovirus [CMV], Epstein-Barr virus [EBV], herpes simplex virus [HSV], and varicella-zoster virus [VZV]) may also cause inflammation of the liver, but they do not primarily target the liver.

Epidemiology

United States data

The Centers for Disease Control and Prevention (CDC) conducts national surveillance for acute and chronic hepatitis infection. Data on chronic infections is limited because not all states report this information: For the year 2014, the CDC received reports on chronic hepatitis B virus (HBV) infection from 40 states and on chronic hepatitis C infection from 37 states.[9] Additionally, the numbers of reported cases for acute and chronic hepatitis infection likely underestimate the true incidence of disease because most cases are asymptomatic.

Beginning in 2011, the CDC incorporated a new method for estimating the number of cases of hepatitis infection to better account for underreporting.[9] In 2014, there were 1239 cases of hepatitis A virus (HAV) reported,[9] which was significantly less than the 2979 cases of acute HAV infection reported in 2007.[1] Between 2011 and 2013, however, the number of reported hepatitis A cases increased, including a large hepatitis A outbreak in 2013 due to imported pomegranate seeds.[9, 29] After adjusting for underreporting and under ascertainment, the CDC estimates that the actual number of new hepatitis A cases in 2014 was 2500.[9]

For HBV infection, rates of reported acute infections have been declining since 1990.[9] There were 2791 cases of acute infection in 2014,[9] as compared to 4519 cases of acute HBV infection reported in 2007.[1] With correction for asymptomatic cases and underreporting, the true number of cases of acute hepatitis B infection in 2014 was estimated at 18,100.[9] The incidence of childhood HBV infection is not well established, because more than 90% of such infections in children are asymptomatic.

The CDC estimates that approximately 850,000 to 2.2 million people in the U.S are chronically infected with HBV.[9, 26] Over 70% of these infections occurred in foreign-born individuals, and over half of the chronic infections occurred in individuals identifying as Asian/Pacific Islanders.[9]

The annual number of reported cases of acute hepatitis C increased steadily between 2010 and 2014.[9] There were 2194 case of acute hepatitis C infection reported in 2014; after adjusting for underreporting, the CDC estimates that there were 30,500 new infections in 2014.[19] Approximately 2.7-3.9 million people In the United States have chronic hepatitis C.[19]

International statistics

Globally, viral hepatitis was the seventh leading cause of death in 2013, up from the 10th leading cause in 1990.[37] Worldwide, HAV is responsible for an estimated 1.4 million infections annually.[38] About 2 billion people in the world have evidence of past or current HBV infection, with 240 million chronic carriers of HBsAg.[5] HBV, along with the associated infection by the hepatitis D virus, is one of the most common pathogens afflicting humans.[39] HBV leads to 650,000 deaths annually as a result of viral hepatitis–induced liver disease.[5]

The worldwide annual incidence of acute HCV infection is not easily estimated, because patients are often asymptomatic. An estimated 71 million people are chronically infected with HCV worldwide.[18] About 55-85% of these people infected progress to chronic HCV infection, with a 15-30% risk of developing liver cirrhosis within two decades.[18] China, the United States, and Russia have the largest populations of anti-HCV positive injection drug users (IDUs). It is estimated that 6.4 million IDUs worldwide are positive for antibody to hepatitis B core antigen (HBcAg) (anti-HBc), and 1.2 million are HBsAg-positive.[40]

Hepatitis A virus

HAV is transmitted commonly most via the fecal-oral route. Cases of transfusion-associated HAV or illness caused by inoculation are uncommon.

HAV infection is common in the less-developed nations of Africa, Asia, and Central and South America; the Middle East has a particularly high prevalence. Most patients in these regions are infected when they are young children. Uninfected adult travelers who visit these regions are at risk for infection.

Epidemics of HAV infection may be explained by person-to-person contact, such as occurs at institutions, or by exposure to a common source, such as consumption of contaminated water or food.

As sanitation has improved, the overall prevalence of hepatitis A in the United States and in other parts of the developed world has decreased to less than 50% of the population. Younger individuals in the United States are better protected from hepatitis A because of guidelines adopted in 2006 recommending universal vaccination of children aged 1 year and older. [9] Unfortunately, many older individuals in the United States still remain at risk.

Hepatitis B virus

Infection with HBV is defined by the presence of hepatitis B surface antigen (HBsAg). Approximately 90-95% of neonates with acute HBV infection and 5% of adults with acute infection develop chronic HBV infection. In the remaining patients, the infection clears, and these patients develop a lifelong immunity against repeated infections.

Of the approximately 5% of the world's population (ie, 350 million people) that is chronically infected with HBV, about 20% will eventually develop HBV-related cirrhosis or hepatocellular carcinoma (HCC). According to the World Health Organization (WHO), HBV is the 10th leading cause of death worldwide. [41]

More than 10% of people living in sub-Saharan Africa and in East Asia are infected with HBV. Maintenance of a high HBsAg carriage rate in these parts of the world is partially explained by the high prevalence of perinatal transmission and by the low rate of HBV clearance by neonates.

In the United States, about 250-350 patients die of HBV-associated fulminant hepatic failure (FHF) each year. A pool of approximately 1.25 million chronic HBV carriers exists in the United States. Of these patients, 4000 die of HBV-induced cirrhosis each year, and 1000 die of HBV-induced HCC.

Perinatal transmission

The vast majority of HBV cases around the world result from perinatal transmission. Infection appears to occur during the intrapartum period or, rarely, in utero. Neonates infected via perinatal infection are usually asymptomatic. Although breast milk can contain HBV virions, the role of breastfeeding in transmission is unclear.

Sexual transmission

HBV is transmitted more easily than human immunodeficiency virus (HIV) or HCV. Infection is associated with vaginal intercourse, genital-rectal intercourse, and oral-genital intercourse. An estimated 30% of sexual partners of patients infected with HBV also contract HBV infection. However, HBV cannot be transmitted through kissing, hugging, or household contact (eg, sharing towels, eating utensils, or food). Sexual activity is estimated to account for as many as 50% of HBV cases in the US.

Parenteral transmission

HBV was once a common cause of posttransfusion hepatitis. Screening of US blood donors for anti-HBc, beginning in the early 1970s, dramatically reduced the rate of HBV infection

associated with blood transfusion. According to the National Heart, Lung and Blood Institute, the risk that a blood donation is infected with hepatitis B is 1 in 205,000. [42]

Patients with hemophilia, those on renal dialysis, and those who have undergone organ transplantation remain at increased risk of HBV infection. IDU accounts for 20% of US cases of HBV. A history of HBV exposure is identified in approximately 50% of IDUs. The risk of acquiring HBV after a needle stick from an infected patient is estimated to be as high as 5%.

Healthcare associated

Hepatitis B outbreaks have been associated with healthcare settings. Between 2008 and 2015, there were 23 outbreaks and 175 outbreak-associated cases of hepatitis B associated with healthcare settings reported in the United States. [43] Outbreaks were reported in long-term care facilities and outpatient clinic settings. The CDC noted that these numbers likely underestimate the true incidence of healthcare-associated outbreaks because of the asymptomatic course of hepatitis B infection as well as the long incubation period. Additionally, there is no requirement to report these cases to the CDC if they have been investigated by state and local health authorities. [43]

Sporadic cases

In approximately 27% of cases, the cause of HBV infection is unknown. Some of these cases, in fact, may be due to sexual transmission or contact with blood.

Hepatitis C virus

HCV is the most frequent cause of parenteral non-A, non-B (NANB) hepatitis worldwide. Hepatitis C is prevalent in 0.5-2% of populations in nations around the world. The highest rates of disease prevalence are found in patients with hemophilia and in IDUs.

In the 1980s, as many as 180,000 new cases of HCV infection were described each year in the United States; by 1995, there were only 28,000 new cases each year. [44]The decreasing incidence of HCV was explained by a decline in the number of cases of transfusion-associated hepatitis (because of improved screening of blood products) and by a decline in the number of cases associated with IDU. New cases of hepatitis C infection tend to occur in individuals who are young and white, with a history of IDU and opioid use. [9]

Transmission via blood transfusion

Screening of the US blood supply has dramatically reduced the incidence of transfusion-associated HCV infection. [19, 45] Before 1990, 37-58% of cases of acute HCV infection (then known as NANB) were attributed to the transfusion of contaminated blood products; at present, only about 4% of acute cases are attributed to transfusions. The risk of having a blood donation infected with hepatitis C is 1 in 2 million. [42] Acute hepatitis C remains an important issue in dialysis units, where patients' risk for HCV infection is about 0.15% per year.

Transmission via intravenous and intranasal drug use

IDU remains an important mode of transmitting HCV. The use of intravenous (IV) drugs and the sharing of paraphernalia used in the intranasal snorting of cocaine and heroin account for approximately 60% of new cases of HCV infection. More than 90% of patients with a history of IDU have been exposed to HCV.

Transmission via occupational exposure

Occupational exposure to HCV accounts for approximately 4% of new infections. On average, the chance of acquiring HCV after a needle-stick injury involving an infected patient is 1.8%

(range, 0-7%). Reports of HCV transmission from healthcare workers to patients are extremely uncommon.

Sexual transmission

Approximately 20% of cases of hepatitis C appear to be due to sexual contact. In contrast to hepatitis B, approximately 5% of the sexual partners of those infected with HCV contract hepatitis C.

The US Public Health Service (USPHS) recommends that persons infected with HCV be informed of the potential for sexual transmission. Sexual partners should be tested for the presence of antibodies to HCV (anti-HCV). Safe-sex precautions are recommended for patients with multiple sex partners. Current guidelines do not recommend the use of barrier precautions for patients with a steady sexual partner. However, patients should avoid sharing razors and toothbrushes with others. In addition, contact with patients' blood should be avoided.

Perinatal transmission

Perinatal transmission of HCV occurs in 5.8% of infants born to mothers infected with HCV. [46] The risk of perinatal transmission of HCV is higher (about 18%) in children born to mothers coinfected with human immunodeficiency virus (HIV) and HCV. [47] Between 2011 and 2014, the proportion of infants born to HCV-infected mothers increased by 68% nationally, indicating an increase in the number of infants who are at risk for vertical transmission of HCV. [46]

Healthcare associated

Hepatitis C outbreaks have been associated with healthcare settings. Between 2008 and 2015, there were 33 outbreaks and 239 outbreak-associated cases of hepatitis C associated with US healthcare settings reported. [43] Outbreaks occurred in outpatient facilities and hemodialysis settings. [43] The CDC noted that these numbers likely underestimate the true incidence of healthcare-associated outbreaks because of the asymptomatic course of hepatitis C infection and its long incubation period. Additionally, there is no requirement to report these cases to the CDC if they have been investigated by state and local health authorities. [43]

Hepatitis D virus

HDV requires the presence of HBV to replicate; thus, HDV infection develops only in patients who are positive for HBsAg. [48] Patients may acquire HDV as a coinfection (at the same time that they contract HBV), or the HDV may superinfect patients who are chronic HBV carriers. Hepatitis D is not a reportable disease in the United States, thus, accurate data regarding HDV infections are scarce. However, it is estimated that approximately 4-8% of cases of acute hepatitis B involve coinfection with HDV. [49, 50, 51]

HDV is believed to infect approximately 5% of the world's HBsAg carriers (ie, about 15 million with chronic HBV/HDV). [5, 33] The prevalence of HDV infection in South America and Africa is high. Italy and Greece are well-studied areas of intermediate endemicity. Only about 1% of HBV-infected individuals in the United States and Northern Europe are coinfected with HDV.

The sharing of contaminated needles in IDU is thought to be the most common means of transmitting HDV. IDUs who are also positive for HBsAg have been found to have HDV prevalence rates ranging from 17% to 90%. Sexual transmission and perinatal transmission are also described. The prevalence of HDV in sex workers in Greece and Taiwan is high.

Hepatitis E virus

HEV is the primary cause of enterally transmitted NANB hepatitis. It is transmitted via the fecal-oral route and appears to be endemic in some parts of less-developed countries, where most outbreaks occur. HEV can also be transmitted vertically to the babies of HEV-infected mothers. It is associated with a high neonatal mortality.[52]

In one report, anti-HEV antibodies were found to be present in 29% of urban children and 24% of rural children in northern India.[53] Sporadic infections are observed in persons traveling from Western countries to these regions.

Prognosis

The prognosis of viral hepatitis varies, depending on the causative virus.

Hepatitis A virus (HAV) infection usually is mild and self-limited, and infection confers lifelong immunity against the virus. Overall mortality is approximately 0.02%[9]; in general, children younger than 5 years and adults older than 50 years have the highest case-fatality rates. Older patients are at greater risk for severe disease: Whereas icteric disease occurs in fewer than 10% of children younger than 6 years, it occurs in 40-50% of older children and in 70-80% of adults with HAV. Three rare complications are relapsing hepatitis, cholestatic hepatitis, and fulminant hepatitic failure (FHF).

The risk of chronic HBV infection in infected older children and adults approaches 5-10%. Patients with such infection are at risk for cirrhosis and hepatocellular (HCC). FHF develops in 0.5-1% of patients infected with HBV; the case-fatality rate in these patients is 80%. Chronic HBV infection is responsible for approximately 5000 deaths per year from chronic liver disease in the United States.

Chronic infection develops in 50-60% of patients with hepatitis C. Chronically infected patients are at risk for chronic active hepatitis, cirrhosis, and HCC. In the United States, chronic HCV infection is the leading indication for liver transplantation.[19] In 2014, the number of HCV-related deaths rose to 19,659 from 15,106 in 2007, with over 50% occurring in people aged 55-64 years.[9]

Patients with chronic HBV infection who are coinfected with HDV also tend to develop chronic HDV infection. Chronic coinfection with HBV/HDV often leads to rapidly progressive subacute or chronic hepatitis, with as many as 70-80% of these patients eventually developing cirrhosis.

HEV infection is usually mild and self-limited. The case-fatality rate reaches 15-20% in pregnant women. HEV infection does not result in chronic disease.

Complications

In general, complications of viral hepatitis may include the following:

- Acute or subacute hepatic necrosis
- Chronic active hepatitis
- Chronic hepatitis
- Cirrhosis
- Hepatic failure
- Hepatocellular carcinoma (HCC) in patients with HBV or HCV infection

Hepatitis B

One of the major complications of hepatitis B is the development of chronic infection. An estimated 240 million people worldwide are chronically infected with HBV.[5] In the United States, 850,000 to 2.2 million people are estimated to have chronic HBV infection.[26] Patients with such infection are at risk for the subsequent development of chronic active hepatitis,

cirrhosis of the liver, and eventual HCC. Each year, approximately 650,000 deaths occur worldwide as a result of chronic HBV infection. [5]

Patients infected at an early age are at greatest risk for chronic HBV infection: Whereas 90% of those infected at birth and 30-50% of children infected at age 1-5 years develop chronic HBV infection, only 5% of older children or adults go on to develop chronic infection. [9] The risk of chronic infection is also higher in patients who are immunocompromised.

Patients with chronic HBV infection are at significantly higher risk for HCC. In fact, HCC is the leading cause of cancer-related deaths in areas where HBV is endemic. Globally, HBV is responsible for 45% of the world's primary liver cancers. [5] Cancer in this setting is postulated to result from repeated bouts of chronic inflammation and cellular regeneration. HCC develops an average of 25-30 years after initial infection.

Another major complication of HBV infection is development of FHF. In approximately 0.5-1% of HBV-infected patients, the disease progresses to FHF, with coagulopathy, encephalopathy, and cerebral edema. The case-fatality rate for these patients approaches 80%. [2]

Hepatitis C

Acute infection with HCV may rarely cause FHF. [54] Approximately 75-85% of patients with hepatitis C become chronically infected. [19] About 60-70% of patients will have ongoing chronic liver disease with laboratory evidence of fluctuating or persistently elevated liver enzymes. Of those with chronic infection, 5-20% may go on to develop cirrhosis. The progression from initial infection to the development of cirrhosis may take 20-30 years. [19]

Cirrhosis related to chronic HCV infection is also strongly linked to the development of HCC, which usually develops after 30 years in patients who are chronically infected. Of patients with HCV-associated cirrhosis, 20-25% may progress to liver failure and death. [54] As noted earlier, in the United States, cirrhosis associated with chronic hepatitis C is a leading indication for liver transplantation. [19]

Extrahepatic complications of hepatitis C

Patients with chronic hepatitis C are also at risk for extrahepatic complications. In essential mixed cryoglobulinemia, HCV may form immune complexes with anti-HCV immunoglobulin G (IgG) and with rheumatoid factor (RF). The deposition of immune complexes may cause small-vessel damage. Complications of cryoglobulinemia include rash, vasculitis, and glomerulonephritis.

Other extrahepatic complications of HCV infection include focal lymphocytic sialadenitis, autoimmune thyroiditis, porphyria cutanea tarda, lichen planus, and Mooren corneal ulcer. Some cases of non-Hodgkin lymphoma can be attributed to HCV infection.

Patient Education

Refer patients with infectious hepatitis to their primary care providers for further counseling specific to their disease; the precise etiologic virus is unlikely to be known at the time of discharge from the emergency department.

Counsel patients regarding the importance of follow-up care to monitor for evidence of disease progression or development of complications. Remind them to exercise meticulous personal hygiene, including thorough hand washing. Instruct them not to share any articles that have the potential for contamination with blood, semen, or saliva, including needles, toothbrushes, or razors.

Inform food handlers suspected of having hepatitis A that they should not return to work until their primary care physician can confirm that they are no longer shedding the virus. Instruct patients to refrain from using any hepatotoxins, including ethanol and acetaminophen.

For patient education resources, see the Infections Center, the Digestive Disorders Center, and the Sexual Health Center, as well as Hepatitis A (HAV, Hep A); Hepatitis B (HBV, Hep B); Hepatitis C (Hep C, HCV); Cirrhosis; Childhood Immunization Schedule; and Immunization Schedule, Adults.

History

The clinical presentation of infectious hepatitis varies with the individual, as well as with the specific causative virus. Some patients may be entirely asymptomatic or only mildly symptomatic at presentation. Others may present with rapid onset of fulminant hepatic failure (FHF). The classic presentation of infectious hepatitis involves four phases, as follows:

- Phase 1 (viral replication phase) – Patients are asymptomatic; laboratory studies demonstrate serologic and enzyme markers of hepatitis
- Phase 2 (prodromal phase) – Patients experience anorexia, nausea, vomiting, alterations in taste, arthralgias, malaise, fatigue, urticaria, and pruritus, and some develop an aversion to cigarette smoke; when seen by a healthcare provider during this phase, patients are often diagnosed as having gastroenteritis or a viral syndrome
- Phase 3 (icteric phase) – Patients may note dark urine, followed by pale-colored stools; in addition to the predominant gastrointestinal (GI) symptoms and malaise, patients become icteric and may develop right upper quadrant pain with hepatomegaly
- Phase 4 (convalescent phase) – Symptoms and icterus resolve, liver enzymes return to normal

Hepatitis A

The incubation period of hepatitis A virus (HAV) is 2-7 weeks (average, 28 days). Clinical symptoms then develop, often with a presentation similar to that of gastroenteritis or a viral respiratory infection. The most common signs and symptoms include fatigue, nausea, vomiting, fever, hepatomegaly, jaundice, dark urine, anorexia, and rash.

HAV infection usually occurs as a mild self-limited disease and confers lifelong immunity to the virus. Chronic HAV infection does not occur. [9]

Hepatitis B

The incubation period for hepatitis B virus (HBV) is 30-180 days (average, approximately 75 days). Patients then enter the prodromal or preicteric phase, characterized by the gradual onset of anorexia, malaise, and fatigue. During this phase, as the liver becomes inflamed, the liver enzymes start to elevate, and the patient may experience right upper quadrant pain. About 15% of patients develop an illness resembling serum sickness. These patients may experience fever, arthritis, arthralgias, or an urticarial rash.

As the disease progresses to the icteric phase, the liver becomes tender, and jaundice develops. Patients may note that their urine darkens and their stools lighten in color. Other symptoms in this stage include nausea, vomiting, and pruritus.

From this point on, the clinical course may be highly variable. Whereas some patients experience fairly rapid improvements in their symptoms, others go on to experience prolonged disease with

slow resolution. Still others may have symptoms that periodically improve, only to worsen later (relapsing hepatitis). Finally, there is an unfortunate subset of patients in whom the disease rapidly progresses to FHF; this may occur over days to weeks.

Hepatitis C

The incubation period for hepatitis C virus (HCV) is 15-150 days, with symptoms developing anywhere from 5-12 weeks after exposure. During acute HCV infection, symptoms may appear similar to those of HBV infection. In up to 80% of cases, however, patients are asymptomatic and do not develop icterus. [1, 18]

Hepatitis D

The incubation period of hepatitis D virus (HDV) is approximately 35 days. Patients simultaneously infected with HBV and HDV often have an acute, self-limited infection. [48, 55] Fewer than 5% of these patients develop chronic HDV infection.

Chronic HBV carriers who become superinfected with HDV tend to have a more severe acute hepatitis; 80% of these patients go on to develop chronic HDV infection. Chronic infection with HBV and HDV may lead to fulminant acute hepatitis and severe chronic active hepatitis with progression to cirrhosis. [48, 55] Over the long term, as many as 70-80% of these patients have evidence of chronic liver disease with cirrhosis, compared with only 15-30% of patients with chronic HBV alone.

Hepatitis E

The incubation period of hepatitis E virus (HEV) is 2-9 weeks (average, 45 days). HEV usually causes an acute self-limited disease similar to HAV infection. Fulminant disease does occur in about 10% of cases. In women who are pregnant, HEV infection has a case-fatality rate of 15-20%. [34] No reports exist of chronic infection with HEV. [34]

Physical Examination

Physical findings in patients with hepatitis vary with the type of hepatitis and the time of presentation.

Patients often present with low-grade fever. Those experiencing significant vomiting and anorexia may show signs of dehydration, such as tachycardia, dry mucous membranes, loss of skin turgor, and delayed capillary refill.

Patients in the icteric phase may have icterus of the sclerae or mucous membranes, or discoloration of the tympanic membranes. The skin may be jaundiced and may reveal macular, papular, or urticarial rashes.

In viral hepatitis, the liver may be tender and diffusely enlarged with a firm, sharp, smooth edge. If the patient has a nodular liver or a mass is palpated, clinicians should suspect an abscess or tumor.

Diagnostic Considerations

In addition to the conditions listed in the differential diagnosis, other problems to be considered in patients with suspected viral hepatitis include the following:

- Liver abscess
- Drug-induced hepatitis
- Autoimmune hepatitis

- Hepatocellular cancer
- Pancreatic cancer

Differential Diagnoses

- Acute Cholangitis
- Acute Cholecystitis and Biliary Colic
- Blunt Abdominal Trauma
- Emergent Management of Pancreatitis
- Emergent Treatment of Gastroenteritis
- Gallstones (Cholelithiasis)
- Intussusception
- Pediatric Gastroenteritis in Emergency Medicine
- Peptic Ulcer Disease
- Small-Bowel Obstruction

Approach Considerations

A simple screening test for the nonicteric patient with suspected viral hepatitis involves checking the urine for presence of bilirubin. As an alternative, a liver enzyme panel (generally a costly test) could be obtained. Bedside fingerstick glucose testing is important to evaluate for hypoglycemia in patients with an altered or questionable mental status.

Total bilirubin levels may be elevated in infectious hepatitis. Bilirubin levels higher than 30 mg/dL indicate more severe disease. Levels of alkaline phosphatase (ALP) are usually in the reference range but may elevate to no higher than twice the normal level. If ALP is elevated significantly, consider liver abscess or biliary obstruction.

A prolonged prothrombin time (PT), if present, is a grave finding indicating impaired synthetic function of the liver. Blood urea nitrogen (BUN) and serum creatinine levels should be assessed to look for evidence of renal impairment. Decreased renal function suggests fulminant hepatic disease. Serum ammonia should be measured in patients with altered mental status or other evidence of hepatic encephalopathy.

Detection of immunoglobulin M (IgM) for hepatitis A virus (HAV) is the standard for diagnosing acute infection with HAV.

Detection of IgM for hepatitis B core antigen (HBcAg) in serum is required to make the diagnosis of acute hepatitis B virus (HBV) infection. Hepatitis B surface antigen (HBsAg) may be present in acute infection or in patients who are chronic carriers. Its presence in patients with symptoms of acute hepatitis strongly suggests acute HBV infection but does not rule out chronic HBV with acute superinfection by another hepatitis virus. The presence of HBsAg in the serum for 6 months or longer indicates chronic infection.

Hepatitis C virus (HCV) infection can be confirmed with serologic assays to detect antibody to HCV (anti-HCV) or with molecular tests for the presence of viral particles. Third-generation assays for anti-HCV are sensitive and specific and can detect such antibodies within 4-10 weeks of infection. A rapid antibody test strip is available. Qualitative polymerase chain reaction (PCR) assay for presence of viral particles is the most specific test of HCV infection and may be helpful in diagnosing acute HCV infection before antibodies have developed.

Assays to detect IgM antibody to hepatitis D virus (HDV) do not need to be routinely performed in all patients with suspected hepatitis.

No specific imaging studies are required to make the diagnosis of hepatitis. However, obtain the appropriate diagnostic imaging studies (eg, ultrasonography or computed tomography [CT]) if the differential diagnosis favors gallbladder disease, biliary obstruction, or liver abscess.

Liver biopsy may be recommended for the initial assessment of disease severity in patients with chronic hepatitis B or chronic hepatitis C infection.

Hepatitis A

Acute infection is documented by the presence of immunoglobulin M (IgM) antibody to hepatitis A virus (HAV) (anti-HAV), which disappears several months after the initial infection. The presence of immunoglobulin G (IgG) anti-HAV merely demonstrates that an individual has been infected with HAV at some point in the past, from 2 months ago to decades ago. IgG anti-HAV appears to offer patients lifelong immunity against recurrent HAV infection.

Hepatitis B

Acute self-limited infection

Hepatitis B surface antigen (HBsAg) is the first serum marker seen in persons with acute infection. It represents the presence of hepatitis B virus (HBV) virions (Dane particles) in the blood. Hepatitis B e antigen (HBeAg), a marker of viral replication, is also present. When viral replication slows, HBeAg disappears, and antibody to HBeAg (anti-HBe) is detected. Anti-HBe may persist for years.

The first antibody to appear is antibody to hepatitis B core antigen (HBcAg) (anti-HBc). Initially, it is of the immunoglobulin M (IgM) class. Indeed, the presence of IgM anti-HBc is diagnostic for acute HBV infection. Weeks later, IgM anti-HBc disappears, and IgG anti-HBc is detected. Anti-HBc may be present for life. The anti-HBc (total) assay detects both IgM and IgG antibodies. The presence of anti-HBc (total) demonstrates that the patient has had a history of infection with HBV at some point in the past.

In patients who clear HBV, HBsAg usually disappears 4-6 months after infection, as titers of antibody to HBsAg (anti-HBs) become detectable. Anti-HBs is believed to be a neutralizing antibody, offering immunity to subsequent exposures to HBV. Anti-HBs may persist for the life of the patient.

Several key points should be kept in mind in interpreting serology findings from patients with acute HBV infection. The presence of HBsAg does not indicate whether the infection is acute or chronic. The presence of anti-HBc (IgM) is the sine qua non of acute HBV infection. The presence of anti-HBc (total) indicates that a patient has been infected with HBV at some point. The anti-HBc (total) remains positive both in patients who clear the virus and in patients with persistent infection.

The presence of anti-HBc (total) with a negative HBsAg and a negative anti-HBs indicates one of the following four things:

1. The test result is a false positive
2. The patient is in a window of acute hepatitis between the elimination of HBsAg and the appearance of anti-HBs; this scenario is not observed in patients with chronic HBV infection
3. The patient has cleared HBV but has lost anti-HBs over the years
4. The patient is one of the uncommon individuals with active HBV replication who is negative for HBsAg; this situation is diagnosed when either a positive HBeAg or a positive HBV DNA result is found

In some clinicians' opinions, the discovery of a lone positive anti-HBc (total) finding in the setting of negative HBsAg and negative anti-HBs findings mandates the performance of a polymerase chain reaction (PCR) assay for HBV DNA.

Chronic infection

HBsAg may remain detectable for life in many patients. Individuals who have positive findings for HBsAg are termed carriers of HBV. They may be inactive carriers or they may have chronic hepatitis. Anti-HBc is present in all patients with chronic HBV infections. HBeAg and HBV DNA may or may not be present. They reflect a state of active viral replication. HBV DNA levels are typically low or absent in inactive carriers. HBV DNA levels are higher in patients with chronic hepatitis B. High HBV DNA levels are associated with increased infectivity.

Anti-HBs is usually absent in patients with chronic infection. If anti-HBs is present in a patient who has positive HBsAg findings, it reflects the presence of a low level of antibody that was unsuccessful at inducing viral clearance.

Table 1 (below) summarizes diagnostic tests for HBV. [10, 13]

Table 1. Diagnostic Tests for Hepatitis B (Open Table in a new window)

Test	CHB HBeAg Positive	CHB HBeAg Negative	Inactive Carrier
HBsAg	+	+	+
Anti-HBs	-	-	-
HBeAg	+	-	-
Anti-HBe	-	+	+
Anti-HBc	+	+	+
IgM anti-HBc	-	-	-
HBV DNA	>2 × 10^4IU/mL* (>10^5copies/mL)	>2 × 10^3IU/mL (>10^4copies/mL)	<2 × 10^3IU/mL (<10^4copies/mL)
ALT level	Elevated	Elevated	Normal

ALT = alanine

aminotransferase; anti-HBc = antibody to hepatitis B core antigen; anti-HBe = antibody to HBeAg; anti-HBs = antibody to HBsAg; CHB = chronic hepatitis B; HBV = hepatitis B virus; HBeAg = hepatitis B e antigen; HBsAg = hepatitis B surface antigen; IgM = immunoglobulin M.

*Increasingly, experts in the field use IU/mL rather than copies/mL.

Markers after vaccination for HBV

The HBV vaccine delivers recombinant HBsAg to the patient without HBV DNA or other HBV-associated proteins. More than 90% of recipients develop protective anti-HBs. Vaccine recipients are not positive for anti-HBc unless they were previously infected with HBV.

Hepatitis C

The tests most commonly used in the diagnosis of hepatitis C are liver chemistry, serology, hepatitis C virus (HCV) RNA testing, and liver biopsy.

In August 2012, the Centers for Disease Control and Prevention (CDC) expanded their existing, risk-based testing guidelines to recommend a one-time blood test for HCV infection in baby boomers—the generation born between 1945 and 1965, who account for approximately 75% of all chronic HCV infections in the United States—without prior ascertainment of HCV risk (see Recommendations for the Identification of Chronic Hepatitis C Virus Infection Among Persons Born During 1945–1965). [56] One-time HCV testing in this population could identify nearly 808,600 additional people with chronic infection. All individuals identified with HCV should be screened and/or managed for alcohol abuse, followed by referral to preventative and/or treatment services, as appropriate.

Liver chemistry

Elevated aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels merely indicate the presence of liver injury. Patients with chronically elevated aminotransferase values should undergo a workup to exclude the possibility of chronic liver disease.

Measuring aminotransferase levels is an imperfect test in patients with documented HCV infection. The values do not predict the severity of clinical findings, the degree of histologic abnormalities, the patient's prognosis, or the therapeutic response. Indeed, patients can have HCV-induced cirrhosis while still having normal liver chemistry values.

Although increases and decreases in aminotransferase levels do not appear to correlate with clinical changes, normalization of AST and ALT levels after acute infection may signal clearance of HCV. Normalization of AST and ALT levels while a patient is undergoing treatment with interferon predicts a virologic response to treatment. Similarly, an increase in AST and ALT values may signal a relapse after apparently successful drug therapy.

Serology

Structural and nonstructural regions of the HCV genome have been synthesized. These can be recognized by human immunoglobulin G (IgG) antibody to HCV (anti-HCV). Recombinant HCV antigens are used in enzyme-linked immunosorbent assay (ELISA) to detect anti-HCV in patients' sera.

Anti-HCV test results remain negative for several months after acute HCV infection. Once anti-HCV appears, it usually remains present for the life of the patient—even in the 15% of cases in which the patient clears the virus and does not develop chronic hepatitis. Anti-HCV is not a protective antibody and does not guard against future exposures to HCV.

In 2010, the US Food and Drug Administration (FDA) approved the OraQuick HCV Rapid Antibody Test.[57] It can be used for persons at risk for hepatitis or for those with signs or symptoms of hepatitis. The test strip can be used with a sample collected from oral fluid, whole blood, serum, or plasma.

Recombinant immunoblot assays (RIBAs) use recombinant HCV antigens that are fixed to a solid substrate. They are more specific than ELISA testing and have been used to confirm positive ELISA results. However, their use is being abandoned in favor of HCV RNA testing.

A positive HCV result with ELISA or RIBA has one of three potential interpretations, as follows:

1. The test result is a true positive, and the patient is infected with HCV.
2. The test result is a true positive, but the patient is no longer viremic for HCV and does not have chronic hepatitis; the results from neither ELISA nor RIBA distinguish resolved infection from active infection
3. The test result is a false positive

ELISA testing has a positive predictive value (PPV) of more than 95% when used in patients at high risk for hepatitis C (eg, intravenous [IV] drug users and those with abnormal liver chemistry findings. However, its PPV is only 50-61% in patients at low risk for HCV infection. Furthermore, patients with autoimmune hepatitis or hypergammaglobulinemia frequently have false-positive ELISA results. Thus, a positive HCV ELISA or RIBA result does not prove that HCV infection is present. Positive serologic tests require confirmation with HCV RNA testing.

Other limitations of ELISA testing are that it fails to detect anti-HCV in 2-5% of infected patients and that it fails to detect anti-HCV in immunosuppressed patients (eg, patients with end-stage renal disease [ESRD], human immunodeficiency virus [HIV] infection, or concomitant immunosuppressant therapy). The possibility of HCV infection in this patient population should prompt HCV RNA testing.

HCV RNA testing

Since the early 1990s, polymerase chain reaction (PCR) assays and branched DNA assays have been used to detect HCV RNA in serum. In contrast to ELISA and RIBA testing, HCV RNA testing can confirm the presence of active HCV infection.

HCV RNA testing aids in the diagnosis of early cases of HCV infection (before the development of HCV antibody positivity or an elevated ALT level), seronegative cases (as in the setting of ESRD), and cases of perinatal transmission. It is also useful for confirming false-positive cases (eg, autoimmune hepatitis), assessing the HCV genotype and viral load, predicting the response to interferon therapy, guiding the duration and dose of interferon therapy, and determining the likelihood of relapse after a response to interferon therapy.

Liver biopsy

Liver biopsy is an important diagnostic test in possible cases of chronic hepatitis C. Biopsy results can help confirm the diagnosis, as well as help exclude other diseases that might have an impact on antiviral therapy, such as autoimmune hepatitis or hemochromatosis. Furthermore, liver biopsy offers the most reliable assessment of the severity of the disease.

Assessment of the degree of hepatic fibrosis is important for several reasons. The presence of advanced fibrosis (ie, stage 3 or 4) might trigger a decision to initiate screening to rule out the development of hepatocellular carcinoma (HCC) as a complication of advanced liver disease. Patients with previously unsuspected cirrhosis on biopsy should be monitored to ensure they do not develop large esophageal varices. Some clinicians consider that patients with stage 3 fibrosis should be regarded as “cirrhotic until proven otherwise.”

Knowledge of the severity of histologic changes may influence the patient and the physician to be either more or less aggressive in the pursuit of effective antiviral therapy. The presence of significant fibrosis (ie, stage 2, 3, or 4) might lead to a decision to initiate antiviral therapy in the hope that eradication of HCV would help to improve the patient’s long-term outcome. Patients with advanced histologic findings may seek experimental therapies should their condition not respond to standard antiviral therapy.

Patients with minimal fibrosis on biopsy (ie, stage 1 disease) might elect either to receive antiviral therapy or to postpone therapy. Indeed, the patient with stage 1 disease might be considered to be at low risk for complications of HCV infection. Furthermore, the risks of therapy might exceed benefits in such a patient (eg, a patient with HCV infection, stage 1 fibrosis and major depression).

In some clinicians' practices, before patients with stage 1 fibrosis elect to undergo a course of watchful waiting, they are advised that only virologic eradication of HCV can ensure that none of the extrahepatic complications of hepatitis C will develop. Patients are also advised to return for a repeat biopsy in 3-4 years to rule out progression of liver disease.

Liver biopsy has a number of noteworthy limitations. First, as an invasive procedure, it may be accompanied by significant complications (eg, bleeding) in approximately 1 in 1000 patients. Second, a sampling error may occur. Indeed, in some patients, the damage induced by viral infection is not uniform throughout the entire liver. In addition, interobserver variability in the assessment of histologic abnormalities may occur. Finally, as a snapshot in time, liver biopsy findings cannot be used to predict the rate of progression of chronic hepatitis C.

Other tests for estimating fibrosis in chronic hepatitis C

Liver stiffness can be estimated by using a technique known as vibration-controlled transient elastography or Fibroscan. The test is reportedly capable of diagnosing cirrhosis correctly in about 95% of patients; however it is less accurate in assessing patients with lesser degrees of fibrosis. [58] Fibroscan was approved for use in the United States in 2013 and, although it is not a

replacement for liver biopsy, it can serve as a useful adjunct to help diagnose or exclude advanced fibrosis and cirrhosis. [59, 60]

Liver fibrosis can also be estimated by means of a number of commercial blood tests, including the following:

- FIBROSpect II uses measurements of hyaluronic acid, tissue inhibitor of metalloproteinase-1 (TIMP-1) and alpha-2 macroglobulin to estimate liver fibrosis
- HepaScore is based on levels of hyaluronic acid, alpha-2 macroglobulin, gamma glutamyl transferase (GGT), and total bilirubin, as well as age and sex
- HCV FibroSURE measures alpha-2 macroglobulin, haptoglobin, GGT, bilirubin, ALT, and apolipoprotein A1

In general, these tests are considered accurate in determining the presence or absence of early (stage 1) or advanced (stage 4) fibrosis; however, they are considered to be less accurate in differentiating patients with moderate fibrosis.

At present, most gastroenterologists do not use serologic fibrosis markers as a substitute for liver biopsy. These tests may be useful for identifying patients at low risk for advanced disease (eg, asymptomatic women with HCV RNA positivity, persistently normal liver chemistry values, and no history of alcohol abuse or HIV infection) or for longitudinal follow-up of patients with minimal disease on biopsy who elect not to undergo antiviral therapy. If future generations of these markers achieve greater accuracy, they may obviate the need for liver biopsy.

Hepatitis D and E

A serologic diagnosis of hepatitis delta virus (HDV) infection is made by using immunoglobulin M (IgM) antibody to HDV (anti-HDV) and IgG anti-HDV tests. IgM antibody to hepatitis B core antigen (anti-HBc) should be used to help distinguish between coinfection (positive for IgM anti-HBc) and superinfection (negative for IgM anti-HBc). Detecting HDV RNA in serum is also possible.

A serologic diagnosis of hepatitis E virus (HEV) infection is made by using IgM antibody to HEV (anti-HEV) and IgG anti-HEV. HEV RNA can be detected in the serum and stool of infected patients.

Histologic Findings

Hepatitis B

Inactive carriers of hepatitis B virus (HBV) have no or minimal histologic abnormalities detected on liver biopsy specimens.

Patients with chronic hepatitis B may have a number of classic histologic abnormalities. Inflammatory infiltrates composed of mononuclear cells may either remain contained within the portal areas or disrupt the limiting plates of portal tracts, expanding into the liver lobule (interface hepatitis). Periportal fibrosis or bridging necrosis (between portal tracts) may be present. The presence of bridging necrosis places the patient at increased risk for progression to cirrhosis.

Ground-glass cells may be seen (see the image below). This term describes the granular homogeneous eosinophilic staining of cytoplasm caused by the presence of hepatitis B surface antigen (HBsAg). Sanded nuclei reflect the presence of an overload of hepatitis B core antigen (HBcAg). Special immunohistochemical stains may help detect HBsAg and HBcAg.

Hepatitis C

Pathologists who interpret liver biopsy specimens frequently use a histologic scoring system introduced by Batts and Ludwig in 1995 (see Table 2 below) to grade hepatitis C virus (HCV)-induced disease.[61] The METAVIR scoring system developed by the French METAVIR Cooperative Study Group uses similar methodology.

Table 2. Histologic Grading for Hepatitis C–Induced Liver Disease (Open Table in a new window)

Grade	Portal Inflammation	Interface Hepatitis	Lobular Necrosis
1 – Minimal	Mild	Scant	None
2 – Mild	Mild	Mild	Scant
3 – Moderate	Moderate	Moderate	Spotty
4 – Severe	Marked	Marked	Confluent

Histologic staging for hepatitis C–induced liver disease is as follows:

- Stage 1 – Portal fibrosis
- Stage 2 – Periportal fibrosis
- Stage 3 – Septal fibrosis
- Stage 4 – Cirrhosis

Lymphocytic infiltrates, either contained within the portal tract or expanding out of the portal tract into the liver lobule (interface hepatitis), are commonly observed in patients with chronic hepatitis C. Portal and periportal fibrosis may be present. Other classic histologic features of the disease include bile duct damage, lymphoid follicles or aggregates, and macrovesicular steatosis.

Hepatitis D and E

The pathologic abnormalities associated with HBV-HDV coinfection are the same as those observed in patients infected with HBV alone (see above).

The classic pathologic findings associated with HEV infection include infiltration of portal tracts by lymphocytes and polymorphonuclear leukocytes, ballooned hepatocytes, acidophilic body formation, and intralobular necrosis of hepatocytes. Submassive and massive hepatic necrosis may be observed in severe cases.

Approach Considerations

No specific emergency department (ED) treatment is indicated for viral hepatitis, other than supportive care that includes intravenous (IV) rehydration. A liver abscess calls for IV antibiotic therapy directed toward the most likely pathogens and consultation for possible surgical or percutaneous drainage.

Admit patients with hepatitis if they are showing any signs or symptoms suggestive of severe complications. Admit and evaluate for hepatic encephalopathy any patients with altered mental status, agitation, behavior or personality changes, or changes in their sleep-wake cycle. Other admission criteria that are suggestive of severe disease include a prothrombin time (PT) longer than 3 seconds, a bilirubin level greater than 30 mg/dL, and hypoglycemia.

Admit any patients with intractable vomiting, significant electrolyte or fluid disturbances, or significant comorbid illness; those who are immunocompromised; and those who are older than 50 years.

Certain patients may benefit from pharmacologic therapy. For chronic hepatitis B virus (HBV) and chronic hepatitis C virus (HCV) infections in particular, the goals of therapy are to reduce liver inflammation and fibrosis and to prevent progression to cirrhosis and its complications. Because the treatment regimens for hepatitis are being actively researched, medication recommendations, indications, and dosages are all subject to change. Consultations with a gastroenterologist, hepatologist, or general surgeon may be indicated.

Most patients with viral hepatitis can be monitored on an outpatient basis. Ensure that patients can maintain adequate hydration, and arrange close follow-up care with primary care physicians. Instruct patients to refrain from using any potential hepatotoxins (eg, ethanol or acetaminophen). Advise patients to avoid prolonged or vigorous physical exertion until their symptoms improve. Patients who are found subsequently to have HBV or HCV should be referred to a gastroenterologist or a hepatologist for further evaluation and treatment.

Acute Hepatitis A

Treatment for acute hepatitis caused by hepatitis A virus (HAV) is necessarily supportive in nature, because no antiviral therapy is available. Hospitalization is warranted for patients whose nausea and vomiting places them at risk for dehydration. Patients with acute liver failure require close monitoring to ensure they do not develop fulminant hepatic failure (FHF), which is defined as acute liver failure that is complicated by hepatic encephalopathy.

Acute Hepatitis B

As is the case for acute hepatitis A virus (HAV) infection, no well-established antiviral therapy is available for acute hepatitis B virus (HBV) infection. Supportive treatment recommendations are the same for acute hepatitis B as for acute hepatitis A. Lamivudine, adefovir dipivoxil, and other antiviral therapies appear to have a positive impact on the natural history of severe cases of acute HBV infection. A study by Schmilovitz-Weiss described a rapid clinical and biochemical response in 13 of 15 patients with severe acute hepatitis B who received lamivudine. [62]

Chronic Hepatitis B

Ideally, treatment of chronic hepatitis B would routinely achieve loss of hepatitis B surface antigen (HBsAg). Indeed, loss of HBsAg is associated with a decreased incidence of hepatocellular carcinoma (HCC) and a decreased incidence of liver-related death in patients with hepatitis B virus (HBV)-induced cirrhosis. [63] However, loss of HBsAg is only achieved in relatively small percentages of patients with chronic hepatitis B, that is, about 3-7% of those treated with pegylated interferon (PEG-IFN) [64, 65, 66] and 0-5% of those treated with oral nucleosides or nucleotides.[67]

At present, the key goal of antiviral treatment of HBV is the inhibition of viral replication. This is marked by the loss of hepatitis B e antigen (HBeAg) in patients with HBeAg-positive chronic hepatitis B and by the suppression of HBV DNA levels. Secondary aims are to reduce symptoms, if any, and to prevent or delay the progression of chronic hepatitis to cirrhosis or HCC.

Agents currently used to treat hepatitis B include PEG-IFN alfa-2a and the oral nucleoside or nucleotide analogues. Typically, PEG-IFN treatment is continued for 48 weeks for both HBeAg-positive and HBeAg-negative chronic hepatitis. Oral agents may be used for as short as 1-2 years; however, most HBeAg-positive chronic hepatitis patients and almost all HBeAg-negative

chronic hepatitis patients require indefinite therapy with these agents. Withdrawal of oral nucleoside/nucleotide analogue therapy in these individuals usually results in virologic relapse.

More detailed information regarding management of chronic hepatitis B is beyond the scope of this emergency medicine topic. The reader is referred to the following references:

- Pyrsopoulos NT, Reddy KR. Hepatitis B. *Medscape Drugs & Diseases*. Updated: May 26, 2017. Available at: http://emedicine.medscape.com/article/177632-overview.
- Terrault NA, Bzowej NH, Chang KM, Hwang JP, Jonas MM, Murad MH, et al. AASLD guidelines for treatment of chronic hepatitis B. *Hepatology*. 2016 Jan. 63 (1):261-83. [4]
- World Health Organization. Guidelines for the prevention, care and treatment of persons with chronic hepatitis B infection. 2015 Mar. [5]

Acute Hepatitis C

Acute hepatitis C virus (HCV) infection is detected infrequently. When it is identified, early interferon (IFN) therapy should be considered. In one study, 44 patients with acute hepatitis C were treated with IFN alfa-2b at 5 million U/day subcuteaneously (SC) for 4 weeks and then three times per week for another 20 weeks. [68] About 98% of patients developed a sustained virologic response (SVR), defined as an undetectable level of serum HCV RNA 6 months after completion of antiviral treatment. Most experts now equate achievement of an SVR with viral eradication or cure of HCV infection. [68, 69]

Chronic Hepatitis C

Goals

Antiviral therapy has several major goals, including the following, to:

- Decrease viral replication or eradicate HCV
- Prevent progression of disease
- Reduce the prevalence of cirrhosis
- Decrease the frequency of hepatocellular carcinoma (HCC) as a complication of cirrhosis
- Ameliorate symptoms, such as fatigue and joint pain
- Treat extrahepatic complications of HCV infection, such as cryoglobulinemia or glomerulonephritis

Interferon (IFN) has been the drug of choice for the treatment of hepatitis C for more than two decades. It is often used in combination with another drug, ribavirin. Successful IFN-based therapy, resulting in a sustained virologic response (SVR), can improve the natural history of chronic hepatitis C and may reduce the risk of HCC in patients with HCV-induced cirrhosis. [70, 71]

IFN-based therapy appears to reduce the rate of fibrosis progression in patients with HCV infection. [72] One report described regression of cirrhosis in some—but not all—patients who responded well to antiviral therapy. [73] In this study, 96 patients with biopsy-proven HCV-induced cirrhosis were treated with IFN-based therapy.

At a median interval of 17 months after the conclusion of antiviral therapy, patients underwent a second biopsy. [73] Overall, 18 patients (19%) had a decrease in fibrosis score on follow-up biopsy, from stage 4 to less than stage 2, and SVR had been achieved in 17 of these 18 patients. With a median follow-up of 118 months, these patients were found to have decreased liver-related morbidity and mortality compared with patients who were not histologic responders.

In this study, not all patients who achieved SVR experienced histologic improvements. [73] Thus, it remains important to continue routine surveillance in patients with HCV cirrhosis—even if SVR is achieved through antiviral therapy—in order to rule out the development of HCC as a complication of cirrhosis.

Another report retrospectively assessed 920 patients with HCV-induced cirrhosis who underwent IFN therapy in the 1990s. The mean follow-up period was 96 months (range, 6-167 months). Achievement of SVR decreased patients' risk for hepatic decompensation, HCC, and liver-related mortality. [71]

When considering treatment of HCV infection, both the clinician and the patient must be clear about the goals of therapy. As an example, in the patient with advanced fibrosis or cirrhosis, the goal of treatment is virologic cure in the hope of preventing progressive liver disease.

Unfortunately, SVR cannot be achieved in everyone. Achievement of SVR, although always desirable, is not always necessary to obtain a desired clinical result. Indeed, partial suppression of HCV through antiviral therapy may be all that is needed to stabilize renal function in a patient with HCV-related glomerulonephritis or to prevent the progression of malignancy in a patient with HCV-related non-Hodgkin lymphoma.

Pharmacologic agents

IFNs are a class of naturally occurring compounds that have both antiviral and immunomodulatory effects. They remain the backbone of antiviral strategies used against HCV infection. Agents currently approved by the FDA for the treatment of HCV infection include the following:

- IFN alfa-2b
- IFN alfa-2a
- Ribavirin, which is used in combination with IFN

The addition of a large, inert polyethylene glycol (PEG) molecule to a therapeutic molecule (eg, IFN) can delay the clearance of the therapeutic molecule from the bloodstream. Long-acting PEG-IFN alfa-2b and PEG-IFN alfa-2a are currently the most commonly used medications for hepatitis C therapy in the United States.

Other interferons under study include IFN beta, IFN gamma, and natural interferon. Future medications may target the enzymes responsible for HCV replication. Drugs that have activity against viral helicases, proteases, and polymerases are currently under study, as are ribozymes and antisense oligonucleotides.

Factors predictive of an SVR to treatment with PEG-IFN in combination with ribavirin include the following:

- Genotype 2 or 3 status
- Baseline HCV RNA level below 800,000 IU/mL or less than 2 million copies/mL
- Compliance with treatment
- Absence of cirrhosis

However, patients with well-compensated cirrhosis have a reasonable likelihood of achieving viral eradication and should be offered IFN therapy, provided no significant contraindication (eg, severe thrombocytopenia) is present. Ideally, HCV eradication in the cirrhotic patient may prevent or forestall the development of progressive hepatic fibrosis and liver decompensation. Patients treated with IFN may also have a decreased risk of HCC.

If a patient ultimately requires liver transplantation for the treatment of complications of cirrhosis, previous eradication of HCV obviates any concerns about potentially severe recurrent hepatitis C after transplantation.

Limitations

Not all patients with chronic hepatitis C are appropriate candidates for therapy with IFN and ribavirin. First, the drugs have well-known adverse effects, which lead to discontinuance in approximately 15% of patients. IFN can induce fatigue, joint pain, emotional irritability, depression, and alopecia. Patients with underlying psychiatric disorders must be carefully screened before they receive a drug that can worsen underlying depression or schizophrenia or that can even induce suicidal ideation.

IFN can also induce the development of thyroid disease or exacerbate an underlying immune-mediated disease (eg, psoriasis or sarcoidosis).

It has long been recognized that adherence to prescribed doses of PEG-IFN and ribavirin will maximize a patient's ability to achieve an SVR. Missed doses due to lack of patient compliance or to physician-ordered dose reductions (eg, on account of the new onset of anemia or cytopenias) will increase the chance for treatment failure.

Patients invariably need close clinical and laboratory follow-up during treatment. Treatment with PEG-IFN can induce neutropenia. In some patients with IFN-induced neutropenia, granulocyte colony-stimulating factor (G-SCF) must be added to the regimen in order to support a falling white blood cell (WBC) count.

Treatment with PEG-IFN can also induce thrombocytopenia. It was once assumed that most patients (typically cirrhotic) with baseline platelet counts lower then 70,000/µL would be unable to tolerate treatment because of the induction of severe thrombocytopenia. Eltrombopag received FDA approval in November 2008 for the treatment of thrombocytopenia in cases of idiopathic thrombocytopenic purpura (ITP).

Eltrombopag was studied in patients with HCV-induced cirrhosis and platelet counts lower than 70,000/µL.[74] Treatment with eltrombopag 75 mg orally once daily successfully improved platelet counts in 95% of the patients studied, permitting a majority to undergo IFN treatment. However, eltrombopag use has been associated with both venous thromboembolism and drug-induced liver injury. In the United States, the medication is only available through an FDA-mandated restricted-distribution program.

Ribavirin commonly produces rash and hemolytic anemia. Some patients with ribavirin-induced anemia need combination therapy with erythropoietin in order to support a falling hematocrit. Some clinicians believe patients should undergo baseline cardiac stress testing, given the potential for patients to develop severe anemia.

Both IFN and ribavirin have been associated with a low risk of inducing retinopathy. Clinicians may wish to consider having patients undergo pretreatment and posttreatment ophthalmologic examinations.

The presence of insulin resistance may reduce the chance of achieving viral eradication with PEG-IFN and ribavirin.[69] Excellent control of diabetes is recommended before patients embark on IFN-based therapy.

In spite of all of the potential concerns related to combination therapy with PEG-IFN and ribavirin, the vast majority of patients are able to tolerate their recommended 24-week (for genotypes 2 and 3) or 48-week (for genotypes 1 and 4) treatment course.

Treatment of special populations

Chronic renal failure

HCV infection is documented in 10-20% of patients receiving chronic hemodialysis. Anti-HCV therapy is often appropriate for such patients. Attempts to eradicate HCV should be made before renal transplantation is carried out. Indeed, the hepatic histologic abnormalities attributed to HCV infection may worsen dramatically after posttransplant immunosuppressant therapy is started.

Reduced doses of PEG-IFN are typically used. Ribavirin should be avoided in all patients with renal insufficiency and in patients receiving hemodialysis because of the increased risk of severe hemolytic anemia.

HIV-HCV coinfection

Approximately 25% of Americans infected with human immunodeficiency virus (HIV) are also coinfected with HCV (10% of HIV-infected people are coinfected with HBV), and 75% of HIV-infected persons who inject drugs have HCV coinfection. [75]Therefore, HIV testing should be routine in patients with diagnosed with HCV infection.

HIV-infected individuals appear to have an impaired immune response to HCV infection. This translates into more rapid progression of hepatic fibrosis and higher rates of liver-related death in coinfected patients than in those with only HCV infection. [7, 75] Indeed, HCV-induced cirrhosis is a major cause of death in the HIV-infected population in the United States. [18, 76]

Accordingly, physicians are now more aggressive than they once were with respect to diagnosing and treating HCV infection in their HIV-infected patients. It also appears that suppression of HCV by means of IFN therapy may improve a patient’s ability to tolerate antiretroviral therapy (ART). Drug-induced hepatotoxicity is common in patients treated with ART.

Treatment with PEG-IFN and ribavirin is usually offered to patients with a CD4 cell count higher than 200/µL. CD-4 cell counts lower than 200/µL—and certainly those lower than 100/µL—are associated with a poor response to therapy.

In general, HIV-infected patients tolerate treatment well. However, significant neutropenia, thrombocytopenia, and anemia may develop. A few case reports describe mitochondrial toxicity and lactic acidosis when IFN and ribavirin are used in combination with dideoxyinosine, zidovudine, stavudine, and efavirenz. Pancreatitis has been described in patients receiving IFN and dideoxyinosine.

Since the introduction of IFN therapy, patients with HIV-HCV coinfection have generally had a diminished rate of hepatitis C SVR in comparison with patients without HIV infection. However, in an early study of coinfected patients who received PEG-IFN alfa-2a 180 µg subcuteaneously (SC) once weekly and ribavirin 800 mg/day orally, patients with genotype 1 had a 29% SVR rate, and those with genotype 2 or 3 had a 62% SVR rate. [77]

There are multiple reports of liver transplantation being successfully performed to treat decompensated HCV-induced cirrhosis in coinfected patients. Potential candidates for transplantation include patients who have achieved a negative HIV viral load through ART.

Overall, however, 2-year posttransplant survival rates are lower in patients coinfected with HIV/HCV than in patients infected with HCV alone. [78] At present, only a small percentage of the more than 100 transplantation programs in the United States perform liver transplantation in HIV-infected patients.

Newer therapeutic agents

The development of direct-acting antiviral drugs (DAAs) has significantly improved treatment options for patients infected with hepatitis C. These newer agents, which are taken orally for 8-12 weeks, are becoming standard of care for patients with chronic hepatitis C because they have been shown to attain sustained virologic response rates of 90% and greater. [9]

Newer, all-oral, direct-acting antiviral agents [9]:

- Simeprevir and sofosbuvir – approved in 2013. Used in combination with PEG-INF and ribavirin, or as an all-oral combination regimen
- Ledipasvir/sofosbuvir (Harvoni) – approved in 2014
- Ombitasvir, paritaprevir, and ritonavir tabliets; dasabuvir tablets (Viekira Pak) – approved in 2014
- Elbasvir and grazoprevir (Zepatier) – licensed in 2016

Further reading

Detailed information on management and treatment of chronic hepatitis C is beyond the scope of this emergency medicine topic. Further guidance is available from the following references:

- AASLD/IDSA HCV Guidance Panel. Hepatitis C guidance: AASLD-IDSA recommendations for testing, managing, and treating adults infected with hepatitis C virus (updated April 12, 2017). *Hepatology*. 2015 Sep. 62 (3):932-54.[7]
- Dhawan VK. Hepatitis C. *Medscape Drugs & Diseases*. Updated: March 28, 2016. Available at: http://emedicine.medscape.com/article/177792-overview.

Treatment of Hepatitis D and E

Treatment of patients coinfected with hepatitis B virus (HBV) and hepatitis delta virus (HDV) has not been well studied. The onl effective treatment for HBV/HDV coinfection is pegylated interferon (PEG-IFN) [4, 5]; antiviral nucleos(t)ide analogues have limited or no effect on HDV replication. [5] However, multiple small studies have demonstrated that patients with HBV-HDV coinfection are less responsive to IFN therapy than patients with HBV infection alone. [5] Treatment with PEG-IFN alfa-2b produced HDV RNA negativity in only 17-19% of patients. [79, 80] Lamivudine appears to be ineffective against HBV-HDV coinfection. [81, 82]

Treatment of patients infected with hepatitis E virus (HEV) infection is supportive in nature.

Prevention

Hepatitis A

Improved sanitation, strict personal hygiene, and hand washing all may help prevent transmission of hepatitis A virus (HAV). The virus is inactivated by household bleach or by heating to 85°C (185°F) for 1 minute. In addition, travelers to endemic areas should not drink untreated water or ingest raw seafood or shellfish. Fruits and vegetables should not be eaten unless they are cooked or can be peeled.

Vaccination

In 1995, the US Food and Drug Administration (FDA) approved the first vaccine for HAV. Beginning in 1996, the Centers for Disease Control and Prevention (CDC) recommended vaccination against HAV for the following individuals:

- People traveling to regions where HAV is endemic
- Men who have sex with men
- Users of illicit drugs

Beginning in 1999, the CDC recommended vaccination for children living in 17 states with consistently elevated rates of HAV infection. Since 2006, the CDC has recommended vaccination for all children at age 1 year as well as encouraged “catchup” vaccination programs for unvaccinated children. [83]

Active immunization with HAV vaccine is also recommended for the following individuals:

- Persons with an occupational risk of infection (eg, persons working with HAV-infected primates)
- Patients who may receive clotting factor concentrates
- “Susceptible persons with chronic liver disease” [83]
- “Susceptible persons who are either awaiting or have received liver transplants” [83]

The third recommendation stemmed from the observation that patients with chronic liver disease, although not at increased risk for exposure to HAV, were at increased risk for fulminant hepatic failure (FHF) if they were infected with the virus. [84]Notably, there are data to suggest that workers exposed to raw sewage do not have a higher prevalence of antibodies to HAV than a comparator population. [83]

The inactivated HAV vaccines Havrix and Vaqta are administered as 1-mL (0.5-mL in children) intramuscular (IM) injections given more than 1 month before anticipated travel. This approach results in a better-than-90% likelihood of stimulating production of immunoglobulin G (IgG) antibody to HAV (anti-HAV), with resulting immunity against HAV infection.

A booster dose of the vaccine is recommended 6 months after the initial vaccination. Whether HAV vaccine administration should be mandated in children (as HBV vaccination is) remains unclear.

An alternative vaccine, containing inactivated HAV and recombinant hepatitis B virus (HBV) vaccines, is Twinrix. This product is immunogenic against both HAV and HBV. The FDA has approved its use in adults. Typical administration involves three injections of 1 mL given IM on a 0-, 1-, and 6-month schedule. Alternatively, a four-dose schedule can be used, with Twinrix administered on days 0, 7, and 21-30, followed by a booster dose at month 12. [85]

Immune globulin

Passive postexposure immunization with hepatitis A immune globulin (HAIG) is an alternative to active immunization with HAV vaccine. [86] Its effectiveness is highest when it is given within 48 hours of exposure, but it may be helpful when given as far as 2 weeks into the incubation period.

Postexposure prophylaxis with HAIG is appropriate for household and intimate contacts of patients with HAV. It is also recommended for contacts at daycare centers and institutions. The typical dosing of HAIG is 0.02 mL/kg IM as a single dose. Postexposure prophylaxis is not recommended for the casual contacts of patients, such as classmates or coworkers.

For travelers who anticipate spending less than 3 months in an HAV-endemic region, the dose is 0.02 mL/kg IM. Travelers who are planning to spend more than 3 months in a region where HAV is endemic should receive 0.06 mL/kg IM every 4-6 months.

Hepatitis B

The primary strategies for prevention of hepatitis B are to reduce transmission of the disease and to improve health outcomes for individuals who are already infected with hepatitis B. [9]

Vaccination

Plasma-derived and recombinant HBV vaccines use hepatitis B surface antigen (HBsAg) to stimulate the production of anti-HBs in noninfected individuals. The vaccines are highly effective, with a greater than 95% rate of seroconversion. Vaccine administration is recommended for all infants as part of the usual immunization schedule, as well as for adults at high risk of infection (eg, those receiving dialysis and healthcare workers). Recommendations for hepatitis B vaccination are available from the CDC [87] and the World Health Organization (WHO). [5]

The recommended vaccination schedule for infants consists of an initial vaccination at the time of birth (ie, before hospital discharge), a repeat vaccination at 1-2 months, and another repeat vaccination at 6-18 months. The recommended vaccination schedule for adults consists of an initial vaccination, a repeat vaccination at 1 month, and another repeat vaccination at 6 months. If Twinrix (the combined HAV-HBV vaccine) is used, it is given according to the schedule previously described for hepatitis A.

Because of the nonresponse rate, many recommend that healthcare workers undergo postvaccination testing to confirm response within 1-2 months of receiving the vaccine. The duration of immunity conferred by the vaccine is not clearly known. Some clinicians recommend that a booster be given at 5-10 years.

Vaccination of children is an effective means of preventing HBV infection and its complications. For example, although HBV infection is endemic in Taiwan, the institution of universal vaccination for neonates in Taiwan in 1984 reduced the HBsAg carrier rate in children from 9.8% to 0.7% over a period of 15 years. [88] There was also a resulting drop in the incidence of HCC in children from 0.54 to 0.20 per 100,000. Follow-up studies are needed to determine whether the overall incidence of HCC in Taiwan decreases as these children enter adulthood.

Vaccination is also recommended for older children and adolescents who were not vaccinated as infants; adults with diabetes; and household contacts and intimate partners of individuals with chronic hepatitis B infection.

Prevention of perinatal transmission

Mother-to-child transmission of hepatitis B most commonly occurs at birth, when the neonate is exposed to maternal blood and bodily fluids, or during early childhood. [5] Because acquiring hepatitis B infection early in life poses a high risk of developing chronic infection, strategies to reduce mother-to-child transmission are of vital importance. For such strategies to be effective, it is important that all pregnant women undergo screening for HBV infection so that they and their newborns may be treated appropriately. [9] Administering hepatitis B vaccination within 12 hours of birth to neonates born to mothers with hepatitis B infection is 80-95% effective in preventing transmission of hepatitis B infection. [4, 5] In some cases, depending upon the mother's viral load and human immunodeficiency virus (HIV) status, there may be indications to treat the mother with antiviral agents during pregnancy. [4, 5]

Immune globulin

Hepatitis B immune globulin (HBIG) is derived from plasma. It provides passive immunization for individuals who describe recent exposure to a patient infected with HBV. HBIG is also administered after liver transplantation to persons infected with HBV in order to prevent HBV-induced damage to the liver allograft.

Recommendations for postexposure prophylaxis for contacts of patients positive for HBsAg are as follows:

- Perinatal exposure – HBIG plus HBV vaccine at the time of birth (90% effective)

- Sexual contact with an acutely infected patient – HBIG plus HBV vaccine
- Sexual contact with a chronic carrier – HBV vaccine
- Household contact with an acutely infected patient – None
- Household contact with an acutely infected person resulting in known exposure – HBIG, with or without HBV vaccine
- Infant (age <12 months) primarily cared for by an acutely infected patient – HBIG, with or without HBV vaccine
- Inadvertent percutaneous or permucosal exposure – HBIG, with or without HBV vaccine

Improving health outcomes for those with HBV infection

Improving health outcomes for persons with HBV requires early identification so that they can be made aware of their infection and can receive appropriate treatment and education on risk reduction. To that end, it is recommended that individuals who are at high risk for HBV infection be offered appropriate testing and connection with care. [9]

Hepatitis C

No vaccine against HCV is available, and immune globulin is not proven to prevent transmission. In fact, immune globulin administration has been associated with HCV. At present, the major means of preventing transmission of HCV is to prevent infected blood, organs, and semen from entering the donor pools. The CDC also recommends meticulous infection control practices within healthcare settings. [9] Additionally, individuals who are at risk for HCV infection should be offered appropriate testing, treatment, and health education to reduce the risk of transmission.

Improving health outcomes for those with HCV infection

With newer treatments that can provide sustained viral response (SVR), health outcomes for individuals with HCV can be improved by linking them to care and providing appropriate treatment. [9] Because many individuals may not be aware that they are infected with HCV, providers should offer testing to individuals at risk to include those with a history of injection drug use, persons infected with HIV, and healthcare workers with bloodborne exposures to HCV. [46] Additionally, the CDC recommends one-time screening for all individuals born between 1945 and 1965 because this population is at high risk of HCV infection, and they are at highest risk for morbidity and mortality as a result of HCV infection. [9]

Prevention of perinatal transmission

The finding of HCV among increasing numbers of women of childbearing age raises the concern that more infants will be at risk for HCV as a result of mother-to-child transmission. Providers should screen pregnant women to assess their risks for HCV and offer testing if they are deemed to be at risk; additionally, infants born to infected mothers should be tested for HCV. Women of childbearing age, pregnant women, and infants who test positive for HCV should be referred for care, monitoring, and treatment.

Practical lesson № 15 . GLOMERULONEPHRITIS

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9

Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Background

Hippocrates originally described the natural history of acute GN, writing of back pain and hematuria followed by oliguria or anuria. Richard Bright (1789-1858) described acute GN clinically in 1827, which led to the eponymic designation Bright disease. With the development of the microscope, Theodor Langhans (1839-1915) was later able to describe these pathophysiologic glomerular changes.

Pathophysiology

Glomerular lesions in acute GN are the result of glomerular deposition or in situ formation of immune complexes. On gross appearance, the kidneys may be enlarged up to 50%. Histopathologic changes include swelling of the glomerular tufts and infiltration with polymorphonucleocytes (see Workup: Histologic Findings). Immunofluorescence reveals deposition of immunoglobulins and complement.

Except in PSGN, the exact triggers for the formation of the immune complexes are unclear. In PSGN, involvement of derivatives of streptococcal proteins has been reported. A streptococcal neuraminidase may alter host immunoglobulin G (IgG). IgG combines with host antibodies. IgG/anti-IgG immune complexes are formed and then collect in the glomeruli. In addition, elevations of antibody titers to other antigens, such as antistreptolysin O or antihyaluronidase, DNAase-B, and streptokinase, provide evidence of a recent streptococcal infection.

Stamatiades et al determined that in PSGN and other type III hypersensitivity reactions, vascular endothelial cells in the kidney actively transport circulating immune complexes from the capillaries to the peritubular interstitial space, where they are detected and scavenged by resident macrophages. Uptake of these immune complexes by the resident macrophages triggers the release of pro-inflammatory cytokines, which in turn results in recruitment of monocytes and neutrophils into the kidney from the circulation. [2]

Structural and functional changes

Acute GN involves both structural changes and functional changes.

Structurally, cellular proliferation leads to an increase in the number of cells in the glomerular tuft because of the proliferation of endothelial, mesangial, [3] and epithelial cells. The proliferation may be endocapillary (ie, within the confines of the glomerular capillary tufts) or extracapillary (ie, in the Bowman space involving the epithelial cells). In extracapillary proliferation, proliferation of parietal epithelial cells leads to the formation of crescents, a feature characteristic of certain forms of rapidly progressive GN.

Leukocyte proliferation is indicated by the presence of neutrophils and monocytes within the glomerular capillary lumen and often accompanies cellular proliferation.

Glomerular basement membrane thickening appears as thickening of capillary walls on light microscopy. On electron microscopy, this may appear as the result of thickening of basement membrane proper (eg, diabetes) or deposition of electron-dense material, either on the endothelial or epithelial side of the basement membrane. Electron-dense deposits can be subendothelial, subepithelial, intramembranous, or mesangial, and they correspond to an area of immune complex deposition.

Hyalinization or sclerosis indicates irreversible injury. These structural changes can be focal, diffuse or segmental, or global.

Functional changes include proteinuria, hematuria, reduction in GFR (ie, oliguria or anuria), and active urine sediment with RBCs and RBC casts. The decreased GFR and avid distal nephron salt and water retention result in expansion of intravascular volume, edema, and, frequently, systemic hypertension.

Poststreptococcal glomerulonephritis

Streptococcal M-protein was previously believed to be responsible for PSGN, but the studies on which this belief was based have been discounted. Nephritis-associated streptococcal cationic protease and its zymogen precursor (nephritis-associated plasmin receptor [NAPlr]) have been identified as a glyceraldehyde-3-phosphate dehydrogenase that functions as a plasmin(ogen) receptor.

Immunofluorescence staining of renal biopsy tissues with anti-NAPlr antibody revealed glomerular NAPlr deposition in early-phase acute PSGN, and glomerular plasmin activity was almost identical to NAPlr deposition in renal biopsy tissues of acute PSGN patients. These data

suggest that NAPlr may contribute to the pathogenesis of acute PSGN by maintaining plasmin activity. [4]
Antibody levels to nephritis-associated protease (NAPR) are elevated in streptococcal infections (group A, C, and G) associated with GN but are not elevated in streptococcal infections without GN, whereas anti-streptolysin-O titers are elevated in both circumstances. These antibodies to NAPR persist for years and perhaps are protective against further episodes of PSGN. In a study in adults, the two most frequently identified infectious agents were streptococci (27.9%) and staphylococci (24.4%). [5]
Go to Acute Poststreptococcal Glomerulonephritis for complete information on this topic.
Etiology
The causal factors that underlie acute GN can be broadly divided into infectious and noninfectious groups.

Infectious

The most common infectious cause of acute GN is infection by *Streptococcus*species (ie, group A, beta-hemolytic). Two types have been described, involving different serotypes:

- Serotype 12 - Poststreptococcal nephritis due to an upper respiratory infection, occurring primarily in the winter months
- Serotype 49 - Poststreptococcal nephritis due to a skin infection, usually observed in the summer and fall and more prevalent in southern regions of the United States

PSGN usually develops 1-3 weeks after acute infection with specific nephritogenic strains of group A beta-hemolytic streptococcus. The incidence of GN is approximately 5-10% in persons with pharyngitis and 25% in those with skin infections.
Nonstreptococcal postinfectious GN may also result from infection by other bacteria, viruses, parasites, or fungi. Bacteria besides group A streptococci that can cause acute GN include diplococci, other streptococci, staphylococci, and mycobacteria. *Salmonella typhosa*, *Brucella suis*, *Treponema pallidum*, *Corynebacterium bovis*, and actinobacilli have also been identified. Cytomegalovirus (CMV), coxsackievirus, Epstein-Barr virus (EBV), hepatitis B virus (HBV), [6] rubella, rickettsiae (as in scrub typhus), and mumps virus are accepted as viral causes only if it can be documented that a recent group A beta-hemolytic streptococcal infection did not occur. Acute GN has been documented as a rare complication of hepatitis A. [7]
Attributing glomerulonephritis to a parasitic or fungal etiology requires the exclusion of a streptococcal infection. Identified organisms include *Coccidioides immitis* and the following parasites: *Plasmodium malariae*, *Plasmodium falciparum*, *Schistosoma mansoni*, *Toxoplasma gondii*, filariasis, trichinosis, and trypanosomes.

Noninfectious

Noninfectious causes of acute GN may be divided into primary renal diseases, systemic diseases, and miscellaneous conditions or agents.
Multisystem systemic diseases that can cause acute GN include the following:

- Vasculitis (eg, granulomatosis with polyangiitis [Wegener granulomatosis]) - This causes glomerulonephritis that combines upper and lower granulomatous nephritides).
- Collagen-vascular diseases (eg, systemic lupus erythematosus [SLE]) – This causes glomerulonephritis through renal deposition of immune complexes).
- Hypersensitivity vasculitis – This encompasses a heterogeneous group of disorders featuring small vessel and skin disease.
- Cryoglobulinemia – This causes abnormal quantities of cryoglobulin in plasma that result in repeated episodes of widespread purpura and cutaneous ulcerations upon crystallization.
- Polyarteritis nodosa - This causes nephritis from a vasculitis involving the renal arteries.
- Henoch-Schönlein purpura – This causes a generalized vasculitis resulting in glomerulonephritis.

- Goodpasture syndrome – This causes circulating antibodies to type IV collagen and often results in a rapidly progressive oliguric renal failure (weeks to months).

Primary renal diseases that can cause acute GN include the following:

- Membranoproliferative glomerulonephritis (MPGN) - This is due to the expansion and proliferation of mesangial cells as a consequence of the deposition of complements. Type I refers to the granular deposition of C3; type II refers to an irregular process.
- Immunoglobulin A (IgA) nephropathy (Berger disease) - This causes GN as a result of diffuse mesangial deposition of IgA and IgG.
- "Pure" mesangial proliferative GN [3]
- Idiopathic rapidly progressive glomerulonephritis - This form of GN is characterized by the presence of glomerular crescents. Three types have been distinguished: Type I is an antiglomerular basement membrane disease, type II is mediated by immune complexes, and type III is identified by antineutrophil cytoplasmic antibody (ANCA).

Miscellaneous noninfectious causes of acute GN include the following:

- Guillain-Barré syndrome
- Irradiation of Wilms tumor
- Diphtheria-pertussis-tetanus (DPT) vaccine
- Serum sickness
- Epidermal growth factor receptor activation, [8] and possibly its inhibition by cetuximab [9]

Epidemiology

United States statistics

GN represents 10-15% of glomerular diseases. Variable incidence has been reported, in part because of the subclinical nature of the disease in more than half the affected population. Despite sporadic outbreaks, the incidence of PSGN has fallen over the past few decades. Factors responsible for this decline may include better health care delivery and improved socioeconomic conditions.

GN comprises 25-30% of all cases of end-stage renal disease (ESRD). About one fourth of patients present with acute nephritic syndrome. Most cases that progress do so relatively quickly, and end-stage renal failure may occur within weeks or months of the onset of acute nephritic syndrome. Asymptomatic episodes of PSGN exceed symptomatic episodes by a ratio of 3-4:1.

International statistics

Worldwide, IgA Nephropathy (Berger disease) is the most common cause of GN.

With some exceptions, the incidence of PSGN has fallen in most developed countries. Japanese researchers reported that incidence of postinfectious GN in their country peaked in the 1990s, and that PSGN, which accounted for almost all of the postinfectious GN cases in the 1970s, has decreased to approximately 40-50% since the 1990s, while the proportion of *Staphylococcus aureus* infection–related nephritis increased to 30%, and hepatitis C virus infection–associated GN also increased. [10]

PSGN remains much more common in regions such as Africa, the Caribbean, India, Pakistan, Malaysia, Papua New Guinea, and South America. In Port Harcourt, Nigeria, the incidence of acute GN in children aged 3-16 years was 15.5 cases per year, with a male-to-female ratio of 1.1:1; the current incidence is not much different.[11] A study from a regional dialysis center in Ethiopia found that acute GN was second only to hypovolemia as a cause of acute kidney injury that required dialysis, accoujting for approximately 22% of cases. [12]

Geographic and seasonal variations in the prevalence of PSGN are more marked for pharyngeally associated GN than for cutaneously associated disease. [11, 13, 14]

Age-, sex-, and race-related demographics

Postinfectious GN can occur at any age but usually develops in children. Most cases occur in patients aged 5-15 years; only 10% occur in patients older than 40 years. Outbreaks of PSGN are common in children aged 6-10 years. Acute nephritis may occur at any age, including infancy. Acute GN predominantly affects males (2:1 male-to-female ratio). Postinfectious GN has no predilection for any racial or ethnic group. A higher incidence (related to poor hygiene) may be observed in some socioeconomic groups.

Prognosis

Most epidemic cases follow a course ending in complete patient recovery (as many as 100%). The mortality of acute GN in the most commonly affected age group, pediatric patients, has been reported at 0-7%.

Sporadic cases of acute nephritis often progress to a chronic form. This progression occurs in as many as 30% of adult patients and 10% of pediatric patients. GN is the most common cause of chronic renal failure (25%).

In PSGN, the long-term prognosis generally is good. More than 98% of individuals are asymptomatic after 5 years, with chronic renal failure reported 1-3% of the time.

Within a week or so of onset, most patients with PSGN begin to experience spontaneous resolution of fluid retention and hypertension. C3 levels may normalize within 8 weeks after the first sign of PSGN. Proteinuria may persist for 6 months and microscopic hematuria for up to 1 year after onset of nephritis.

Eventually, all urinary abnormalities should disappear, hypertension should subside, and renal function should return to normal. In adults with PSGN, full recovery of renal function can be expected in just over half of patients, and prognosis is dismal in patients with underlying diabetic glomerulosclerosis. Few patients with acute nephritis develop rapidly progressive renal failure. Approximately 15% of patients at 3 years and 2% of patients at 7-10 years may have persistent mild proteinuria. Long-term prognosis is not necessarily benign. Some patients may develop hypertension, proteinuria, and renal insufficiency as long as 10-40 years after the initial illness. Immunity to type M protein is type-specific, long-lasting, and protective. Repeated episodes of PSGN are therefore unusual.

The prognosis for nonstreptococcal postinfectious GN depends on the underlying agent, which must be identified and addressed. Generally, the prognosis is worse in patients with heavy proteinuria, severe hypertension, and significant elevations of creatinine level. Nephritis associated with methicillin-resistant *Staphylococcus aureus* (MRSA) and chronic infections usually resolves after treatment of the infection.

In a pooled analysis of poststaphylococcal GN, only 44.7% of patients achieved remission; 22.9% progressed to ESRD and remained dialysis-dependent, and 14.5% died. Older age and diabetes mellitus were risk factors for adverse outcomes. [1]

Other causes of acute GN have outcomes varying from complete recovery to complete renal failure. The prognosis depends on the underlying disease and the overall health of the patient. The occurrence of cardiopulmonary or neurologic complications worsens the prognosis.

Murakami and colleagues examined the clinical characteristics and pathological patterns of postinfectious glomerulonephritis in 72 HIV-infected patients. The most common infectious agent was *Staphylococcus*. During a median of 17 months of follow-up, pathological patterns had no significant effects on renal outcomes. Mortality occurred in 14 patients overall, and mortality rates were significantly elevated among the 28 patients with healed postinfectious glomerulonephritis. [15]

In a retrospective study of 101 patients with severe lupus and rapidly progressive glomerulonephritis and 200 lupus patient controls who were followed for a median of 4 years, rapidly progressive glomerulonephritis was associated with poorer treatment response, atrophy and fibrosis, severe renal manifestations, serious sclerotic and crescentic glomeruli lesions, severe tubulointerstitial inflammation, and prominent leukocyte infiltration. Serum creatinine

levels and the proportion of crescents were the most important predictors of developing end-stage renal disease. [16]

Xu et al reported an association between elevation in plasma phosphorus levels and adverse renal outcomes in Chinese patients with glomerulonephritis. In their prospective study, each 1 mg/dL elevation in baseline phosphorus was associated with a 1.33-fold higher risk of 50% reduction in eGFR, end-stage renal disease, or death. [17]

Patient Education

Counsel patients about the need for the following measures:

- Salt restriction during the acute phase to control edema and volume-related hypertension
- Blood pressure monitoring at periodic intervals
- Ongoing long-term monitoring of patients with persistent urinary abnormalities and elevated blood pressure
- Consideration of protein restriction and angiotensin-converting enzyme (ACE) inhibitors (in patients who show evidence of persistent abnormalities or in those who develop late evidence of progressive disease)
- Early antibiotic treatment of close contacts

For patient education resources, see the Kidneys and Urinary System Center, as well as Blood in the Urine.

Practical lesson № 15. CHRONIC PYELONEPHRITIS

Technological module of the LESSON	
Hours: Practice: 3 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 6 hours		

Background

Chronic pyelonephritis is characterized by renal inflammation and fibrosis induced by recurrent or persistent renal infection, vesicoureteral reflux, or other causes of urinary tract obstruction. The diagnosis of chronic pyelonephritis is made based on imaging studies such as

ultrasound or CT scanning. It occurs almost exclusively in patients with major anatomic anomalies, most commonly in young children with vesicoureteral reflux (VUR).

VUR is a congenital condition that results from incompetence of the ureterovesical valve due to a short intramural segment. VUR is present in 30-40% of young children with symptomatic UTIs and in almost all children with renal scars. It may also be acquired by patients with a flaccid bladder due to spinal cord injury. VUR is classified into 5 grades (I-V), according to the increasing degree of reflux. (See Treatment.) The diagnosis of VUR is frequently established on the basis of radiologic evidence obtained during an evaluation for recurrent urinary tract infection (UTI) in young children.

For patient education information, see Urinary Tract Infections (UTIs).

Etiology and Pathophysiology

Chronic pyelonephritis is associated with progressive renal scarring, which can lead to end-stage renal disease (ESRD). For example, in reflux nephropathy, intrarenal reflux of infected urine is suggested to induce renal injury, which heals with scar formation. [2] In some cases, scars may form in utero in patients with renal dysplasia with perfusion defects. Infection without reflux is less likely to produce injury. Dysplasia may also be acquired from obstruction. Scars of high-pressure reflux can occur in persons of any age. In some cases, normal growth may lead to spontaneous cessation of reflux by age 6 years.

Factors that may affect the pathogenesis of chronic pyelonephritis are as follows: (1) the sex of the patient and his or her sexual activity; (2) pregnancy, which may lead to progression of renal injury with loss of renal function; (3) genetic factors; (4) bacterial virulence factors; and (5) neurogenic bladder dysfunction. In cases with obstruction, the kidney may become filled with abscess cavities.

Epidemiology

In the United States, VUR may be present in 30-40% of children with UTIs. The prevalence rate of VUR in siblings of patients with chronic pyelonephritis is approximately 35%. VUR and chronic pyelonephritis are less common in African American children than in white children, with chronic pyelonephritis occurring 3 times more often in white children. Chronic pyelonephritis is also twice as common in females as it is in males.

Chronic pyelonephritis occurs more often in infants and young children (younger than 2 y) than it does in older children and adults.

Prognosis

The Birmingham Reflux Study clearly showed that medical and surgical management are equally effective in preventing renal damage from VUR. Almost all children should receive a trial of medical management.

Although most children with chronic pyelonephritis due to VUR may experience spontaneous resolution of reflux, approximately 2% can still progress to renal failure, and 5-6% can have long-term complications, including hypertension.

Hypertension contributes to the accelerated loss of renal function in persons with chronic pyelonephritis. Reflux nephropathy is the most common cause of hypertension in children, occurring in 10-20% of children with VUR and renal scars. The resolution of reflux does not appear to correct hypertension.

Complications of chronic pyelonephritis can also include the following:

- Proteinuria
- Focal glomerulosclerosis
- Progressive renal scarring leading to end-stage renal disease
- Xanthogranulomatous pyelonephritis (XPN) - May occur in approximately 8.2% of cases and in 25% of patients with pyonephrosis; XPN can be confused with renal cancer
- Pyonephrosis - May occur in cases of obstruction
- Progressive renal scarring (reflux nephropathy)

History and Physical Examination

Some children with chronic pyelonephritis may report the following:

- Fever
- Lethargy
- Nausea and vomiting
- Flank pain or dysuria

The following may be noted on physical examination:

- Hypertension
- Failure to thrive in young children
- Flank tenderness

Diagnostic Considerations

Chronic pyelonephritis may resemble the following :

- Analgesic abuse nephropathy
- Renal tuberculosis
- Renal dysplasia
- Xanthogranulomatous pyelonephritis
- Renal malakoplakia

In malakoplakia, however, characteristic inclusions called Michaelis-Gutmann bodies are seen on biopsy.

Differential Diagnoses

- Acute Pyelonephritis
- Azotemia
- Chronic Kidney Disease
- Hypertension
- Nephrolithiasis
- Perinephric Abscess
- Pyonephrosis
- Tuberculosis (TB)
- Uremia
- Xanthogranulomatous Pyelonephritis Imaging

Approach Considerations

The characteristic renal scars of VUR are often present at the time of the initial diagnosis of chronic pyelonephritis. New renal scars may develop in 3-5% of patients after the initial evaluation. The progression of renal scars is inversely related to the promptness with which specific antibiotic therapy is instituted. The presence of new scars often suggests the occurrence of breakthrough infections.

Urinalysis results may reveal pyuria. Obtain a urine culture, which often isolates gram-negative bacteria, such as *Escherichia coli* or *Proteus* species. A negative result from urine culture does not exclude a diagnosis of chronic pyelonephritis. Proteinuria may be present and is a negative prognostic factor for this chronic pyelonephritis. Serum creatinine and blood urine nitrogen levels are elevated (azotemia).

Renal biopsy specimens show focal glomerulosclerosis in advanced reflux nephropathy, while XPN must be distinguished from renal malakoplakia based on the presence of inclusions called Michaelis-Gutmann bodies in the latter.

Imaging Studies

Findings from an intravenous urogram help to establish the diagnosis of pyelonephritis, because they reveal caliceal dilatation and blunting with cortical scars. Ureteral dilatation and reduced renal size also may be evident.

Voiding cystourethrogram (VCUG) findings may document the reflux of urine to the renal pelvis and ureteral dilatation in children with gross reflux.

Radioisotopic scanning with technetium dimercaptosuccinic acid is more sensitive than intravenous pyelography for helping to detect renal scars. This is the preferred test for many pediatric nephrologists and radiologists, because it is sensitive and easy to perform.

Cystoscopy findings show evidence of previous reflux at the ureteral orifices, even if voiding cystourethrogram (VCUG) images show no reflux because of the spontaneous cessation of reflux due to puberty.

Computed tomography (CT) scanning is the procedure of choice to help diagnose XPN. Renal ultrasonographic images may show calculi, but ultrasonography is not a sensitive screening procedure for reflux nephropathy. However, many cases of VUR are suggested based on prenatal ultrasonographic findings.

Approach Considerations

VUR Stages I and II

This is reflux of urine to the ureter or renal pelvis without ureteral dilatation. Medical therapy with antibiotics, such as amoxicillin, trimethoprim/sulfamethoxazole (Bactrim), trimethoprim alone, or nitrofurantoin, is usually sufficient.

Continue antibiotic therapy until puberty or until reflux resolves. The rule in these cases is spontaneous resolution; surgery is not indicated.

VUR Stages III and IV (severe reflux)

Data from the Birmingham Reflux Study show that medical and surgical therapies for reflux are equally effective. [4] Surgery entails the reimplantation of the ureters, with the creation of an adequate submucosal tunnel and detrusor support. The following are indications for surgical therapy:

- Failure to comply with medical regimen, with formation of new scars
- Breakthrough infections occurring in patients who are compliant
- Women of childbearing age who prefer surgical therapy
- Reflux persisting after puberty in women - Should be surgically treated to prevent possible complications (eg, pyelonephritis, abortions in pregnancy)

VUR Stage V (severe reflux)

Surgery is recommended in all children older than 1 year with bilateral reflux with or without the presence of renal scarring. Patients aged 1-5 years with unilateral reflux and no scarring may initially be treated with antibiotic prophylaxis.

Deterrence/prevention

Progressive renal injury can be reduced by dietary protein restriction, while aggressive blood pressure control aids in slowing progression of renal failure. Angiotensin-converting enzyme (ACE) inhibitors are particularly beneficial in treating hypertension.

Careful follow-up and monitoring of renal function is beneficial. Vigorously treat a UTI or bacteriuria in a patient who is pregnant to prevent renal failure, preeclampsia, and abortions. Renal ultrasonography is recommended for siblings of patients with VUR. If an abnormality is found, then perform a voiding cystourethrogram (VCUG).

Medication Summary

The penicillins (amoxicillin) and first-generation cephalosporins are the drugs of choice because of good activity against gram-negative rods and good oral bioavailability. In infants, the choice of antibiotics is either amoxicillin or a first-generation cephalosporin. In patients aged 3-6 months, therapy can be changed to sulfamethoxazole or nitrofurantoin. Older children and adults may be treated with trimethoprim-sulfamethoxazole (Bactrim).

Once one antibiotic is chosen, frequent changes in the antibiotic regimen are discouraged to help prevent the development of resistance.

Antibiotics

Class Summary

Antibiotic therapy must be comprehensive and cover all likely pathogens in the context of this clinical setting.

Amoxicillin (Moxatag)

- View full drug information

Amoxicillin interferes with the synthesis of cell wall mucopeptides during active multiplication, resulting in bactericidal activity against susceptible bacteria..

Cephalexin (Keflex)

- View full drug information

Cephalexin is a first-generation cephalosporin that arrests bacterial growth by inhibiting bacterial cell wall synthesis. It has bactericidal activity against rapidly growing organisms.

Trimethoprim/sulfamethoxazole (Bactrim DS, Septra DS, Sulfatrim)

- View full drug information

Trimethoprim/sulfamethoxazole inhibits bacterial growth by inhibiting the synthesis of dihydrofolic acid. Bacterial species it acts against include common urinary tract pathogens, except Pseudomonas aeruginosa.

Nitrofurantoin (Furadantin, Macrodantin, Macrobid)

This is a synthetic nitrofuran that interferes with bacterial carbohydrate metabolism by inhibiting acetylcoenzyme A. Nitrofurantoin is bacteriostatic at low concentrations (5-10 mcg/mL) and bactericidal at higher concentrations.

Practical lesson № 16. RHEUMATOID ARTHRITIS

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON

Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Method of teaching	Presentation and information
Location	The consecrated cabinet

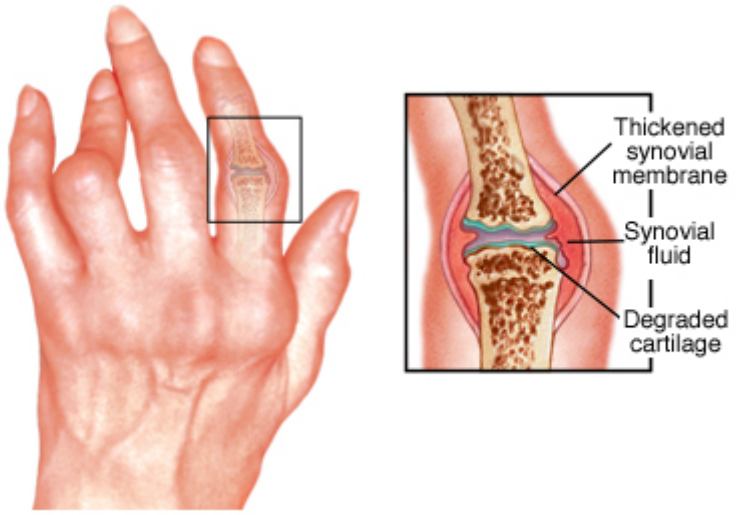
Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 4 hours		

Autoimmune diseases are illnesses that occur when the body's tissue mistakenly attacks its own immune system. Patients with these types of diseases have antibodies in their blood that target their own body's tissues. Rheumatoid arthritis is an autoimmune disease that causes chronic inflammation the joints as well as other organs in the body. It often develops gradually over a period of years, however, in rare cases it can appear Rheumatoid arthritis affects more than two million people each year in the United States alone. It afflicts people of all races equally, but is three times more common in women than in men. It occurs most often in people twenty to fifty years old, however,

young children and the elderly also have the potential to develop the disease. The exact cause of rheumatoid arthritis is unknown.

Overview



- Rheumatoid arthritis

Rheumatoid arthritis is a chronic inflammatory disorder that can affect more than just your joints. In some people, the condition also can damage a wide variety of body systems, including the skin, eyes, lungs, heart and blood vessels.

An autoimmune disorder, rheumatoid arthritis occurs when your immune system mistakenly attacks your own body's tissues.

Unlike the wear-and-tear damage of osteoarthritis, rheumatoid arthritis affects the lining of your joints, causing a painful swelling that can eventually result in bone erosion and joint deformity.

The inflammation associated with rheumatoid arthritis is what can damage other parts of the body as well. While new types of medications have improved treatment options dramatically, severe rheumatoid arthritis can still cause physical disabilities.

Symptoms

Signs and symptoms of rheumatoid arthritis may include:

- Tender, warm, swollen joints
- Joint stiffness that is usually worse in the mornings and after inactivity
- Fatigue, fever and weight loss

Early rheumatoid arthritis tends to affect your smaller joints first — particularly the joints that attach your fingers to your hands and your toes to your feet.

As the disease progresses, symptoms often spread to the wrists, knees, ankles, elbows, hips and shoulders. In most cases, symptoms occur in the same joints on both sides of your body.

About 40 percent of the people who have rheumatoid arthritis also experience signs and symptoms that don't involve the joints. Rheumatoid arthritis can affect many nonjoint structures, including:

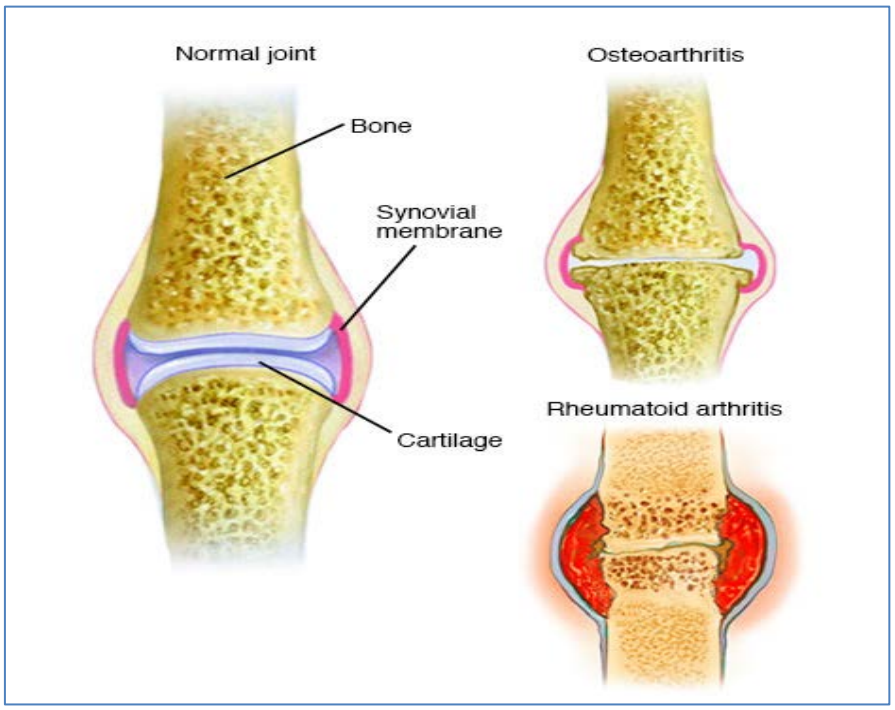
- Skin
- Eyes
- Lungs
- Heart
- Kidneys
- Salivary glands
- Nerve tissue
- Bone marrow
- Blood vessels

Rheumatoid arthritis signs and symptoms may vary in severity and may even come and go. Periods of increased disease activity, called flares, alternate with periods of relative remission — when the swelling and pain fade or disappear. Over time, rheumatoid arthritis can cause joints to deform and shift out of place.

When to see a doctor

Make an appointment with your doctor if you have persistent discomfort and swelling in your joints.

Causes

- 

Rheumatoid arthritis vs. osteoarthritis

Rheumatoid arthritis occurs when your immune system attacks the synovium — the lining of the membranes that surround your joints.

The resulting inflammation thickens the synovium, which can eventually destroy the cartilage and bone within the joint.

The tendons and ligaments that hold the joint together weaken and stretch. Gradually, the joint loses its shape and alignment.

Doctors don't know what starts this process, although a genetic component appears likely. While your genes don't actually cause rheumatoid arthritis, they can make you more susceptible to environmental factors — such as infection with certain viruses and bacteria — that may trigger the disease.

Risk factors

Factors that may increase your risk of rheumatoid arthritis include:

- **Your sex.** Women are more likely than men to develop rheumatoid arthritis.
- **Age.** Rheumatoid arthritis can occur at any age, but it most commonly begins between the ages of 40 and 60.

- **Family history.** If a member of your family has rheumatoid arthritis, you may have an increased risk of the disease.
- **Smoking.** Cigarette smoking increases your risk of developing rheumatoid arthritis, particularly if you have a genetic predisposition for developing the disease. Smoking also appears to be associated with greater disease severity.
- **Environmental exposures.** Although uncertain and poorly understood, some exposures such as asbestos or silica may increase the risk for developing rheumatoid arthritis. Emergency workers exposed to dust from the collapse of the World Trade Center are at higher risk of autoimmune diseases such as rheumatoid arthritis.
- **Obesity.** People who are overweight or obese appear to be at somewhat higher risk of developing rheumatoid arthritis, especially in women diagnosed with the disease when they were 55 or younger.

Complications

Rheumatoid arthritis increases your risk of developing:

- **Osteoporosis.** Rheumatoid arthritis itself, along with some medications used for treating rheumatoid arthritis, can increase your risk of osteoporosis — a condition that weakens your bones and makes them more prone to fracture.
- **Rheumatoid nodules.** These firm bumps of tissue most commonly form around pressure points, such as the elbows. However, these nodules can form anywhere in the body, including the lungs.
- **Dry eyes and mouth.** People who have rheumatoid arthritis are much more likely to experience Sjogren's syndrome, a disorder that decreases the amount of moisture in your eyes and mouth.
- **Infections.** The disease itself and many of the medications used to combat rheumatoid arthritis can impair the immune system, leading to increased infections.
- **Abnormal body composition.** The proportion of fat compared to lean mass is often higher in people who have rheumatoid arthritis, even in people who have a normal body mass index (BMI).
- **Carpal tunnel syndrome.** If rheumatoid arthritis affects your wrists, the inflammation can compress the nerve that serves most of your hand and fingers.
- **Heart problems.** Rheumatoid arthritis can increase your risk of hardened and blocked arteries, as well as inflammation of the sac that encloses your heart.

- **Lung disease.** People with rheumatoid arthritis have an increased risk of inflammation and scarring of the lung tissues, which can lead to progressive shortness of breath.
- **Lymphoma.** Rheumatoid arthritis increases the risk of lymphoma, a group of blood cancers that develop in the lymph system.

Diagnosis

Rheumatoid arthritis can be difficult to diagnose in its early stages because the early signs and symptoms mimic those of many other diseases. There is no one blood test or physical finding to confirm the diagnosis.

During the physical exam, your doctor will check your joints for swelling, redness and warmth. He or she may also check your reflexes and muscle strength.

Blood tests

People with rheumatoid arthritis often have an elevated erythrocyte sedimentation rate (ESR, or sed rate) or C-reactive protein (CRP), which may indicate the presence of an inflammatory process in the body. Other common blood tests look for rheumatoid factor and anti-cyclic citrullinated peptide (anti-CCP) antibodies.

Imaging tests

Your doctor may recommend X-rays to help track the progression of rheumatoid arthritis in your joints over time. MRI and ultrasound tests can help your doctor judge the severity of the disease in your body.

Treatment

There is no cure for rheumatoid arthritis. But recent discoveries indicate that remission of symptoms is more likely when treatment begins early with strong medications known as disease-modifying antirheumatic drugs (DMARDs).

Medications

The types of medications recommended by your doctor will depend on the severity of your symptoms and how long you've had rheumatoid arthritis.

- **NSAIDs.** Nonsteroidal anti-inflammatory drugs (NSAIDs) can relieve pain and reduce inflammation. Over-the-counter NSAIDs include ibuprofen (Advil, Motrin IB) and naproxen sodium (Aleve). Stronger NSAIDs are available by prescription. Side effects may

include ringing in your ears, stomach irritation, heart problems, and liver and kidney damage.

- **Steroids.** Corticosteroid medications, such as prednisone, reduce inflammation and pain and slow joint damage. Side effects may include thinning of bones, weight gain and diabetes. Doctors often prescribe a corticosteroid to relieve acute symptoms, with the goal of gradually tapering off the medication.
- **Disease-modifying antirheumatic drugs (DMARDs).** These drugs can slow the progression of rheumatoid arthritis and save the joints and other tissues from permanent damage. Common DMARDs include methotrexate (Trexall, Otrexup, Rasuvo), leflunomide (Arava), hydroxychloroquine (Plaquenil) and sulfasalazine (Azulfidine).

  Side effects vary but may include liver damage, bone marrow suppression and severe lung infections.

- **Biologic agents.** Also known as biologic response modifiers, this newer class of DMARDs includes abatacept (Orencia), adalimumab (Humira), anakinra (Kineret), certolizumab (Cimzia), etanercept (Enbrel), golimumab (Simponi), infliximab (Remicade), rituximab (Rituxan), tocilizumab (Actemra) and tofacitinib (Xeljanz).

  These drugs can target parts of the immune system that trigger inflammation that causes joint and tissue damage. These types of drugs also increase the risk of infections.

  Biologic DMARDs are usually most effective when paired with a nonbiologic DMARD, such as methotrexate.

Therapy

Your doctor may send you to a physical or occupational therapist who can teach you exercises to help keep your joints flexible. The therapist may also suggest new ways to do daily tasks, which will be easier on your joints. For example, if your fingers are sore, you may want to pick up an object using your forearms.

Assistive devices can make it easier to avoid stressing your painful joints. For instance, a kitchen knife equipped with a saw handle helps protect your finger and wrist joints. Certain tools, such as buttonhooks, can make it easier to get dressed. Catalogs and medical supply stores are good places to look for ideas.

Surgery

If medications fail to prevent or slow joint damage, you and your doctor may consider surgery to repair damaged joints. Surgery may help restore your ability to use your joint. It can also reduce pain and correct deformities.

Rheumatoid arthritis surgery may involve one or more of the following procedures:

- **Synovectomy.** Surgery to remove the inflamed synovium (lining of the joint). Synovectomy can be performed on knees, elbows, wrists, fingers and hips.
- **Tendon repair.** Inflammation and joint damage may cause tendons around your joint to loosen or rupture. Your surgeon may be able to repair the tendons around your joint.
- **Joint fusion.** Surgically fusing a joint may be recommended to stabilize or realign a joint and for pain relief when a joint replacement isn't an option.
- **Total joint replacement.** During joint replacement surgery, your surgeon removes the damaged parts of your joint and inserts a prosthesis made of metal and plastic.

Surgery carries a risk of bleeding, infection and pain. Discuss the benefits and risks with your doctor.

Clinical trials

Explore Mayo Clinic studies testing new treatments, interventions and tests as a means to prevent, detect, treat or manage this disease.

Lifestyle and home remedies

You can take steps to care for your body if you have rheumatoid arthritis. These self-care measures, when used along with your rheumatoid arthritis medications, can help you manage your signs and symptoms:

- **Exercise regularly.** Gentle exercise can help strengthen the muscles around your joints, and it can help fight fatigue you might feel. Check with your doctor before you start exercising. If you're just getting started, begin by taking a walk. Try swimming or gentle water aerobics. Avoid exercising tender, injured or severely inflamed joints.
- **Apply heat or cold.** Heat can help ease your pain and relax tense, painful muscles. Cold may dull the sensation of pain. Cold also has a numbing effect and decreases muscle spasms.
- **Relax.** Find ways to cope with pain by reducing stress in your life. Techniques such as guided imagery, distraction and muscle relaxation can all be used to control pain.

Alternative medicine

Some common complementary and alternative treatments that have shown promise for rheumatoid arthritis include:

- **Fish oil.** Some preliminary studies have found that fish oil supplements may reduce rheumatoid arthritis pain and stiffness. Side effects can include nausea, belching and a fishy taste in the mouth. Fish oil can interfere with medications, so check with your doctor first.
- **Plant oils.** The seeds of evening primrose, borage and black currant contain a type of fatty acid that may help with rheumatoid arthritis pain and morning stiffness. Side effects may include nausea, diarrhea and gas. Some plant oils can cause liver damage or interfere with medications, so check with your doctor first.
- **Tai chi.** This movement therapy involves gentle exercises and stretches combined with deep breathing. Many people use tai chi to relieve stress in their lives. Small studies have found that tai chi may reduce rheumatoid arthritis pain. When led by a knowledgeable instructor, tai chi is safe. But don't do any moves that cause pain.

Coping and support

The pain and disability associated with rheumatoid arthritis can affect a person's work and family life. Depression and anxiety are common, as are feelings of helplessness and low self-esteem.

The degree to which rheumatoid arthritis affects your daily activities depends in part on how well you cope with the disease. Talk to your doctor or nurse about strategies for coping. With time you'll learn what strategies work best for you. In the meantime, try to:

- **Take control.** With your doctor, make a plan for managing your arthritis. This will help you feel in charge of your disease.
- **Know your limits.** Rest when you're tired. Rheumatoid arthritis can make you prone to fatigue and muscle weakness. A rest or short nap that doesn't interfere with nighttime sleep may help.
- **Connect with others.** Keep your family aware of how you're feeling. They may be worried about you but might not feel comfortable asking about your pain. Find a family member or friend you can talk to when you're feeling especially overwhelmed. Also connect with other people who have rheumatoid arthritis — whether through a support group in your community or online.
- **Take time for yourself.** It's easy to get busy and not take time for yourself. Find time for what you like, whether it's time to write in a journal, go for a walk or listen to music. Use this time to relieve stress and reflect on your feelings.

Preparing for your appointment

While you might first discuss your symptoms with your family doctor, he or she may refer you to a rheumatologist — a doctor who specializes in the treatment of arthritis and other inflammatory conditions — for further evaluation.

What you can do?

Write a list that includes:

- Detailed descriptions of your symptoms
- Information about medical problems you've had in the past
- Information about the medical problems of your parents or siblings
- All the medications and dietary supplements you take
- Questions you want to ask the doctor

What to expect from your doctor?

Your doctor may ask some of the following questions:

- When did your symptoms begin?
- Have your symptoms changed over time?
- Which joints are affected?
- Does any activity make your symptoms better or worse?
- Are your symptoms interfering with daily tasks?

Practical lesson № 17. DEFORMING OSTEOARTHRITIS

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases
Short annotation	D*efinition.* • *Etiology.*

	• *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Метод обучения	Presentation and information
Место проведения	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
1.Stage of introduction to the lesson (15 minutes)	1. Preparation of material for the lesson. 2. Preparation of slides for display 3.Development of the list of used literature for the subject	Students Observe Participate Listen and answer questions
2 - The main stage (55minutes)	1.Using posters 2.Using slides, multime dia 3.Summarizes all the data on the topic and draws conclusions. Active students are encouraged	Listening Listening
The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 3 hours		

Practical lesson № 18. GOUT

Technological module of the LESSON	
Hours: Practice: 1 hours Clinical: 3 hours	Number of students 8-9
Occupation form	PRACTICAL LESSON
Lesson plan	1. To teach to diagnose diseases; 2. To learn the proper treatment and prevention of diseases

Short annotation	D*efinition.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.*
Purpose	Familiarize students with the etiology, pathogenesis and classification of diseases. Correctly diagnose and treat therapeutic diseases.
Equipping a practical lesson:	Handout, computer, multimedia, video
Метод обучения	Presentation and information
Место проведения	The consecrated cabinet

Technological map of practical and clinical exercises

Stages of work and hours.	Stages of conducting the lesson by the teacher	Learning
Preparatory stage (10 minutes)	1.Control for the purity of the audience 2.Testing the preparedness of students for a lesson 3. Control of attendance	Students
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The final stage (10 minutes)	1. Make the final conclusions 2. Gives independent work 3.Has homework	Listens Write off Write off
Total: 3 hours		

Practice Essentials

Gout and pseudogout are the 2 most common crystal-induced arthropathies. Gout (see the image below) is caused by monosodium urate monohydrate crystals; pseudogout is caused by calcium pyrophosphate crystals and is more accurately termed calcium pyrophosphate disease.
Gout. Acute podagra due to gout in elderly man.

Signs and symptoms

Symptoms of gout or pseudogout include the following:

- Podagra (initial joint manifestation in 50% of gout cases and eventually involved in 90%; also observed in patients with pseudogout and other conditions)
- Arthritis in other sites – In gout, the instep, ankle, wrist, finger joints, and knee; in pseudogout, large joints (eg, the knee, wrist, elbow, or ankle)

- Monoarticular involvement most commonly, though polyarticular acute flares are not rare, and many different joints may be involved simultaneously or in rapid succession
- In gout, attacks that begin abruptly and typically reach maximum intensity within 8-12 hours; in pseudogout, attacks resembling those of acute gout or a more insidious onset that occurs over several days
- Without treatment, symptom patterns that change over time; attacks can become more polyarticular, involve more proximal and upper-extremity joints, occur more often, and last longer
- In some cases, eventual development of chronic polyarticular arthritis that can resemble rheumatoid arthritis

Physical findings may include the following:

- Involvement of a single (most common) or multiple joints
- Signs of inflammation – Swelling, warmth, erythema (sometimes resembling cellulitis), and tenderness
- Fever (also consider infectious arthritis)
- Migratory polyarthritis (rare)
- Posterior interosseous nerve syndrome (rare)
- Tophi in soft tissues (helix of the ear, fingers, toes, prepatellar bursa, olecranon)
- Eye involvement – Tophi, crystal-containing conjunctival nodules, band keratopathy, blurred vision, anterior uveitis (rare), scleritis

Complications of gout include the following:

- Severe degenerative arthritis
- Secondary infections
- Urate or uric acid nephropathy
- Increased susceptibility to infection
- Urate nephropathy
- Renal stones
- Nerve or spinal cord impingement
- Fractures in joints with tophaceous gout

Diagnosis

Studies that may be helpful include the following:

- Joint aspiration and synovial fluid analysis
- Serum uric acid measurement (though hyperuricemia is not diagnostic of gout)
- 24-hour urinary uric acid evaluation
- Blood studies (including white blood cells [WBCs, triglyceride, high-density lipoprotein, glucose, and renal and liver function tests)

Plain radiographs may show findings consistent with gout. Erosions with overhanging edges are generally considered pathognomonic for gout (though also found in other diseases). Characteristics of erosions typical of gout include the following:

- Maintenance of the joint space
- Absence of periarticular osteopenia
- Location outside the joint capsule
- Sclerotic (cookie-cutter, punched-out) borders
- Asymmetric distribution among the joints, with a strong predilection for distal joints, especially in the lower extremities

Ultrasonographic findings in established gout include the following:

- A “double-contour” sign, consisting of a hyperechoic, irregular line of MSU crystals on the surface of articular cartilage overlying an adjacent hyperechoic bony contour
- “Wet clumps of sugar,” representing tophaceous material, described as hyperechoic and hypoechoic heterogeneous material with an anechoic rim
- Bony erosions adjacent to tophaceous deposits

Other imaging modalities that may be considered include the following:

- Computed tomography (CT) – Complementary to plain radiography for recognizing erosions in gout
- Magnetic resonance imaging (MRI) – MRI with gadolinium is recommended when tendon sheath involvement must be evaluated and when osteomyelitis is in the differential diagnosis

Management

Gout is managed in the following 3 stages:

- Treating the acute attack
- Providing prophylaxis to prevent acute flares
- Lowering excess stores of urate to prevent flares of gouty arthritis and to prevent tissue deposition of urate crystals

Acute treatment of proven crystal-induced arthritis is directed at relief of the pain and inflammation. Agents used in this setting include the following:

- Nonsteroidal anti-inflammatory drugs (NSAIDs), such as indomethacin
- Corticosteroids
- Colchicine (now less commonly used for acute gout than it once was)
- Adrenocorticotropic hormone (ACTH)
- Combinations of drugs (colchicine plus NSAIDs, oral corticosteroids plus colchicine, intra-articular steroids plus colchicine or NSAIDs)

Therapy to control the underlying hyperuricemia generally is contraindicated until the acute attack is controlled (unless kidneys are at risk because of an unusually heavy uric acid load).

Long-term management of gout is focused on lowering uric acid levels. Agents used include the following:

- Allopurinol
- Febuxostat
- Probenecid

Because these agents change serum and tissue uric acid levels, they may precipitate acute attacks of gout. This undesired effect may be reduced by prophylaxis with the following:

- Colchicine or low-dose NSAIDs
- Low-dose prednisone (if patients cannot take colchicine or NSAIDs)

Other therapeutic agents that may be considered include the following:

- Uricase and pegloticase
- Vitamin C
- Anakinra
- Fenofibrate
- Lesinurad/allopurinol

Nonpharmacologic measures that may be warranted are as follows:

- Avoidance or restricted consumption of high-purine foods
- Avoidance of excess ingestion of alcoholic drinks, particularly beer
- Avoidance of sodas and other beverages or foods sweetened with high-fructose corn syrup
- Limited use of naturally sweet fruit juices, table sugar, and sweetened beverages and desserts, as well as table salt
- Maintenance of a high level of hydration with water (≥8 glasses of liquids daily)
- A low-cholesterol, low-fat diet, if such a diet is otherwise appropriate for the patient
- Weight reduction in patients who are obese

See Treatment and Medication for more detail.

Background

Gout and pseudogout are the two most common crystal-induced arthropathies. Gout is caused by monosodium urate monohydrate crystals; pseudogout is caused by calcium pyrophosphate (CPP) crystals and is more accurately termed calcium pyrophosphate disease (CPPD). (See

Pathophysiology and Etiology.) Gout is one of the oldest diseases in the medical literature, [1, 2] known since the time of the ancient Greeks. Pseudogout, which may be clinically indistinguishable from gout, was recognized as a distinct disease entity in 1962.

Crystal deposition can be asymptomatic, but gout and CPPD can develop into debilitating illnesses marked by recurrent episodes of pain and joint inflammation that result from the formation of crystals within the joint space and deposition of crystals in soft tissue. [3, 4, 5] If untreated, these disorders can lead to joint destruction and, in the case of uric acid crystals, renal damage.

Elevated serum uric acid levels are the principal risk factor for developing gout. lIn study that compared 993 patients with asymptomatic hyperuricemia and 4,241 normouricemic patients, the odds ratio (OR) for developing gout was 32 times higher in the hyperuricemic group than in the normouricemic group. The risk was most striking in men with severe hyperuricemia, in whom the OR for developing gout was 624.8. [6]

Although gout is associated with hyperuricemia, gout attacks are triggered not by a particular level of uric acid but typically by acute changes in the level of uric acid. All individuals with gout have hyperuricemia; however, hyperuricemia is also found in patients taking diuretics and even in those taking niacin or low doses of aspirin.

Gout may be either primary or secondary (see Etiology). Primary gout is related to underexcretion or overproduction of uric acid, often associated with a mix of dietary excesses or alcohol overuse and metabolic syndrome. Secondary gout is related to medications or conditions that cause hyperuricemia, such as the following [7] :

- Myeloproliferative diseases or their treatment
- Therapeutic regimens that produce hyperuricemia
- Renal failure
- Renal tubular disorders
- Lead poisoning
- Hyperproliferative skin disorders
- Enzymatic defects (eg, deficient hypoxanthine-guanine phosphoribosyl transferase, glycogen storage diseases)

Gout is definitively diagnosed on the basis of demonstration of urate crystals in aspirated synovial fluid, in the absence of another etiology for arthritis. Classic radiographic findings are highly suggestive (see Workup).

Advances in early diagnosis and the availability of definitive treatment have significantly improved the prognosis of gout, as evidenced by the declining incidence of disabling chronic tophaceous gout. However, tophaceous gout may still develop because of misdiagnosis, poor management, medication intolerances, or poor patient adherence.

Gout is managed in the following 3 stages:

- Treating the acute attack
- Providing prophylaxis to prevent acute flares
- Lowering excess stores of urate

Treatment of gout is important to relieve pain; to prevent disease progression; and to prevent deposition of urate crystals in the renal medulla or uric acid crystals in the renal collecting system, which may produce kidney stones or urate nephropathy. [8] (See Treatment.)

Management of pseudogout also involves treatment of the acute attack and prophylaxis. Treatment of the acute phase of pseudogout follows the same approaches as are used in gout, and colchicine is effective for prophylaxis. In contrast with gout, however, no specific therapeutic regimen exists to treat the underlying cause of CPP crystal deposition in pseudogout, except in cases associated with disorders such as hemochromatosis or hyperparathyroidism. (See Treatment.)

Pathophysiology

Gout can be considered a disorder of metabolism that allows uric acid or urate to accumulate in blood and tissues. When tissues become supersaturated, the urate salts precipitate, forming

crystals. In addition, the crystals also are less soluble under acid conditions and at low temperatures, such as occur in cool, peripheral joints (eg, the metatarsophalangeal joint of the big toe).

Urate initially precipitates in the form of needlelike crystals. The light-retarding (phase-shifting) characteristics of urate crystals allow them to be recognized by polarizing microscopy (see the image below).

Many conditions and drugs have been associated with an increase in plasma (and subsequent synovial) urate levels, particularly metabolic syndrome.[9] A genetic predisposition for hyperuricemia exists; except in rare genetic disorders, however, the development of gout in hyperuricemic individuals appears to be mediated by environmental factors.[10, 11, 12]

The CPP crystals that produce pseudogout comprise a combination of inorganic pyrophosphate and calcium. The inorganic pyrophosphate is produced in large part by ectonucleotide phosphodiesterase pyrophosphatase (ENPP1), a catalytic enzyme found in chondrocytes of cartilage, and the pyrophosphate is exported potently by the membrane transporter ANKH.

A genetic predisposition exists for pseudogout. However, aging, some metabolic diseases (eg, hyperparathyroidism, hemochromatosis, and hypomagnesemia), and any process that leads to osteoarthritis also can be associated with subsequent CPP crystal deposition and pseudogout.

The presence of urate crystals in the soft tissues and synovial tissues is a prerequisite for a gouty attack. However, these crystals can also be found in synovial fluid or on the cartilage surface in the absence of joint inflammation.

A gout attack may be triggered either by release of crystals (eg, from partial dissolution of a microtophus caused by changing serum urate levels) or by precipitation of crystals in a supersaturated microenvironment (eg, release of urate as a consequence of cellular damage). In either situation, it is believed, naked urate crystals then interact with intracellular and surface receptors of local dendritic cells and macrophages, triggering a danger signal to activate the innate immune system.[13]

This interaction may be enhanced by immunoglobulin G (IgG) binding.[14, 15]Triggering of these receptors, including Toll-like receptors, followed by intracellular signaling by the NLRP3 inflammasome, results in the release of interleukin (IL)-1β, which in turn initiates a cascade of proinflammatory cytokines, including IL-6, IL-8, neutrophil chemotactic factors, and tumor necrosis factor (TNF)-α.[16, 17] Neutrophil phagocytosis leads to another burst of inflammatory mediator production.

Subsidence of an acute gout attack results from multiple mechanisms, including the clearance of damaged neutrophils, change in the properties of urate crystals, and the production of anti-inflammatory cytokines such as IL-1 receptor antagonist (IL-1RA), IL-10, and transforming growth factor (TGF)-β.[15, 18, 19, 20]

Etiology

Gout develops in the setting of excessive stores of uric acid in the form of monosodium urate. Uric acid is an end-stage by-product of purine metabolism. Humans remove uric acid primarily by renal excretion. When excretion is insufficient to maintain serum urate levels below the saturation level of 6.8 mg/dL, hyperuricemia may develop, and urate can crystallize and deposit in soft tissues.

About 90% of patients with gout develop excess urate stores because of an inability to excrete sufficient amounts of uric acid in the urine (underexcretion). Most of the remaining patients either overconsume purines or produce excessive amounts of uric acid endogenously (overproduction). A few have impaired intestinal elimination of uric acid.

In rare cases, overproduction of uric acid is the result of a genetic disorder, such as the following[21]:

- Hypoxanthine-guanine phosphoribosyltransferase deficiency (Lesch-Nyhan syndrome)
- Glucose-6-phosphatase deficiency (von Gierke disease)
- Fructose 1-phosphate aldolase deficiency
- Superactivity of phosphoribosyl pyrophosphate synthetase (PRPP)

Overproduction of uric acid may also occur in disorders that cause high cell turnover with release of purines that are present in high concentration in cell nuclei. These disorders include myeloproliferative and lymphoproliferative disorders, psoriasis, and hemolytic anemias. [162] Cell lysis from chemotherapy for malignancies, especially those of the hematopoietic or lymphatic systems, can raise uric acid levels, as can excessive exercise and obesity.

Causes of secondary gout due to underexcretion of uric acid include renal insufficiency, lead nephropathy (saturnine gout), starvation or dehydration, certain drugs, [9] and chronic abuse of ethanol (especially beer and hard liquor). These disorders should be identified and corrected, if possible.

Certain comorbid conditions are associated with a higher incidence of gout, including the following [22, 23] :

- Hypertension
- Diabetes mellitus
- Renal insufficiency
- Hypertriglyceridemia
- Hypercholesterolemia
- Obesity
- Anemia

Foods that are rich in purines include anchovies, sardines, sweetbreads, kidney, liver, and meat extracts. Consumption of fructose-rich foods and beverages (eg, those sweetened with high-fructose corn syrup) is associated with an increased risk of gout in both men and women. [24, 25]

Genetics

The heritability of serum urate levels is estimated at 63%. [26] Genome-wide association studies (GWAS) have identified several candidate loci associated with chronically elevated serum urate concentrations and gout. [27, 28, 29, 30]

In particular, 3 genes are noted to have a strong association with hyperuricemia. The locus with the strongest evidence of association is the glucose transporter 9 (*GLUT9)* gene, commonly referred to as the solute carrier 2A9 (*SLC2A9*), the product of which alters the renal excretion of uric acid. Some of the variants are associated with a protective effect, whereas others convey a higher risk of gout. [31]

The urate transporter 1 (*URAT1)* gene is involved with the urate-organic anion exchanger. Several mutations in this gene have been associated with gout.

Polymorphisms in the *ABCG2* gene, which is located on chromosome 4 and codes for an intestinal urate transporter, are strongly associated with high serum uric acid concentrations and gout. Elevation of uric acid levels is greater in men than in women with the minor allele of rs2231142 in *ABCG2*. [27, 29]

Although genetic factors have been strongly associated with hyperuricemia, environmental and other state-of-health factors are responsible for the majority of the gout burden in developed countries. [31, 32] A study of 514 male twin pairs did show a strong concordance in hyperuricemia among monozygotic (MZ) twins (53%) as compared with dizygotic (DZ) twins (24%), but it did not show a significant difference between MZ and DZ twins with regard to the lifetime prevalence of gout.[12]

Causes of gout flares

Individual gout flares are often triggered by acute increases or decreases in urate levels that may lead to the production, exposure, or shedding of crystals. Changes in urate levels can result from acute alcohol ingestion, acute overindulgence in foods high in purines, rapid weight loss, dehydration, or trauma.

Similarly, flares can be precipitated by additions of or changes in dosage of medications that raise or lower uric acid levels. Medications that increase uric acid levels via effects on renal tubular transport include loop and thiazide diuretics, niacin, low-dose aspirin, and cyclosporine

A. [33, 34, 35] Agents that lower levels of uric acid include radiocontrast dyes, xanthine oxidase inhibitors (eg, allopurinol and febuxostat), and uricosurics (eg, probenecid).

Pseudogout

Although the pathophysiology, clinical presentation, and acute-phase treatment of gout and pseudogout are very similar, the underlying causes of the 2 diseases are very different. Many cases of pseudogout in elderly people are idiopathic, but pseudogout has also been associated with trauma and with many different metabolic abnormalities, the most common of which are hyperparathyroidism and hemochromatosis.

Risk factors for pseudogout include use of loop diuretics (but not thiazide diuretics) and proton pump inhibitors, which cause hypomagnesemia. [35] Pseudogout attacks have been reportedly induced by etidronate disodium therapy and angiography. [36,37]

Pseudogout has been recognized as having an underlying genetic component; however, comorbid conditions (such as osteoarthritis) and environmental factors are thought to play a much stronger role. [38] Some disorders that can lead to secondary pseudogout, such as hemochromatosis, do have a clear genetic cause. These patients should be properly evaluated and counseled.

Epidemiology

United States statistics

Gout affects 8.3 million people in the United States; prevalence among adults is estimated to be 3.9%, on the basis of data from the 2007-2008 National Health and Nutrition Examination Survey (NHANES). [39] Prevalence is approximately 20% in patients with a family history of gout. It is estimated that more than 2 million people in the United States take medication to decrease serum uric acid levels.

Gout has become increasingly common in the United States as the population has grown older and heavier. [40] From 1990 to 1999, the incidence rose 40%. [41]Estimates for the number of US adults with self-reported gout in the previous year rose from 2.1 million in 1995 to 3 million in 2008. [11] In 2008, gout accounted for 174,823 emergency department (ED) visits in the US, or approximately 0.2% of all ED visits. [42]

The frequency of pseudogout varies with age. The annual incidence of acute attacks of arthritic pain and swelling is about 1.3 per 1000 adults, but nearly 50% of adults develop radiographic changes typical of CPPD by age 80 years.

Attacks of gout have been noted to occur more frequently in the spring and less frequently in the winter. The reason for this is unknown.

International statistics

Gout has a worldwide distribution. The prevalence varies widely from country to country. Regional differences may reflect environmental, dietary, and genetic influences. [43]

In the United Kingdom from 2000 to 2007, the incidence of gout was 2.68 per 1000 person-years—4.42 in men and 1.32 in women, and increasing with advancing age.[44] In Italy, the prevalence of gout rose from 6.7 per 1000 population in 2005 to 9.1 per 1000 population in 2009, increasing with age and 4 times higher in men. [45] In the Maori people of New Zealand, studies from the 1970s found that 0.3% of men and 4.3% of women were affected. [46, 47]

Sex- and age-related demographics

Gout has a male predominance. [25, 48] The estimated prevalence of gout is 5.9% in men and 2% in women. [39] This difference is largely a consequence of age at onset; estrogenic hormones have a mild uricosuric effect, and gout is therefore unusual in premenopausal women. For pseudogout, the male-to-female ratio is approximately 50:50.

The predominant age range of gout is 30-60 years. Usually, uric acid levels are elevated for 10-20 years before the onset of gout. In men, uric acid levels rise at puberty, and the peak age of

onset of gout in men is in the fourth to sixth decade of life. However, onset may occur in men in their early 20s who have a genetic predisposition and lifestyle risk factors. [49] In women, uric acid levels rise at menopause, and peak age of onset is in the sixth to eighth decade of life.

The rate of gout is almost 5 times higher in persons aged 70-79 years than in those younger than 50 years. [50] The higher prevalence of gout in elderly persons may also reflect an increased prevalence of metabolic syndrome, high rates of diuretic treatment for hypertension and chronic heart failure, and the use of low-dose aspirin. [51]

Earlier onset of gout occurs in patients with renal insufficiency or a genetic abnormality of purine metabolism (eg, hypoxanthine-guanine phosphoribosyltransferase deficiency or phosphoribosylpyrophosphate synthetase superactivity). Cyclosporine A can cause an accelerated form of gout, even in premenopausal women, that can present after only a few years of hyperuricemia, particularly if the patient is also receiving diuretics.

Race-related demographics

Gout has an increased prevalence in some populations but is rare in others. For example, the frequency of gout is higher in populations such as the Chamorros and Maori and in the Blackfoot and Pima tribes. Many Maori and other Polynesian women have a genetic defect in renal urate handling that places them at risk for hyperuricemia and gout. [52] However, racial differences may at least in part reflect differences in diet, which has a large influence on the clinical expression of gout.

In the United States, the incidence of gout is 3.11 per 1000 person-years in African Americans and 1.82 per 1000 person-years in whites; the excess risk can be partly explained by a higher frequency of incident hypertension. [53] In contrast, clinically recognized gout is extremely rare among blacks living in Africa. [54]

Prognosis

Gout is associated with considerable morbidity, with acute episodes often causing incapacitation. However, gout that is treated early and properly carries an excellent prognosis if patient adherence to treatment is good.

With early treatment, gout should be totally controlled. If attacks recur, successful uric acid adjustment (requiring lifelong use of urate-lowering medication) usually suppresses further activity. During the first 6-24 months of urate-lowering therapy, acute attacks of gout often occur more frequently. [55, 56]

Chronic injury to intra-articular cartilage leaves the joints more susceptible to subsequent joint infections. Draining tophi can become secondarily infected. Untreated chronic tophaceous gout can lead to severe joint destruction and, rarely, renal impairment. Deposition of monosodium urate crystals in the kidney can result in inflammation and fibrosis, leading to reduced renal function or chronic nephropathy. [57] Rarely, gout can produce spinal cord impingement when deposition in tissues produces a local mass.

Acute attacks of pseudogout usually resolve within 10 days. Prognosis for resolutions of acute attacks is excellent. Some patients experience progressive joint damage with functional limitation. CPPD also can cause chronic arthritis that can resemble osteoarthritis or rheumatoid arthritis.

Hyperuricemia and gout are associated with an increased overall likelihood of mortality. Whether this is directly attributable to hyperuricemia or gout or to gout-associated diseases (eg, insulin resistance, type 2 diabetes mellitus, abdominal obesity, hypercholesterolemia, or hypertension) has been much debated. [58, 59, 60]

Although no evidence has shown that gout or hyperuricemia causes any of these disorders, elevated urate levels have been shown to correlate with elevated blood pressure in adolescents. [61] Among middle-aged men, hyperuricemia is a significant independent risk factor for death from cardiovascular disease. [62] A meta-analysis found an independent association between gout and cardiovascular mortality as well as all-cause mortality. [60]

In a 2010 study, Kuo et al demonstrated that gout, but not hyperuricemia, is associated with higher risk of death from all causes and cardiovascular diseases. Analysis of 1383 deaths among 61,527 Taiwanese subjects showed in individuals with gout compared with those who had normal uric acid levels, the hazard ratio (HR) of all-cause mortality was 1.46 and the adjusted HR of cardiovascular mortality was 1.97. Among individuals with hyperuricemia, the HR of all-cause mortality was 1.07 and the adjusted HR of cardiovascular mortality was 1.08. [63]

An analysis of nationwide data on more than 200,000 English patients indicates that individuals with gout are at increased risk for both heart attack and stroke. The rate ratio for myocardial infarction in patients with gout was 1.82. Rate ratios for stroke were 1.71 for all stroke, 1.68 for ischemic stroke, 1.69 for hemorrhagic stroke, and 2.00 for stroke of unspecified type. Risks were elevated in both men and women and were higher in the younger age groups. [64, 65]

Risk for vascular disease is increased in patients with gout, particularly women, according to a retrospective cohort study from the United Kingdom that included 8386 patients with gout and 39,766 matched controls. Multivariate analysis showed that women with gout had a 25% increased risk for any vascular event compared with women without gout (hazard ratio [HR], 1.25) and increased risks for any coronary heart disease (HR, 1.25) and peripheral vascular disease (HR, 1.89). [66, 67]

Men with gout, compared with those without gout, had a small but significantly increased risk for any vascular event (hazard ratio [HR], 1.06) and an increased risk for any coronary heart disease (HR, 1.08) and peripheral vascular disease (HR, 1.18). Unlike women, men with gout were not at greater risk for angina, transient ischemic attack, or stroke. [66, 67]

In contrast, urate-lowering therapy (ULT) in patients with gout has been linked to reduced risk for both cardiovascular (CV) mortality and all-cause mortality. A prospective case-matched cohort study by Chen et al of Taiwanese patients followed for 6.5 years found that patients with gout who received ULT with either allopurinol or benzbromarone had a lower risk of CV disease (HR 0.29) and all-cause mortality (HR 0.47) relative to patients with gout not treated with ULT. [68]

Similarly, Solomon and colleagues reported a reduced risk of a CV event in patients with gout who take colchicine. Their analysis of data from an electronic medical record database on 1002 gout patients, with a median follow-up of 16.5 months, found that the incidence rates of myocardial infarction, stroke, or transient ischemic attack were 35.6 per 1000 person-years for colchicine users and 81.8 for non-users. Adjusted risk of a CV event was 49% lower with colchicine use (HR 0.51) and all-cause mortality was 73% lower (HR 0.55). [69]

Patient Education

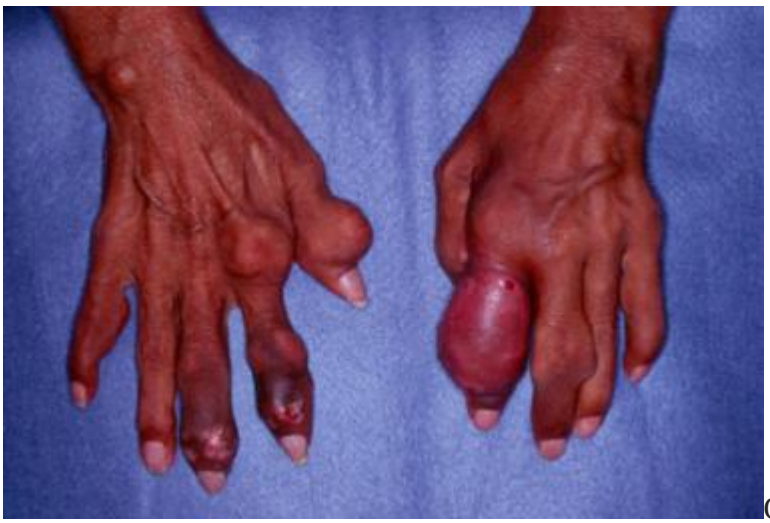
Patients with severe hyperuricemia should avoid foods with high purine content. Moderation in food and alcohol consumption is advised. Early recognition of acute gout attacks is critical, in that intervention with medication is much more effective earlier in the attack.

For patient education information, see the Arthritis Center, as well as Gout. Online information and pamphlets on gout are also available from the Arthritis Foundation.

What is gout? Gout is an inflammatory disease where uric acid precipitates into crystals that deposit in various joints around the body, causing pain and inflammation. This video describes the pathophysiology, causes, symptoms, and treatment of gout.

History

The spontaneous onset of excruciating pain, edema, and inflammation in the metatarsal-phalangeal joint of the great toe (podagra; see the image below) is highly suggestive of acute crystal-induced arthritis. Podagra is the initial joint manifestation in 50% of gout cases; eventually, it is involved in 90% of cases. Podagra is not synonymous with gout, however: it may also be observed in patients with pseudogout, sarcoidosis, gonococcal arthritis, psoriatic arthritis, and reactive arthritis.

 Gout. Chronic tophaceous gout in

Eye involvement

The folklore surrounding gout has also involved the eye, and before the 20th century, a myriad of common and unusual ocular symptoms were falsely ascribed to gout. Medical science has since documented eye involvement as a rare but definite aspect of gout. All manifestations of gout in the eye are secondary to deposition of urate crystals within the ocular tissue. [80, 81]

Tophi have been described in the eyelids. [82, 83, 84] Conjunctival nodules containing needlelike crystals have been described within the interpalpebral areas, sometimes associated with a mild marginal keratitis. Band keratopathy with refractile, yellow crystals in the deep corneal epithelial cells and at the level of the Bowman membrane are not uncommon. [85]

Blurring of vision from the corneal haze or a foreign body sensation due to epithelial breakdown may occur. Gout rarely can be associated with anterior uveitis; Duke-Elder mentions this as a cause of hemorrhagic iritis in his classic *Text Book of Ophthalmology*. Scleritis and tendinitis have also been described. Besides the cornea, the iris, anterior chamber, lens, and sclera have been found to harbor urate crystals; on postmortem examination, urate crystals have also been found in tarsal cartilage and in the tendons of extraocular muscles. [80, 81]

Complications

Complications of gout include the following:

- Severe degenerative arthritis
- Secondary infections
- Urate or uric acid nephropathy
- Increased susceptibility to infection
- Urate nephropathy
- Renal stones
- Nerve or spinal cord impingement [86, 87]
- Fractures in joints with tophaceous gout

Diagnostic Considerations

The cause of new-onset acute monoarticular arthritis cannot be reliably determined from the history and physical examination alone. Septic arthritis, gout, and pseudogout can present in very similar ways.

Nevertheless, certain clinical presentations are so characteristic of gout that attempts have been made to diagnose or exclude gout without joint aspiration. Janssens et al developed a diagnostic rule for this purpose, which included the following diagnostic criteria [89] :

- Male sex
- Previous arthritis attack
- Onset within 1 day
- Joint redness

- First metatarsophalangeal joint involvement
- Hypertension or 1 or more cardiovascular diseases
- A serum uric acid level higher than 5.88 mg/dL

In a study of this rule in 328 patients, the positive predictive value of gout diagnosis by family physicians was 0.64; the negative predictive value was 0.87. [89]

Nevertheless, the criterion standards for the diagnosis of gout remain the following:

- Demonstration of intracellular monosodium urate crystals
- Exclusion of infection or other crystal types in the synovial fluid from the inflamed joint

Patients who present with acute inflammatory arthritis need to undergo arthrocentesis to exclude septic arthritis, even if their serum uric acid level is elevated. Nongonococcal infectious arthritis carries a 10% fatality rate and therefore must be excluded.

Other problems to be considered in the differential diagnosis of gout and pseudogout include the following:

- Acute sarcoidosis
- Amyloidosis
- Bursitis
- Calcific periarthritis
- Chondrocalcinosis
- Congenital fructose intolerance
- Conjunctival calcinosis
- Hyperparathyroidism
- Hypoxanthine-guanine phosphoribosyltransferase deficiency (Lesch-Nyhan syndrome)
- Malignant soft tissue tumors
- Milk-alkali syndrome
- Multicentric reticulohistiocytosis
- Paronychia
- Pigmented villonodular synovitis
- Phosphoribosylpyrophosphate synthetase superactivity
- Psoriatic arthropathy
- Reactive arthritis
- Renal osteodystrophy
- Spondyloarthropathy
- Rheumatoid arthritis
- Tenosynovitis
- Trauma
- Type IIA hyperlipoproteinemia

Differential Diagnoses

- Arthritis as a Manifestation of Systemic Disease
- Cellulitis
- Nephrolithiasis
- Rheumatoid Arthritis
- Septic Arthritis

Approach Considerations

Arthrocentesis of the affected joint is mandatory for all patients with new-onset acute monoarthritis and is very strongly recommended for those with recurrent attacks whose diagnosis has never been proved by microscopic visualization of crystals. Tophi also may be aspirated for crystal analysis under polarizing microscopy.

A prior history of gout or pseudogout does not rule out the possibility of acute septic arthritis. In fact, the latter is more common in patients with a history of crystal-induced arthritis. Septic arthritis must be diagnosed and treated promptly, because irreversible damage can occur within 4-6 hours and the joint can be completely destroyed within 24-48 hours.

Send joint fluid for fluid analysis, including cell count and differential, Gram stain, culture and sensitivity, and microscopic analysis for crystals. If crystals are seen, their shape and appearance under polarized light are diagnostic.

In gout, crystals of monosodium urate (MSU) appear as needle-shaped intracellular and extracellular crystals. When examined with a polarizing filter and red compensator filter, they are yellow when aligned parallel to the slow axis of the red compensator but turn blue when aligned across the direction of polarization (ie, they exhibit negative birefringence). Negatively birefringent urate crystals are seen on polarizing examination in 85% of specimens.

Microscopic analysis in pseudogout shows calcium pyrophosphate (CPP) crystals, which appear shorter than MSU crystals and are often rhomboidal. Under a polarizing filter, CPP crystals change color depending upon their alignment relative to the direction of the red compensator. They are positively birefringent, appearing blue when aligned parallel with the slow axis of the compensator and yellow when perpendicular.

In crystal arthritis, the white blood cell (WBC) count in the synovial fluid is usually 10,000-70,000/µL. However, it may be as low as 1000/µL or as high as 100,000/µL.

Even in the presence of crystals in the joint fluid, blood cultures are indicated if any sign of systemic toxicity is present. Septic arthritis can occur in patients with active crystalline arthropathy.

Gouty attacks are not related to serum levels of uric acid. Thus, an elevated serum uric acid level does not prove the diagnosis of acute gout, though hyperuricemia is present in 95% of cases, and a normal level does not exclude the diagnosis. Renal uric acid excretion should be measured in high-risk patients, including those with renal calculi, a strong family history of gout, and a first attack before age 25 years.

Pseudogout attacks can be triggered by many metabolic abnormalities. Thus, patients who have an initial attack of arthritis with CPP crystals should have a workup that includes a chemistry screen; serum magnesium, calcium, and iron levels; and thyroid function tests.

The WBC count in peripheral blood is usually elevated, with a left shift during acute attacks. The erythrocyte sedimentation rate (ESR) usually is elevated during acute attacks.

Imaging studies of the affected joint or joints are indicated. Patients with new onset of acute gout usually have no radiographic abnormalities. In established disease, radiographs may reveal punched-out erosions or lytic areas with overhanging edges.

Magnetic resonance imaging (MRI) is capable of detecting crystal deposits but is not part of any routine evaluation for acute arthritis. MRI can be very useful in determining the extent of the disease and may help in the differential diagnosis.

Patients with pseudogout usually have degenerative joint changes evident on imaging studies. In addition, they may have calcifications in the soft tissues, tendons, or bursae.

Synovial Fluid Analysis

When a patient presents with acute inflammatory monoarticular arthritis, aspiration of the involved joint is critical to rule out an infectious arthritis and to attempt to confirm a diagnosis of gout or pseudogout on the basis of identification of crystals (see the image below). Minute quantities of fluid in the shaft or hub of the needle are sufficient for synovial fluid analysis.

Urate crystals are shaped like needles or toothpicks with pointed ends (see the first image below). Under polarizing light microscopy, urate crystals are yellow when aligned parallel to the axis of the red compensator and blue when aligned across the direction of polarization (ie, they exhibit negative birefringence). Finding negatively birefringent urate crystals (see the second image below) firmly establishes the diagnosis of gouty arthritis.

Pseudogout crystals (CPP) are rod-shaped with blunt ends and are positively birefringent. Thus, pseudogout crystals are blue when aligned parallel to the slow ray of the compensator and yellow when they are perpendicular.

Crystals must be distinguished from birefringent cartilaginous or other debris. Debris may have fuzzy borders and may be curved, whereas crystals have sharp borders and are straight. As alkalization reduces uric acid crystal solubility and the enzyme uricase can “dissolve” these crystals, reduction by addition of sodium hydroxide or uricase to suspected gout crystal can be helpful.

Corticosteroids injected into joints have a crystalline structure that can mimic either MSU or CPP crystals. They can be either positively or negatively birefringent.

The sensitivity of a synovial fluid analysis for crystals is 84%, with a specificity of 100%. If gout remains a clinical consideration after negative analysis findings, the procedure can be repeated in another joint or with a subsequent flare. Crystals may be absent very early in a flare.

Although the sensitivity of this test is inferior, aspiration of synovial fluid from previously inflamed joints that are not currently inflamed may reveal urate crystals. Such crystals are generally extracellular.

Synovial fluid should also be sent for cell count. During acute attacks, the synovial fluid is inflammatory, with a WBC count higher than 2000/µL (class II fluid) and possibly higher than 50,000/µL, with a predominance of polymorphonuclear neutrophils, though low WBC counts are occasionally found.

Synovial fluid glucose levels are usually normal, whereas they may be depressed in septic arthritis and occasionally in rheumatoid arthritis. Measurement of synovial fluid protein has no clinical value.

Crystalline arthritis and infectious arthritis can coexist. Indeed, infectious arthritis is more common in previously damaged joints, which may occur in patients with chronic gouty arthritis. Consequently, in patients with acute monoarticular arthritis, send synovial fluid for Gram stain and culture and sensitivity.

The pathologic specimens must be processed anhydrously. MSU is water-soluble and dissolves in formalin; therefore, only the ghosts of urate crystals may be seen if formalin is used. Absolute (100%) alcohol–fixed tissue is best for identification of urate crystals.

Once a diagnosis of gout is established by confirmation of crystals, repeat aspiration of joints with subsequent flares is not necessary unless infection is suggested or the flare does not respond appropriately to therapy for acute gout.

Serum Uric Acid

Measurement of serum uric acid is the most misused test in the diagnosis of gout. The presence of hyperuricemia in the absence of symptoms is not diagnostic of gout. In addition, as many as 15% of patients with symptoms from gout may have normal serum uric acid levels at the time of their attack. Thus, the diagnosis of gout can be missed if the joint is not aspirated. Remember that situations that decrease uric acid levels can trigger attacks of gout. In such cases, the patient’s medical records may reveal prior elevations of uric acid.

Approximately 25% of the population has a history of elevated serum uric acid, but only a minority of patients with hyperuricemia develop gout. Thus, an abnormally high serum uric acid level does not indicate or predict gout. As noted, gout is diagnosed by the presence of urate crystals in the synovial fluid or soft tissues. More important, some patients who present with a hot swollen joint and an elevated serum uric acid level in fact have infectious arthritis, which may be mismanaged if their synovial fluid is not examined.

Asymptomatic hyperuricemia generally should not be treated. However, patients with levels higher than 11 mg/dL and overexcretion of uric acid are at increased risk for renal stones and renal impairment; therefore, renal function should be monitored in these individuals. [32]

The level of serum uric acid does correlate with the risk for developing gout. The 5-year risk for developing gout is approximately 0.6% if the level is below 7.9 mg/dL, 1% if it is 8-8.9 mg/dL, and 22% if it is higher than 9 mg/dL.

Urinary Uric Acid

A 24-hour urinary uric acid evaluation is generally performed if uricosuric therapy is being considered. If patients excrete more than 800 mg of uric acid in 24 hours while eating a regular

diet, they are overexcretors and thus overproducers of uric acid. These patients (approximately 10% of patients with gout) require allopurinol instead of probenecid to reduce uric acid levels. Furthermore, patients who excrete more than 1100 mg in 24 hours should undergo close renal function monitoring because of the risk of stones and urate nephropathy.

In patients in whom probenecid is contraindicated (eg, those with a history of renal stones or renal insufficiency), a 24-hour urine test of uric acid excretion need not be performed, because the patient clearly will need allopurinol.

Blood Studies

Blood studies may reveal abnormalities associated with gout or common comorbid conditions. In addition, abnormal results on renal function or liver function studies may affect the selection of therapy.

Obtaining an accurate measure of the patient's renal function before deciding on therapy for gout is important. The glomerular filtration rate can be estimated by using formulas such as the Modification of Diet in Renal Disease (MDRD) Study equation or the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Serum creatinine evaluation alone can underestimate renal dysfunction in elderly patients or in patients with low muscle mass.

The WBC count may be elevated in patients during the acute gouty attack, particularly if it is polyarticular. Hypertriglyceridemia and low levels of high-density lipoprotein (HDL) are associated with gout. Glucose measurement is useful because patients with gout are at increased risk for the development of diabetes mellitus.

Pseudogout attacks can be triggered by many metabolic abnormalities. Thus, patients who have an initial attack of arthritis with CPP crystals should have a workup that includes a chemistry screen; serum magnesium, calcium, iron and iron-binding levels; and thyroid function tests.

Radiography

Plain radiographs may show findings consistent with gout, but these findings are not diagnostic. Early in the disease, radiographs are often normal or show only soft-tissue swelling. Radiographic findings characteristic of gout, which generally do not appear within the first year of disease onset, consist of punched-out erosions or lytic areas with overhanging edges (see the image below). Haziness suggestive of tophi can be seen in late gout, and tophi may calcify.

Erosions with overhanging edges generally are considered pathognomonic for gout but also can be found in amyloidosis, multicentric reticulohistiocytosis, and type IIA hyperlipoproteinemia. Characteristics of erosions that are typical of gout but not of rheumatoid arthritis include the following:

- Maintenance of the joint space
- Absence of periarticular osteopenia
- Location outside the joint capsule

Another characteristic of erosions typical of gout is sclerotic borders, sometimes called cookie-cutter or punched-out borders. In addition, erosions in gout may be distributed asymmetrically among the joints, with strong predilection for distal joints, especially in the lower extremities

At the first attack, sites affected with gout may be anechoic on ultrasonography. Later, diffuse enhancement may be evident on the articular cartilage surface. Chondrocalcinosis show up as a thin, hyperechoic band within hyaline cartilage and punctuated pattern on fibrocartilage.

Ultrasonographic findings in established gout include the following

- A "double-contour" sign, consisting of a hyperechoic, irregular line of MSU crystals on the surface of articular cartilage overlying an adjacent hyperechoic bony contour
- "Wet clumps of sugar," representing tophaceous material, described as hyperechoic and hypoechoic heterogeneous material with an anechoic rim
- Bony erosions adjacent to tophaceous deposits

The double contour sign is 85% sensitive and 80% specific for crystalline arthritis in general, with specificity for gout of 64% and for calcium pyrophosphate deposition disease of 52%. The

reliability of the double contour sign varies with the joint: femoral condyle sensitivity and specificity are 42% and 100%, respectively, compared with 62% and 98% for first metatarsals.
Ultrasonography may demonstrate urate crystal deposition in tissues of asymptomatic patients with hyperuricemia. Pineda et al found double-contour signs in the first metatarsal-phalangeal joints of 25% of 50 asymptomatic patients with hyperuricemia but in none of 52 normouricemic subjects.
Ultrasonography had higher sensitivity than radiography for detection of calcium pyrophosphate crystal deposition (CPPD) in a study by Ottaviani et al. In 51 patients, ultrasonography revealed hyperechoic spots in all 25 patients with CPPD (sensitivity 100%, specificity 92.3%), whereas radiography revealed CPPD in 16 of the 25 (sensitivity 64%, specificity 100%; P <0.0001). [99]
In a study by DeMiguel et al, ultrasonography identified urate crystal deposition in 11 of 26 patients who had asymptomatic hyperuricemia for 2-28 years (average, 6.2 years), affecting the knee in nine cases and the first metatarsal-phalangeal joint in six. These results document that asymptomatic gout may not be as innocuous as was once believed.
Ultrasonography has good sensitivity and specificity for detecting tendon involvement, which occurs frequently in gout. In a controlled study by Ventura-Rios et al, which included 80 patients with gout, intra-tendinous tophi were found in tendon insertions at the distal patella, quadriceps, Achilles, and proximal patella.
Computed Tomography
Plain radiography and computed tomography (CT) are complementary for recognizing erosions in gout. Dual-energy CT, using a renal stone color-coding protocol, assesses chemical composition, labeling urate deposits in red. In a case report, Ward et al describe the use of dual-energy CT to diagnose tumoral calcium pyrophosphate crystal deposition, differentiating it from gouty tophus or soft-tissue malignancy.
In a study comparing CT imaging versus a history of urinary tract calculus for identification of nephrolithiasis in gout patients, 62% of the patients with CT-documented scans had no history of urolithiasis. In 383 male patients with primary gout, CT scanning confirmed nephrolithiasis in 103 (26.9%), whereas the history of urinary tract calculus was positive in only 65 (17%). The authors concluded that the prevalence of urolithiasis cannot be accurately determined on the basis of patients' histories.
Magnetic Resonance Imaging
MRI is not part of any routine evaluation for acute arthritis. MRI evidence of edema is minimal in gout, unless concomitant osteomyelitis is present. However, MRI with gadolinium is recommended when tendon sheath involvement must be evaluated and when osteomyelitis is in the differential diagnosis. Large deposits of crystals may be seen in bursae or ligaments. MRI examination of erosions reveals tophi but no bone edema or synovitis.
Tophi usually have low or intermediate signal intensity on T1-weighted spin echo images. Signal intensity also tends to be low on T2-weighted images. In the absence of inflammation, the tophi are sharply delineated. Presence of inflammation results in increased perilesional signal intensity. Tophi and the surrounding area of inflammation enhance with gadolinium.

Approach Considerations
Gout is managed in the following 3 stages:
- Treating the acute attack
- Providing prophylaxis to prevent acute flares
- Lowering excess stores of urate to prevent flares of gouty arthritis and to prevent tissue deposition of urate crystals

In 2012, the American College of Rheumatology (ACR) published guidelines on the treatment and prophylaxis of acute gouty arthritis and the management of hyperuricemia. [109, 110] While those guidelines do describe treatment targets, more recent publications have focused more closely on the treat-to-target concept, although for the most part these recommendations are based on underlying principles and expert opinion rather than trial data. [163, 164, 165, 166]

As a general rule, asymptomatic hyperuricemia should not be treated, though ultrasonographic studies have demonstrated that urate crystal deposition into soft tissues occurs in a minority of patients with asymptomatic hyperuricemia. [98, 100] Patients with levels higher than 11 mg/dL who overexcrete uric acid are at risk for renal stones and renal impairment; therefore, renal function should be monitored in these individuals. [32]

Urate-lowering therapy appears to reduce the incidence of kidney damage in gout. [111] In a retrospective study of 16,186 patients with initial serum uric acid levels above 7 mg/dL, Levy and colleagues found that patients with gout who remained on urate-lowering therapy were less likely to develop kidney damage leading to chronic kidney disease than those who were untreated. [111] All patients were followed for 36 months from their first documented high serum uric acid level.

Patients who achieved a serum uric acid level below 6 mg/dL had a 37% improvement in renal outcomes (P <0.0001). [111] The hazard ratio for kidney damage was 1.08 (95% confidence interval, 0.76–1.52) in patients who received urate-lowering therapy more than 80% of the time and was 1.27 (95% confidence interval, 1.05–1.55) in those who received urate-lowering therapy less than 80% of the time.

In a study of gout flares in patients newly started on urate-lowering therapy, Rashid et al found that 68% of these patients had one or more gout flares during the first 12 months of therapy. [112] Patients 65 years of age and older were more likely to have three or more flares. Other risk factors for gout flares included the following:

- Male gender
- Failure to attain serum uric acid goal
- Presence of three or more comorbidities
- Use of diuretics
- No changes in initial urate-lowering therapy dose
- Nonadherence to urate-lowering therapy

These findings echo those of other studies and emphasize the importance of providing close coverage, patient education, and prophylaxis against gout flares, especially during the first year of urate-lowering therapy.

Tophi should not be surgically removed unless they are in a critical location or drain chronically. Surgery may be indicated for tophaceous complications, including infection, joint deformity, compression (eg, cauda equina or spinal cord impingement), and intractable pain, as well as for ulcers related to tophaceous erosions. Delayed healing is noted in 50% of patients.

An international working group has developed treat-to-target recommendations for gout. In the absence of randomized trials comparing standard treatment with treat-to-target approaches in gout, the recommendations were based on indirect evidence and expert recommendations. The treatment targets are as follows:

- Serum uric acid levels reduced below 6 mg/dL (5 mg/dL in patients with severe gout, such as tophi or frequent attacks) and maintained there
- Tophi reduced in number or size
- Pain reduction
- Absence of attacks

Patients should have regular monitoring (eg, every 3-6 months) to assess whether targets are being met.

Treatment of the acute phase of pseudogout is identical to that of acute gout. In patients with idiopathic pseudogout, a deterrent regimen of colchicine may be used. If an underlying metabolic problem is responsible for pseudogout, the arthritis may be cured when the underlying problem is addressed.

Treatment of Acute Attacks

The temptation to treat patients without a proven diagnosis must be resisted. Septic arthritis may clinically resemble gout or pseudogout, and unrecognized septic arthritis can lead to loss of life

or limb. Distinguishing septic arthritis from crystal-induced arthritis is not possible without an examination of joint fluid.

Acute treatment of proven crystal-induced arthritis is directed at relief of the pain and inflammation. Nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, colchicine, and adrenocorticotropic hormone (ACTH) are treatment options. The choice is based primarily on whether the patient has any concomitant health problems (eg, renal insufficiency or peptic ulcer disease). Colchicine, a classic treatment, is now rarely indicated.

When comorbid conditions limit the use of NSAIDs or colchicine, a preferred option may be an intra-articular steroid injection, particularly when a large, easily accessible joint is involved. Septic arthritis must be reasonably excluded.

Therapy to control the underlying hyperuricemia generally is contraindicated until the acute attack is controlled (unless kidneys are at risk because of an unusually heavy uric acid load). Starting therapy to control hyperuricemia during an acute attack may intensify and prolong the attack. If the patient has been on a consistent dosage of probenecid or allopurinol at the time of the acute attack, however, the drug should be continued at that dosage during the attack.

Furthermore, control of hyperuricemia generally is not pursued for a single attack. If attacks are recurrent or evidence of tophaceous or renal disease is present, therapy for control of hyperuricemia is indicated. [115, 116, 117]

Nonsteroidal anti-inflammatory drugs

NSAIDs are the drugs of choice in most patients with acute gout who do not have underlying health problems. Although indomethacin is the NSAID traditionally chosen for acute gout, most of the other NSAIDs can be used as well. Select an agent with a quick onset of action. Do not use aspirin, because it can alter uric acid levels and potentially prolong and intensify an acute attack. Low-dose aspirin alters uric acid levels, increasing the risk of gout attacks and requiring close uric acid monitoring when aspirin is added to a uric acid/gout treatment regimen. [118]

Cyclooxygenase-2 (COX-2) inhibitors have been used with success, but patients may require higher dosages than are typically used. [119]

Avoid NSAIDs in patients with a history of peptic ulcer disease or gastrointestinal (GI) bleeding, those with renal insufficiency or abnormal hepatic function, those taking warfarin (a selective COX-2 inhibitor can be used), and those in the intensive care unit (ICU) who are predisposed to gastritis. Limit NSAID use in elderly patients, because of the potential for adverse central nervous system (CNS) effects. Use NSAIDs cautiously in patients with diabetes and those who are receiving concomitant angiotensin-converting enzyme (ACE) inhibitors.

To control the acute attack, NSAIDs are prescribed at full dosage for 2-5 days. Once the acute attack is controlled. the dosage is reduced to approximately one half to one fourth of that amount. Taper the dosage over approximately 2 weeks. Gout symptoms should be absent for at least 2 days before the NSAID is discontinued.

Colchicine

Although colchicine was once the treatment of choice for acute gout, it is now less commonly used than NSAIDs because of its narrow therapeutic window and risk of toxicity. [120, 121] To be effective, colchicine therapy is ideally initiated within 36 hours of onset of the acute attack. When used for acute gout in classic hourly dosing regimens (no longer recommended), colchicine causes adverse GI effects, particularly diarrhea and vomiting, in 80% of patients.

Dosing recommendations for colchicine in the treatment of acute gout have undergone modifications as awareness of its toxicities has increased. Newer recommendations trend toward lowered daily and cumulative doses. [120, 122]

The regimen currently favored consists of 1.2 mg of colchicine, followed by 0.6 mg 1 hour later to initiate treatment of the early gout flare. In a multicenter, randomized, double-blind, placebo-controlled, parallel-group study, Terkaltaub et al found that this regimen yielded both maximum plasma concentration and early gout flare efficacy comparable with those of high-dose

colchicine (4.8 mg total over 6 hours), with a safety profile indistinguishable from that of placebo. [123]

Data from 7 separate drug-to-drug interaction (DDI) studies suggests colchicine dose reductions of 33-66% for treatment of acute gout and 50-75% for prophylaxis when colchicine is given in combination with the extended-release calcium channel blockers verapamil and diltiazem or with the numerous P-gp and/or CYP3A4 inhibitors (eg, clarithromycin and cyclosporine); in addition, patients should avoid grapefruit juice. Dosages of colchicine did not have to be adjusted when the drug was used in combination with azithromycin. [124]

Colchicine should generally be avoided if the glomerular filtration rate (GFR) is lower than 10 mL/min, and the dose should be decreased by at least half if the GFR is lower than 50 mL/min. Colchicine should also be avoided in patients with hepatic dysfunction, biliary obstruction, or an inability to tolerate diarrhea.

A clinical response to colchicine is not pathognomonic for gout. Responses may also occur in patients with pseudogout, sarcoid arthropathy, psoriatic arthritis, or calcific tendonitis.

In February 2008, the US Food and Drug Administration (FDA) ruled that intravenous (IV) colchicine can no longer be produced or shipped in the United States, because of its toxicities. Consequently, IV colchicine is no longer advocated for the treatment of acute gout in the United States. [125]

Corticosteroids

Corticosteroids can be given to patients with gout who cannot use NSAIDs or colchicine. Steroids can be given orally, IV, intramuscularly (IM), or intra-articularly. Using parenteral corticosteroids confers no advantage unless the patient cannot take oral medications.

Prednisone can be given at a dose of approximately 40 mg for 1-3 days, which is then tapered over approximately 2 weeks (tapering more rapidly can result in a rebound flare). Monitor closely for corticosteroid effects. If treatment continues for more than 2 weeks, consider measures to prevent osteoporosis.

Intra-articular long-acting (depot) corticosteroids are particularly useful in patients with a monoarticular flare to help reduce the systemic effects of oral steroids. Ensuring that the joint is not infected before injecting intra-articular corticosteroids is particularly important.

An alternative to corticosteroid administration is to give ACTH (40 IU subcutaneously, with repeat dosing as needed) to induce production of corticosteroid by the patient's own adrenal glands. Such a regimen does not depend on the patient for proper tapering of prednisone.

Combination therapy

If the patient does not have an adequate response to initial therapy with a single drug, ACR guidelines advises that adding a second appropriate agent is acceptable. Using combination therapy from the start is appropriate for an acute, severe gout attack, particularly if the attack involves multiple large joints or is polyarticular. Acceptable regimens include any of the following, in full or prophylactic doses as appropriate [110] :

- Colchicine plus NSAIDs
- Oral corticosteroids plus colchicine
- Intra-articular steroids plus colchicine or NSAIDs

Treatment of Chronic Gout

When a patient experiences a first attack of gout, any medication regimens that may have contributed to the gout attack must be altered, and any predisposing medical conditions or habits must be addressed. [126] Patients should be instructed to go on a diet if obese, to stop drinking beer, and to avoid purine-rich foods.

In many cases, patients who have a first attack of gout should undergo therapy with agents that lower uric acid, given the high risk for further inflammatory attacks and the potential for destructive tophaceous deposition in the bone, synovium, and kidney, even without episodes of acute inflammation. If the first attack is not severe, however, some rheumatologists advocate

waiting for a second attack before initiating such therapy; not all patients experience a second attack, and some patients may require convincing that they need life-long therapy.

The risk of a second attack of gout after the first attack is 62% after 1 year, 78% after 2 years, and 93% after 10 years. The decision to begin therapy depends partly on the baseline serum uric acid levels (>9 mg/dL denotes a higher risk for recurrent gouty arthritis and tophi).

ACR guidelines recommend pharmacologic urate-lowering therapy for patients with gout who have 1 or more tophi on clinical examination or imaging study or have frequent attacks of acute gouty arthritis (≥2 attacks per year). Less robust evidence supports pharmacologic therapy for patients with chronic kidney disease of stage 2 or worse or a past history of urolithiasis. [109]

Long-term management of gout is focused on lowering uric acid levels. The goal of therapy is to reduce serum uric acid levels to below 6 mg/dL, at minimum. In many cases, lowering uric acid levels to less than 5 mg/dL is necessary to improve the signs and symptoms of gout. ACR guidelines recommend that once palpable tophi and all acute and chronic gout symptoms have resolved, serum uric acid levels should be maintained below 6 mg/dL indefinitely. [109]

In contrast, Perez-Ruiz et al have proposed that once dissolution of existing urate crystals has been achieved, less stringent control may suffice to prevent formation of new crystals. [127] In their prospective cohort study of 211 patients from whom urate-lowering therapy was withdrawn either after 5 years if no tophus was present at baseline or 5 years after resolution of the last tophus, no patient who maintained an average serum urate level lower than 7 mg/dL developed a crystal-proven recurrence of gout.

Controversially, a 2016 guideline from the American College of Physicians (ACP) does not recommend the "treat to target" approach to controlling serum uric acid levels. The ACP concluded that evidence was insufficient to determine whether the benefits of escalating urate-lowering therapy to reach a serum urate target outweigh the harms associated with repeated monitoring and medication escalation. [128, 129]

Avoiding the use of medications that elevate uric acid in patients with gout is prudent. Thus, in patients with hypertension, other agents are preferable to a thiazide diuretic, provided that blood pressure can be managed easily with a single drug. Low-dose aspirin is also uricosuric. The angiotensin-receptor blocker (ARB) losartan should be considered, because it is uricosuric at 50 mg/day. However, medications that elevate uric acid can still be used, if required, by making appropriate adjustments of allopurinol or probenecid doses.

Urinary excretion amounting to less than 800 mg per 24-hour period on an unrestricted diet is considered underexcretion. Underexcreting patients are candidates for uricosuric therapy with probenecid. The dosage is increased at monthly intervals until the uric acid level is lowered to target. Urinary alkalization (eg, with potassium citrate) and ingestion of copious amounts of fluid are adjunctive recommendations.

In patients with gout who have renal disease, ACR guidelines recommend xanthine oxidase inhibitor therapy with either allopurinol or febuxostat as the first-line pharmacologic approach. Probenecid can be used in patients who have contraindications to or are intolerant of at least 1 of those first-line agents, or it may be combined with a xanthine oxidase inhibitor if the inhibitor does not lower uric acid sufficiently. [109] Probenecid could also be used for those patients who consider the risks of xanthine oxidase inhibitors to be too high.

The ACR advises, however, that monotherapy with probenecid is not a first-line choice in patients with a creatinine clearance of less than 50 mL/min. [109] In addition, drug interactions may occur with probenecid (see Medication).

Prophylaxis

Because allopurinol, febuxostat, and probenecid change serum and tissue uric acid levels, they may precipitate acute attacks of gout. To reduce this undesired effect, colchicine or low-dose NSAID treatment is provided for at least 6 months. In patients who cannot take colchicine or NSAIDs, low doses of prednisone can be considered. When used prophylactically, colchicine

can reduce such flares by 85%.[130] Patients with gout may be able to abort an attack by taking a single colchicine tablet at the first twinge of an attack.
The standard dosage of colchicine for prophylaxis is 0.6 mg twice daily, but lower dosages have also been suggested. Significant dosage reduction is critical for patients who are also taking calcium channel blockers (eg, verapamil or diltiazem) and any of the large number of P-gp or CYP3A4 inhibitors (eg, clarithromycin or cyclosporine). In patients with renal insufficiency, the dosing frequency may have to be decreased to once daily or every other day.
Adverse GI effects are uncommon with this dosage, occurring in only 4% of patients. This stands in contrast to the 80% risk of adverse GI effects with the classic hourly colchicine regimen for the treatment of acute gout.
Even in prophylactic doses, however, long-term use of colchicine can lead to marrow toxicity and to neuromyopathy, with elevated levels of creatine kinase and resulting muscle weakness. Colchicine-induced neuromyopathy is a particular risk in patients with renal insufficiency. [131]
If the patient develops a gout flare after beginning therapy with a uric acid–lowering agent, the agent should not be discontinued, because discontinuance will only cause another flux in the uric acid level, which may prolong and intensify the attack.

Allopurinol

Allopurinol blocks xanthine oxidase and thus reduces the generation of uric acid. Approximately 3-10% of patients taking allopurinol develop symptoms of intolerance, such as dyspepsia, headache, diarrhea, or pruritic maculopapular rash.
Less frequently (1% of cases), patients taking allopurinol can develop severe allopurinol hypersensitivity syndrome, which carries a mortality of 20-30%. [132]Features of this syndrome include fever, toxic epidermal necrolysis, bone marrow suppression, eosinophilia, leukocytosis, renal failure, hepatic failure, and vasculitis. Corticosteroids are often used to treat severe allopurinol hypersensitivity syndrome.
Severe allopurinol hypersensitivity syndrome is more likely to occur in patients with renal insufficiency, those who are taking a thiazide diuretic, and those started on allopurinol at a dosage of 300 mg/day. [133] In addition, strong associations have been found between severe allopurinol hypersensitivity reactions and carriage of the HLA–B*5801 allele. [134]
ACR guidelines recommend considering screening for HLA–B*5801 carriage, using a polymerase chain reaction–based test, in selected high-risk patients before starting allopurinol. Patients at particularly high risk are known to include those of Han Chinese or Thai descent; Koreans are also at risk, if they have stage 3 or worse chronic kidney disease. [109] It is unclear whether such precautions are necessary with a 100-mg starting dose of allopurinol. Additionally, availability of this test may be an issue.
Severe allopurinol hypersensitivity syndrome may present as Stevens-Johnson syndrome or as drug rash with eosinophilia and systemic symptoms (DRESS) syndrome. DRESS syndrome affects the liver, kidney, and skin. It is a delayed-hypersensitivity response occurring 6-8 weeks after initiation of allopurinol. The underlying mechanism is thought to be a cell-mediated immune reaction to allopurinol and its metabolites. Although the frequency is only is 0.4%, the rate of organ failure and death is high. Treatment is with IV *N*- acetylcysteine and steroids.
Allopurinol should immediately be discontinued in patients who develop pruritus or a rash consistent with allopurinol hypersensitivity.
In most patients, start allopurinol at 100 mg/day (50 mg/day in patients with renal insufficiency). Stamp et al have proposed that the risk of allopurinol hypersensitivity may be reduced by starting allopurinol at a dose of 1.5 mg per unit of estimated GFR. [135]
Adjust the dosage upward every 2-5 weeks according to the uric acid level until the goal of a uric acid level of 6 mg/dL or less is achieved. Once the target uric acid level has been achieved and maintained for 6 months, discontinue colchicine prophylaxis, unless the patient has 1 or more tophi on clinical exam.

Previously, adjusting the allopurinol maintenance dosage to the creatinine clearance rate was recommended for patients with renal insufficiency. However, Vázquez-Mellado et al found no increase in the prevalence of adverse reactions to allopurinol in patients who were started at an adjusted dosage but subsequently had their dosage raised to meet therapeutic targets. [136]

ACR guidelines advise that the dosage of allopurinol can be raised above 300 mg/day, even in patients with renal impairment, provided that the patient receives adequate education and monitoring for drug toxicity (including measurement of transaminase levels). The maximum dosage of allopurinol approved by the US Food and Drug Administration (FDA) is 800 mg/day, [109] but the maximum dosage should be lower in patients with chronic kidney disease.

Beware of drug interactions. For example, allopurinol prolongs the half-life of azathioprine and 6-mercaptopurine. It enhances the bone marrow toxicity of cyclophosphamide. Patients taking concomitant ampicillin are at an increased risk of rash.

Allopurinol can be used in combination with probenecid. However, note that probenecid increases the excretion of allopurinol.

In a retrospective 24-month study of gout patients who had been prescribed allopurinol, Riedel et al found that only 18% of them filled all their prescriptions throughout the entire follow-up period and thus were presumably compliant; 10.4% filled only a single prescription. [137] In contrast, Rees et al reported that when patients receiving urate-lowering therapy were given a predominantly nurse-delivered intervention that included education and individualized lifestyle advice, 92% achieved target serum uric acid levels at 1 year. [138]

Febuxostat

Febuxostat, a nonpurine selective inhibitor of xanthine oxidase, is a potential alternative to allopurinol in patients with gout. [139, 140] Febuxostat is administered orally and is metabolized mainly in the liver. In contrast, allopurinol and its metabolites are excreted primarily by the kidney. Therefore, febuxostat can be used in patients with renal impairment with no dosage adjustment. [141] It is more expensive than allopurinol.

The CONFIRMS trial demonstrated the efficacy and safety of febuxostat in lowering hyperuricemia. By 6 months, the primary endpoint—a serum uric acid level of less than 6.0 mg/dL—was achieved in 45% of subjects on febuxostat 40 mg/day, 67% on febuxostat 80 mg/day, and 42% on allopurinol. In subjects with renal impairment, the primary endpoint was achieved in 50% of subjects on febuxostat 40 mg/day, 72% on febuxostat 80 mg/day, and 42% on allopurinol. Adverse event rates were low and similar in all groups. [142]

In patients aged 65 years or older, the primary endpoint was achieved in 62% on febuxostat 40 mg/day, 82% on febuxostat 80 mg/day, and 47% on allopurinol. These figures remained essentially unchanged in subjects with mild-to-moderate renal impairment. [143]

In African-American subjects, the primary endpoint was reached in 47% on febuxostat 40 mg/day, 68% on febuxostat 80 mg/day, and 43% on allopurinol. Similar rates were seen in subjects with renal impairment. [144] Adverse event rates in both subgroups were comparable with those in the overall trial.

The efficacy and safety of febuxostat in women was demonstrated in the CONFIRMS trial and in 2 other trials comparing febuxostat and allopurinol: FACT (Febuxostat Versus Allopurinol Controlled Trial) and APEX (Allopurinol- and Placebo-Controlled, Efficacy Study of Febuxostat). Achievement of a uric acid level below 6.0 mg/dL rose with increasing daily doses of febuxostat doses, from 54.3% in patients receiving 40 mg to 100% in those receiving 240 mg, compared with 45.9% with allopurinol. Results were similar in subjects with renal impairment. [145]

Stepwise introduction of febuxostat—10 mg/day for 4 weeks, then 20 mg/day for 4 weeks, then 40 mg/day—was found to reduce gout flares, in randomized open-label comparative study by Yamanaka et al. [146] Although flares still occurred, their frequency was reduced even in absence of colchicine coverage, so this approach may also be of benefit for individuals with significant contraindications to colchicine or NSAIDs.

Lesinurad

Lesinurad (Zurampic) is the first selective uric acid reabsorption inhibitor (SURI) approved by the FDA. It acts by inhibiting the urate transporter, URAT1, which is responsible for the majority of the renal reabsorption of uric acid. It also inhibits organic anion transporter 4 (OAT4), a uric acid transporter associated with diuretic-induced hyperuricemia.

Lesinurad must be coadministered with a xanthine oxidase inhibitor and is for hyperuricemia associated with gout in patients who have not achieved target serum uric acid levels with a xanthine oxidase inhibitor alone. Monotherapy or higher than recommended doses are associated with an increased serum creatinine. Renal function should be assessed before initiating therapy and periodically thereafter. More frequent monitoring is required for an estimated CrCl <60 mL/min. Do not initiate therapy if CrCl is <45 mL/min and discontinue if CrCl decreases persistently to <45 mL/min.

Approval was based on 3 randomized, placebo-controlled studies in combination with a xanthine oxidase inhibitor involving 1,537 participants for up to 12 months. Participants treated with lesinurad plus allopurinol or febuxostat experienced reduced serum uric acid levels compared with placebo. [147]

In a randomized double-blind study of 227 patients with an inadequate response to allopurinol, the addition of lesinurad to the prestudy allopurinol dose resulted in significant mean reductions of serum uric acid levels from baseline. Levels decreased 16%, 22%, and 30% with lesurinad doses of 200, 400, and 600 mg, respectively. In comparison, patients receiving placebo demonstrated a mean 3% increase in serum uric acid levels (P <0.0001, all doses vs placebo). Similar results were observed in patients with mild or moderate renal insufficiency. [148]

Uricase

Nonrecombinant urate-oxidase (uricase) is used in Europe to prevent severe hyperuricemia induced by chemotherapy in patients with malignancies, as well as in selected patients with treatment-refractory gout. Short-term use of such agents in patients with severe tophaceous gout could debulk the total-body urate load, allowing maintenance with probenecid or allopurinol.

In 2009, the FDA approved recombinant uricase (rasburicase) for the prevention of tumor lysis syndrome. However, it is highly immunogenic and may cause anaphylaxis. [149]

In 2010, a polyethylene-glycol–conjugated uricase (pegloticase) was approved by the FDA for gout. Pegloticase, which enzymatically catalyzes the oxidation of uric acid to allantoin, is an IV biologic agent to be considered when adjustment of contributing medications (eg, diuretics) and treatment with allopurinol, febuxostat, and uricosuric agents are insufficient to achieve appropriate reduction of serum uric acid levels. [109] The European Medicines Agency (EMA) has approved use of pegloticase in Europe. [150]

Adverse effects of pegloticase include anaphylaxis, infusion reactions, gout flares, and exacerbation of congestive heart failure. At present, substantial expense compromises its cost-effectiveness as an initial approach. [151] The ACR guidelines do not recommend pegloticase as a first-line approach.

Other therapeutic options

Benzbromarone is an effective uricosuric agent available on a restricted basis only outside the United States. However, it has been withdrawn because it causes fulminant hepatotoxicity.

Vitamin C, with its uricosuric effect, may reduce the serum concentration of uric acid. In one study, 500 mg/day for 2 months reduced uric acid by a mean of 0.5 mg/dL in patients without gout. [152] However, gout patients appear to be less responsive to such a low dose of ascorbate. Vitamin C treatment should be avoided in patients with nephrolithiasis, urate nephropathy, or cystinuria.

In an open-label pilot study of 10 patients with refractory acute gout treated with the interleukin (IL)-1 antagonist anakinra, pain was substantially reduced in all patients within 2 days, without

side effects. Clinical signs of inflammation had disappeared in 9 of 10 patients by day 3 of treatment. [153]

The lipid-lowering drug fenofibrate, a fibric acid derivative, lowers serum uric acid levels while reducing very-low-density lipoprotein (VLDL), total cholesterol, and triglyceride levels. [154] However, the creatinine level increases, and all effects are negated once the drug has been discontinued. [149]

Canakinumab

In 2010, an 8-week, single-blind, double-dummy, dose-ranging study showed that the selective IL-1β antibody canakinumab yielded fast and lasting relief of pain in patients with acute gouty arthritis flares refractory to treatment with NSAIDs or colchicine. [155] However, in June 2011, canakinumab was denied approval by the FDA. [156] (See FDA Panel Says No to Canakinumab for Gout Attacks.)

Diet and Activity

Because uric acid is a breakdown product of purine, high-purine foods should be either avoided or consumed only in moderation. Foods very high in purines include the following:

- Organ meats such as sweetbreads (eg, pancreas and thymus)
- Smelt
- Sardines
- Mussels

Foods moderately high in purines include the following:

- Anchovies
- Trout
- Haddock
- Scallops
- Mutton
- Veal
- Liver
- Bacon
- Salmon
- Kidneys
- Turkey

Purines are found in all protein foods. All sources of purines cannot and should not be eliminated.

Overall, purine restriction generally reduces serum uric acid levels by no more than 1 mg/mL, with modest impact, and diets with very low purine content are not palatable. Diet modifications alone are rarely able to lower uric acid levels sufficiently to prevent accumulation of urate, but they may help lessen the triggers of acute gout attacks.

Patients with gout should avoid excess ingestion of alcoholic drinks, particularly beer, because alcohol use elevates uric acid levels and thus can precipitate attacks of gout. Indeed, heavy drinkers are much more likely to have recurrent gout attacks, even with allopurinol therapy. Moderate wine intake is not associated with increased development of incident gout, [1] but excesses of any form of alcohol in gout patients are associated with acute gout flares.

Patients should avoid sodas and other beverages or foods sweetened with high-fructose corn syrup. They should also limit their use of naturally sweet fruit juices, table sugar, and sweetened beverages and desserts, as well as table salt. [109] Patients taking colchicine should avoid grapefruit and grapefruit juice.

Maintaining a high level of hydration with water (at least 8 glasses of liquids per day) may be helpful in avoiding attacks of gout. In view of the association of gout with atherosclerosis, the diagnosis of gout may afford a particularly good opportunity for the clinician to advise a low-cholesterol, low-fat diet if such a diet is otherwise appropriate for the patient. Although a diet of

this type may help uric acid levels, such advice should be given primarily to help prevent atherosclerosis.

Weight reduction in patients who are obese can improve hyperuricemia. Ketosis-inducing diets (eg, fasting) should be avoided, however.

Because acute attacks are already sufficiently limiting of activity, additional limitations of activity are not necessary. The patient should avoid trauma to the affected joint; otherwise, they should be active.

Consultations

Rheumatologists should be involved in the care of patients with difficult gout, as advised in the ACR guidelines. They can establish the diagnosis with arthrocentesis and synovial fluid analysis for crystals. They also are skilled in the management of this disorder, and consultation may be helpful for patients with an acute gout attack that does not respond to NSAIDs within 2 days or to colchicine within 1 day, as well as for patients with refractory hyperuricemia.

Rheumatology or orthopedic consultation is indicated for any patient with septic arthritis or for any patient in whom a septic arthritis cannot be ruled out.

Long-Term Monitoring

After diagnosis and treatment of an acute gouty arthritis episode, the patient should return for a follow-up visit in approximately 1 month to be evaluated for therapy to lower serum uric acid levels.

If uric acid–lowering therapy is begun, patients should be seen within 2 weeks to ensure that no untoward toxicity has developed and then every 1-2 months while medication dosages are adjusted to achieve the target uric acid level of 5-6 mg/dL. Once this level is achieved and maintained, patients can be seen every 6-12 months and their serum uric acid monitored to help assess efficacy and adherence.

Prevention

Diet may affect the risk of developing gout. [157] A large prospective cohort study in men found that higher adherence to the Dietary Approaches to Stop Hypertension (DASH) diet was associated with a lower risk for gout (adjusted relative risk [RR] for extreme fifths 0.68, 95% confidence interval [CI] 0.57–0.80, P for trend <0.001), whereas following a typical Western diet was associated with an increased risk for gout (RR 1.42, 95% CI 1.16–1.74, P=0.005). [158]

The study included 44,444 men with no prior history of gout. On the basis of questionnaire responses, each participant was assigned a DASH dietary pattern score (based on high intake of fruits, vegetables, nuts and legumes, low-fat dairy products, and whole grains, and low intake of sodium, sweetened beverages, and red and processed meats) and a Western dietary pattern score (based on high intake of red and processed meats, French fries, refined grains, sweets, and desserts). Documented gout occurred in 1731 study subjects during 26 years of follow-up. [158]

As an observational trial, the study could not prove that the DASH diet reduced gout risks. In addition, 91% of the study subjects were white men, and all were health professionals, so the study results may not apply to other racial or socioeconomic groups. Nevertheless, the DASH diet is more palatable than a low-purine diet, and it offers the additional benefits of reducing the risk for cardiovascular disease, stroke, and kidney stones.

Guidelines Summary

Guidelines on hyperuricemia and gout have been developed by the following organizations:

- American College of Rheumatology (ACR) – Management of hyperuricemia.[109]
- ACR – Treatment and prophylaxis of acute gouty arthritis [110]
- American College of Physicians (ACP) – Diagnosis of acute gout [159]
- ACP – Management of acute and recurrent gout [129]

American College of Rheumatology Guidelines

ACR guidelines on gout use the following evidence grades for recommendations:

- Level A – Supported by more than one randomized clinical trial or meta-analysis
- Level B – Derived from a single randomized trial or nonrandomized studies

- Level C – Consensus opinion of experts, case studies, or standard of care

Baseline treatment recommendations

ACR baseline recommendations for treatment of patients with gout are as follows (all evidence level C) [109]:

- Patient education, with diet and lifestyle recommendations
- Consider secondary causes of hyperuricemia
- Consider elimination of nonessential prescription drugs that induce hyperuricemia
- Clinically evaluate gout disease burden (ie, palpable tophi, frequency and severity of acute and chronic symptoms and signs)

Patient education

The ACR guidelines recommend the following general health, diet, and lifestyle measures for gout patients [109]:

- Weight loss for obese patients, to achieve a body mass index (BMI) that promotes general health
- Healthy overall diet
- Exercise (achieve physical fitness
- Smoking cessation
- Staying well hydrated

Specific dietary recommendations are listed in Table 1, below. [109]

Table 1. American College of Rheumatology Dietary Recommendations for Gout Patients (Open Table in a new window)

Avoid	Limit	Encourage
Organ meats high in purine content (eg, sweetbreads, liver, kidney)	Serving sizes of beef, lamb, pork, and seafood with high purine content (eg, sardines, shellfish)	Low-fat or non-fat dairy products
High-fructose corn syrup–sweetened sodas, other beverages, foods	• Servings of naturally sweet fruit juices • Table sugar, sweetened beverages, desserts • Table salts, including in sauces and gravies	Vegetables
Alcohol overuse (ie, >2 servings/day for men, >1/d for women	Alcohol—particularly beer, but also wine and spirits	

Secondary causes of hyperuricemia

The ACR recommends the following checklist of comorbidities as appropriate to consider in the clinical evaluation of patients with gout, and to evaluate if clinically indicated (all level C) [109]:

- Obesity, dietary factors
- Excessive alcohol intake
- Metabolic syndrome, type 2 diabetes mellitus
- Hypertension
- Hyperlipidemia, modifiable risk factors for coronary artery disease or stroke
- Serum urate–elevating medications
- History of urolithiasis

- Chronic kidney, glomerular, or interstitial renal disease (eg, analgesic nephropathy, polycystic kidney disease)
- In selected cases, potential genetic or acquired causes of uric acid overproduction (eg, inborn error of purine metabolism or psoriasis, myeloproliferative or lymphoproliferative disease)
- Lead intoxication

Pharmacologic therapy

ACR indications for pharmacologic therapy to lower serum uric acid levels in patients with an established diagnosis of gouty arthritis include the following:

- Tophus or tophi identified on clinical examination or imaging study (evidence A)
- Frequent (≥2/yr) of acute gouty arthritis (evidence A)
- Chronic kidney disease (CKD) stage ≥2 (evidence C)
- Previous urolithiasis (evidence C)

Treatment to target

The ACR recommends treatment to target serum uric acid level, as follows:

- The minimum serum uric acid target is <6 mg/dL
- A lower target (<5 mg/dL) may be needed to improve signs and symptoms
- Allopurinol or febuxostat is a first-line xanthine oxidase inhibitor for urate-lowering therapy (ULT) (evidence A)
- If at least one xanthine oxidase inhibitor is contraindicated or not tolerated, probenecid is an alternative first-line agent (evidence B)

Allopurinol

ACR recommendations for use of allopurinol ULT in gout include the following:

- Starting dosage should be no greater than 100 mg/day for any patient (evidence level B)
- Start at 50 mg/day in patients with stage 4 or worse CKD (evidence B)
- Gradually titrate maintenance dose upward every 2–5 weeks to appropriate maximum dose in order to treat to chosen serum uric acid target (evidence C)
- Dose can be raised above 300 mg daily, even in patients with renal impairment, if it is accompanied by adequate patient education and monitoring for drug toxicity (eg, pruritus, rash, elevated hepatic transaminases) (evidence B)
- Before starting allopurinol, consider testing for HLA–B*5801 in selected patients, specifically in subpopulations at higher risk for severe allopurinol hypersensitivity reaction (eg, Koreans with stage 3 or worse CKD, Han Chinese and Thai irrespective of renal function (evidence A)

Uricosuric urate-lowering therapy

ACR recommendations for use of uricosuric ULT in gout include the following:

- Probenecid is the first choice among uricosuric agents for ULT (evidence B)
- In gout patients with a creatinine clearance <50 mL/min, probenecid is not recommended as first-line ULT monotherapy (evidence C)
- Agents other than probenecid that have clinically significant uricosuric effects (eg, fenofibrate, losartan) can be useful as components of a comprehensive ULT strategy (evidence B)
- A history of urolithiasis is a contraindication to first-line uricosuric urate-lowering monotherapy (evidence C)
- Urinary uric acid should be measured before initiation of uricosuric ULT (evidence C)
- Elevated urine uric acid indicative of uric acid overproduction is a contraindication to uricosuric ULT (evidence C)
- Continue to monitor urinary uric acid during uricosuric ULT (evidence C)
- Consider urine alkalinization (eg, with potassium citrate) with monitoring of urine pH, in addition to increased fluid intake, as a risk management strategy for urolithiasis (evidence C)

ACR recommendations for refractory disease in gout include the following:

- Attempt upward titration of one xanthine oxidase inhibitor to its maximum appropriate dose (evidence A)
- Febuxostat can be substituted for allopurinol or vice versa in the event of drug intolerance and adverse events, and such substitution should be considered after initial failure of upward dose titration of either drug (evidence C); however, febuxostat and allopurinol should not be used together
- A uricosuric agent (eg, probenecid, fenofibrate, or losartan) may be added to a xanthine oxidase inhibitor (evidence B) or vice versa (evidence C)
- Pegloticase is appropriate for patients with severe gout disease burden and refractoriness to, or intolerance of, conventional and appropriately dosed ULT (evidence A)
- Pegloticase therapy is not recommended as first-line ULT agent

The ACR notes that the pegloticase package insert advises discontinuing other oral ULT agents during the course of pegloticase therapy. The ACR was unable to reach consensus on the appropriate duration of pegloticase therapy relative to intended and achieved decrease in symptoms and signs of gout.

Long-term management

ACR recommendations for long-term management of gout are as follows:

- Continue gout attack prophylaxis in patients with ongoing gout manifestations (eg, ≥1 tophus on physical exam)
- Continue regular monitoring of serum urate and monitoring for adverse effects
- After resolution of palpable tophi and all acute and chronic symptoms of chronic gouty arthritis, continue all measures needed to maintain serum urate levels <6 mg/dL indefinitely

Referral

Consider specialist referral in situations such as the following:

- Unclear etiology of hyperuricemia
- Difficulty reaching target serum urate level, particularly in patients with renal impairment who have had a trial of xanthine oxidase inhibitor treatment
- Multiple and/or serious adverse effects from pharmacologic ULT

Prophylaxis

ACR recommendations for prophylaxis of acute gouty arthritis are as follows [110]:

● Pharmacologic anti-inflammatory prophylaxis is recommended for all gout patients when pharmacologic urate lowering is initiated, and should be continued if the patient has any clinical evidence of continuing gout disease activity and/or the serum urate target has not yet been achieved

● Oral colchicine is an appropriate first-line drug for prevention of gout attacks; with appropriate dose adjustments, it may be used in patients with CKD and those with drug interactions, unless medically contraindicated or not tolerated

● Low-dose NSAID therapy in an appropriate first-line choice for prevention of gout attacks, unless medically contraindicated or not tolerated

Treatment of acute attacks

ACR recommendations for treatment of attacks of acute gouty arthritis are as follows [110]:

● An acute gouty arthritis attack should be treated with pharmacologic therapy, started within 24 hours of onset

● Established pharmacologic ULT should be continued, without interruption, during an acute attack of gout.

● Nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, or oral colchicine are appropriate first-line options for treatment of acute gout, and certain combinations can be employed for severe or refractory attacks

The ACR recommends tailoring therapy according to the severity of the attack. For a mildly to moderately painful attack, particularly one affecting only one or a few small joints, or one to two large joints, monotherapy is recommended (evidence A). Choices for monotherapy include the following (all evidence A):

- An NSAID
- Systemic corticosteroids
- Colchicine, if started within 36 hours after symptom onset
- Supplemental topical ice, as needed

For patients with gastrointestinal contraindications or intolerance to other NSAIDs, use of selective COX-2 inhibitors available outside the United States (eg, etoricoxib) is an option (evidence A). However, these against share many adverse events with nonselective NSAIDs. Therapy with the agent available in the US, celecoxib, requires high doses and its risk-benefit ratio is currently unclear.

For severely painful attacks, particularly those that are polyarticular or affect multiple large joints, initial combination therapy is an option. Both agents are started at full—or, when appropriate, prophylactic—doses. Acceptable combinations include any of the following (evidence C):

- Colchicine and NSAIDs
- Oral corticosteroids and colchicine
- Intra-articular steroids with all other modalities

In patients with an inadequate response to treatment (ie, <20% improvement in their pain score within 24 h, or <50% improvement at ≥24 h, the ACR recommends switching to an alternate monotherapy or considering add-on combination therapy (both evidence C). If the attack still fails to respond, off-label use of investigational agents may be considered (eg, interleukin-1 inhibitors such as anakinra, canakinumab, or rilonacept).

American College of Physicians Guidelines

Diagnosis of acute gout

The ACP guideline recommends using synovial fluid analysis when clinical judgment indicates that diagnostic testing is necessary in patients with possible acute gout (weak recommendation, low-quality evidence). The guideline advises that synovial fluid analysis is considered the reference standard for gout diagnosis but may be difficult to perform in a primary care setting. Synovial fluid analysis is recommended if the following criteria can be met [159]

- An experienced clinician can aspirate the joint without substantial patient discomfort and can minimize the risk of infection
- A reliable and accurate source (including a trained operator with a polarizing microscope) is available to assess the fluid for the presence of urate crystals
- The clinical situation is ambiguous and a probability of joint infection exists

If the criteria for synovial fluid analysis cannot be met, the ACP recommends that clinicians either refer the patient to a source that can meet the criteria or use their clinical judgment regarding the need for joint aspiration. Clinical judgment is especially appropriate in situations that are less clinically ambiguous and the probability of infection is not significant. For example, a patient with podagra, appropriate risk factors (eg, age), and no sign of an overlying skin wound) could be considered to have gout without undergoing joint aspiration.

The ACP notes that algorithms for clinical diagnosis of gout exist and have sensitivities and specificities >80%, but little evidence exists that they can be used to identify septic joints. Current evidence is insufficient to support the use of dual-energy computed tomography or ultrasonography to diagnose acute gout. [159]

Management of acute and recurrent gout

ACP recommendations for the treatment of acute and recurrent gout attacks are as follows [129] :

- Use corticosteroids, NSAIDS, or colchicine to treat acute gout
- Use low-dose colchicine (1.2 mg, then 0.6 mg 1 hr later) when using colchicine for acute gout
- Recommend against initiating long-term urate-lowering therapy in most patients after a first gout attack or in patients with infrequent attacks
- Discuss benefits, harms, costs, and individual preferences with patients before initiating urate-lowering therapy, including concomitant prophylaxis, in patients with recurrent gout attacks

In contrast to American College of Rheumatology recommendations, the ACP concluded that evidence was insufficient to determine whether the benefits of escalating urate-lowering therapy to reach a serum urate target outweigh the harms associated with repeated monitoring and medication escalation.

Medication Summary

Acute inflammation due to gout can be treated with nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, or colchicine. NSAIDs are the most commonly used drugs in acute gout.

Over the long term, gout is treated by decreasing tissue stores of uric acid with the xanthine oxidase inhibitors allopurinol or febuxostat or with the uricosuric agent probenecid. Because agents that lower uric acid can precipitate attacks of gout, low-dose colchicine is typically used as prophylaxis (usually for 6 months) when such therapy is initiated.

If these measures, along with adjustment of contributing medications (eg, diuretics), do not result in appropriate reduction of serum uric acid levels, uric acid−lowering treatment is escalated as recommended in the 2012 American College of Rheumatology (ACR) gout guidelines. [109, 110]

Other agents lower uric acid levels as a secondary effect. The angiotensin-receptor blocker (ARB) losartan is moderately uricosuric at 50 mg/day. The lipid-lowering agent fenofibrate reduces serum urate 19% and increases clearance by 36% at 200 mg/day. [41]

NSAIDs

Class Summary

As a class, NSAIDs are the drugs most widely used to treat the pain and inflammation of acute gout attacks in patients who can safely take these medications. Although NSAID effects on pain tend to be patient-specific, naproxen and indomethacin are common choices. Nevertheless, the choice of an NSAID is a matter more of habit than of science. Use of concomitant gastric protection with misoprostol or consideration of a cyclooxygenase-2 (COX-2)–specific NSAID might be considered if the patient has gastrointestinal (GI) risk or is older than 51 years.

To control the attack as quickly and safely as possible (recalling that it takes 5 half-lives to reach steady state), consider using an NSAID with a short half-life (eg, ketoprofen, ibuprofen, or diclofenac). Use the maximum dosage of NSAID, and taper over approximately 10-14 days, depending on patient response.

Naproxen (Mediproxen, Naprelan, Naprosyn)

- View full drug information

Naproxen is used for relief of mild to moderate pain. It inhibits inflammatory reactions and pain by decreasing activity of the enzyme cyclooxygenase, resulting in prostaglandin synthesis.

Ketoprofen

- View full drug information

Ketoprofen is used for the relief of mild-to-moderate pain and inflammation. Small doses are initially indicated in small and elderly patients and in those with renal or liver disease. Individual

doses greater than 75 mg do not increase therapeutic effects. Administer high doses with caution, and closely observe the patient for response.

Diclofenac (Dyloject, Zorvolex, Zipsor, Cambria)

- View full drug information

Diclofenac inhibits prostaglandin synthesis by decreasing activity of the enzyme cyclooxygenase, which in turn decreases formation of prostaglandin precursors.

Indomethacin (Indocin, Tivorbex)

- View full drug information

Indomethacin has been the NSAID traditionally used to treat acute inflammation in gout, though other NSAIDs are effective in this setting as well. Like all NSAIDs, indomethacin blocks cyclooxygenase and thereby reduces the generation of prostaglandins.

Celecoxib (Celebrex)

- View full drug information

Unlike most NSAIDs, which inhibit both COX-1 and COX-2, the selective COX-2 inhibitor celecoxib offers the possibility of relieving inflammation and pain, but with a lower risk of GI side effects. It has been suggested that COX-2 expression in monocytes is induced in response to urate crystals.

Several studies have found that selective COX-2 inhibitors are comparable to other NSAIDs for treating acute gouty arthritis. However, celecoxib requires particularly high doses to provide pain relief comparable to that provided by indomethacin in acute gout. [108]

Selective COX-2 inhibitors may increase the risk of cardiac disease; 1 drug in this class, rofecoxib, has already been removed from the market for this reason. Celecoxib is currently under investigation for associated risk of accelerated cardiac disease. Curiously, the risk appears to be associated with ingestion of 200 mg twice daily, but not with ingestion of 400 mg once daily.

Uricosuric Agents

Class Summary

Uricosuric agents lower uric acid levels by inhibiting renal tubular reabsorption of uric acid, thereby increasing net renal excretion of uric acid. These agents increase the risk of renal stones, with about a 9-10% risk for probenecid. They should not be started during an attack of acute gouty arthritis. The goal of therapy is to lower serum uric acid to approximately 5-6 mg/dL without causing renal stones.

Colchicine (Colcrys, Mitigare)

- View full drug information

Colchicine inhibits microtubules and may thereby inhibit phagocytosis, neutrophil mobility, and chemotaxis. It also may inhibit generation of prostaglandins. The traditional approach of giving colchicine until vomiting or diarrhea appears is not appropriate; these are signs of toxicity. Instead, 1.2 mg is given orally, followed by 0.6 mg after 1 hour. Dose reduction is required for coingestion of interacting drugs (eg, P-gp or CYP3A4 inhibitors).

Probenecid

- View full drug information

Probenecid lowers tissue stores of uric acid by increasing net renal excretion of uric acid through inhibition of tubular reabsorption. Some authorities recommend alkalizing the urine when starting probenecid to reduce the risk for renal stone formation. Probenecid is indicated for long-term management of hyperuricemia associated with gout.

Corticosteroids

Class Summary

Corticosteroids are potent and effective anti-inflammatory drugs that can be used to treat acute gout in patients who cannot tolerate NSAIDs or colchicine. They can be given orally, intramuscularly (IM), intravenously (IV), or intra-articularly. Adrenocorticotropic hormone (ACTH) also acts in gout, in part by inducing adrenal steroids. No intrinsic advantage to treating with IV corticosteroids exists unless the patient cannot take oral medications.

The short-burst corticosteroid regimen used to treat an acute flare of gout is generally well tolerated. Nevertheless, patients may experience the adverse effects seen with long-term steroid use.

In patients with only 1 or 2 involved joints, intra-articular corticosteroids are a safe and effective treatment option, once infection has been excluded. Water-soluble steroids (eg, dexamethasone) are teleologically inappropriate for use as a depot steroid treatment.

Prednisone (Deltasone, Intensol, Rayos)

- View full drug information

Oral prednisone can be given to abort an attack of gout. By reversing increased capillary permeability and suppressing polymorphonuclear leukocyte (PMN) activity, this agent may decrease inflammation. Steroid dose packs that clearly label the dose to be taken each day can be convenient for some patients.

Triamcinolone (Aristocort)

- View full drug information

Intra-articular use is considered by some as the treatment of choice for pseudogout and for acute gouty attacks in patients who cannot be given NSAIDs, colchicine, or high-dose systemic corticosteroids.

Corticotropin (HP Acthar Gel, Acthar Gel)

- View full drug information

Corticotropin stimulates endogenous production of corticosteroids and directly and rapidly acts on peripheral leukocyte activation. It decreases inflammation by suppressing migration of PMNs and reversing increased capillary permeability.

Xanthine Oxidase Inhibitors

Class Summary

Inhibition of xanthine oxidase, the enzyme that synthesizes uric acid from hypoxanthine, reduces the synthesis of uric acid without disrupting the biosynthesis of vital purines. This results in the reduction of the tissue stores of uric acid. The goal of therapy is to lower the serum uric acid level to approximately 5-6 mg/dL. These agents should not be started during an attack of acute gouty arthritis without adequate control of the gouty inflammation.

Allopurinol (Zyloprim, Aloprim)

- View full drug information

Allopurinol reduces production of uric acid, thereby allowing the body to dispose of excess uric acid stores. It is the most effective therapy for lowering serum uric acid. Most patients achieve the target uric acid level of 5 mg/dL at a dosage of 300-400 mg/day. A lower dosage is used if renal insufficiency is present.

Febuxostat (Uloric)

- View full drug information

Febuxostat is a potential alternative to allopurinol.[126, 127] Like allopurinol, febuxostat is a xanthine oxidase inhibitor that prevents uric acid production and lowers elevated serum uric acid levels. Unlike allopurinol, it is a thiazolecarboxylic acid derivative, not a purine base analogue.

Febuxostat physically blocks the channel to the molybdenum-pterin active site of xanthine oxidase and is metabolized by liver oxidation and glucuronidation. [42]
Common adverse events include upper respiratory tract infections, arthralgias, diarrhea, headache, and liver function abnormalities. Atrioventricular block or atrial fibrillation and cholecystitis also have been reported. [141] As with other uricosuric agents, initiation of febuxostat may precipitate gouty attacks. [42, 141]
Selective Uric acid Reabsorption Inhibitor (SURI)

Class Summary

May considered adding a SURI to the therapeutic regimen in patients who have not achieved target serum uric acid levels with a xanthine oxidase inhibitor alone.

Lesinurad (Zurampic)

- View full drug information

Lesinurad is the first selective uric acid reabsorption inhibitor to be approved in the United States. It acts by inhibiting the urate transporter, URAT1, which is responsible for the majority of the renal reabsorption of uric acid. It also inhibits organic anion transporter 4 (OAT4), a uric acid transporter associated with diuretic-induced hyperuricemia. It is indicated in combination with a xanthine oxidase inhibitor for hyperuricemia associated with gout in patients who have not achieved target serum uric acid levels with a xanthine oxidase inhibitor alone.
Rheumatologics, Other

Class Summary

Uricase facilitates conversion of urate to allantoin. Unlike uric acid, allantoin is soluble and easily excreted by the kidneys. Thus, hyperuricemia is reduced, with little risk of acute kidney injury.

Pegloticase (Krystexxa)

- View full drug information

Pegloticase is a pegylated uric acid–specific enzyme that is a polyethylene glycol conjugate of recombinant uricase. It achieves its therapeutic effect by catalyzing oxidation of uric acid to allantoin, thereby lowering serum uric acid levels. Pegloticase is indicated for gout in adults refractory to conventional therapy (ie, when serum uric acid levels have not normalized and either signs and symptoms are inadequately controlled with xanthine oxidase inhibitors or uricosurics at maximum appropriate doses or xanthine oxidase inhibitors are contraindicated).
The dosage is 8 mg IV every 2 weeks. Complications include anaphylaxis, infusion reactions, flare of gout attacks in 63-86% of patients and nephrolithiasis in 13-14%, along with arthralgias, nausea, dyspepsia, muscle spasms, pyrexia, back pain, diarrhea, and rash. [142, 143] Glucose-6-phosphate dehydrogenase (G6PD) deficiency is a contraindication. [143]
Corticotropic Hormones

Class Summary

Corticotropic hormones stimulate synthesis and release of corticosteroid hormones. They are principally used in diagnostic tests to differentiate primary adrenal insufficiency from secondary adrenal insufficiency. They have limited therapeutic value in conditions responsive to corticosteroid therapy, for which a corticosteroid should be the drug of choice.

Cosyntropin (Cortrosyn)

- View full drug information

Cosyntropin is an adrenocorticotropic hormone (corticotropin) that stimulates the production and release of endogenous steroids. It is an effective treatment of acute crystal-induced arthritis in postoperative patients and in other patients who cannot take oral medications.

Combination drugs

Class Summary

Uricase facilitates conversion of urate to allantoin. Unlike uric acid, allantoin is soluble and easily excreted by the kidneys. Thus, hyperuricemia is reduced, with little risk of acute kidney injury.

Gout is a highly symptomatic and painful form of inflammatory arthritis caused by hyperuricemia, or elevated serum uric levels in the blood, which can lead to painful flares and serious potential long-term health consequences. Combination treatments provide a new option in the treatment of both gout and hyperuricemia.

Lesinurad/allopurinol (Duzallo)

- View full drug information

Fixed-dosed combination indicated for treatment of hyperuricemia associated with gout in patients for whom target serum uric acid (sUA) levels have not been achieved with allopurinol alone.

For IV students of the faculty

medical business and medical

pedagogy in the subject

FACULTY THERAPY

Themes of independent work

Independent work of students
Thematic plans for independent work of students

№	The name of IW of students	hours
1.	Internet search for methods of studying lung diseases. The study of the functions of external respiration.	3
2.	Methods of preventing rheumatism.	3
3.	Prolapse of the mitral valve. Internet search	4
4.	Anatomical and functional characteristics of the organs of the blood.	4
5.	Internet search for modern ways of treating myocarditis.	4
6.	The main groups of antihypertensive drugs (formulation). Online search for lipid metabolism.	4
7.	Functional diagnostics in IHD.	4

8.	Recipe for myocardial infarction	3
9.	Internet search for new methods of diagnosing chronic gastritis	4
10.	Internet search for new methods of treatment of peptic ulcer.	3
11.	Functional bowel disease. Dysbacteriosis.	4
12.	Chronic cholecystitis. Study of morphofunctional liver states	3
13.	Functional diagnostics of kidney diseases	3
14.	Pyelonephritis. Formulation of antibiotics and uroseptics	3
15.	Methods of examination of patients with joint diseases.	3
16.	Differential Diagnosis of Articular Syndrome	4
17.	Recipe for nosteroid and steroid anti-inflammatory drugs	4
	Total	60

FACULTY THERAPY

GLOSSARY

Glossary

word part of speech	Meaning	example sentence
abnormal adj	not normal for the human body	This amount of weight loss is abnormal for women your age.
ache noun/verb	pain that won't go away	I can't sleep because my knees ache in the night.
acute adj	quick to become severe/bad	We knew the baby was coming right away because the woman's labour pains were acute.
allergy noun allergic adj	a body's abnormal reaction to certain foods or environmental substances (eg causes a rash)	Your son is extremely allergic to peanuts.
ambulance noun	emergency vehicle that rushes people to a hospital	We called the ambulance when Josh stopped breathing.

amnesia noun	a condition that causes people to lose their memory	I can't remember the accident because I had amnesia.
amputation noun amputate verb	permanent removal of a limb	We had to amputatehis leg because the infection spread so quickly.
anaemia noun anaemic adj	occurs when the body doesn't have enough red blood cells	I have low energy because I am anaemic.
antibiotics noun	medication that kills bacteria and cures infections	My throat infection went away after I started the antibiotics.
anti-depressant noun	medication that helps relieve anxiety and sadness	The anti-depressants helped me get on with life after Lucy died.
appointment noun	a scheduled meeting with a medical professional	I've made you an appointment with a specialist in three week's time.
arthritis noun	a disease that causes the joints to become swollen and crippled	My grandmother can't knit anymore because the arthritis in her hands is so bad.
asthma (attack) noun	a condition that causes a blockage of the airway and makes it difficult for a person to breathe	I carry an inhaler when I run because I have asthma.
bacteria noun	a disease-causing organism	To prevent the spread of bacteria it is important that nurses wash their hands often.
bedsore noun	wounds that develop on a patient's body from lying in one place for too long	If you don't get up and take a walk, you will develop painful bedsores.
benign adj	not harmful (not cancerous)	We're hoping that the tests will show that the lump in your breast is benign.
biopsy noun	removal of human tissue in order to conduct certain medical tests	The biopsy ruled out a number of illnesses.
blood count noun	the amount of red and white blood cells a person has	You will be happy to know that your blood count is almost back to normal.
blood donor noun	a person who gives blood to a blood bank or other person	Blood donors have to answer questions about their medical history.
blood pressure noun	the rate at which blood flows through the body (high/low)	High blood pressureputs you at risk of having a heart attack.

brace noun	a device that holds injured body parts in place	You will probably always have to wear a brace on your ankle when you jog.
breech adj	position of an unborn baby in which the feet are down and the head is up	We thought it was going to be a breechbirth, but the baby turned himself around.
broken adj	a bone that is divided in two or more pieces as a result of an injury	We thought it was just a sprain, but it turned out his leg was broken.
bruise noun bruised adj	injured body tissue that is visible underneath the skin	The woman was badly bruised when she came into the emergency room.
Caesarean section, C-section noun	procedure that involves removing a baby from its mother through an incision in the woman's lower abdomen	The baby was so large that we had to perform a Caesarean section.
cancer noun	disease caused by the uncontrollable growth of cells	There are many different options when it comes to treating cancer.
cardiopulmonary resuscitation (CPR) noun	restoring a person's breath and circulation	You saved your brother's life by performing CPR.
cast noun	a hard bandage that is wrapped around a broken bone to keep it in place	My leg was in a castfor graduation.
chapel, chapeline noun	a place where loved ones can go to pray for a patient's recovery; a priest who visits patients in the hospital	If you want a place to pray, the chapel is on the third floor.
chemotherapy noun	type of treatment used on cancer patients	My mother has already had three rounds of chemotherapy.
chickenpox noun	a virus commonly contracted by children, characterized by itchy spots all over the body	It is best to get chickenpox as a child so that you don't get it worse as an adult.
coroner noun	a person who determines the cause of death after a person dies	We only call the coroner if we think a death is suspicious.
critical condition noun	requiring immediate and constant medical attention	You can't see her right now; she's in critical condition.
crutches noun	objects that people with injured legs or feet use to help them walk	I'd rather hop on one foot than use crutches.

cyst noun	a sac in the body-tissue filled with fluid (sometimes diseased)	We're going to remove the cysts just to be on the safe side.
deaf adj	unable to hear	The accident left the patient both deaf and blind.
deficiency noun	a lack of something necessary for one's health	The tests show that you have an iron deficiency.
dehydrated adj	in need of water	It is easy for the elderly to become dehydrated in this heat.
dementia noun	loss of mental capacity	It is hard to watch a loved one suffering with dementia.
diabetes noun	type of disease typically involving insulin deficiency	People with diabeteshave to constantly check their blood sugar levels.
diagnosis noun	medical explanation of an illness or condition	The doctor would prefer to share the diagnosis with the patient himself.
discomfort noun	experiencing pain	This pain medication should relieve some of your discomfort.
disease noun	a medical disorder that is harmful to a person's health	I understand that this disease runs in your family.
dislocated adj	when a bone is temporarily separated from its joint	You will have to wear a sling because of your dislocatedshoulder.
emergency noun	a medical problem that needs immediate attention	It is important that children know which number to dial in case of an emergency.
ER (emergency room) noun	the hospital room used for treating patients with immediate and life-threatening injuries	The child was rushed into the ER after he had a severe allergic reaction to a bee sting.
external adj	on the outside	This cream is for external use only. Do not get it near your ears, eyes, or mouth.
false negative noun adj	a test that incorrectly comes back negative	We had two false negative pregnancy tests, so we didn't know we were having a baby.
family history noun	medical background of a person's family members	The doctor was concerned about my family history of skin cancer.

fatal adj	causing death	The doctor made a fatal error when he wrote the wrong prescription.
fever noun feverish adj	higher than normal body temperature	He is very feverish, and his temperature is near danger point.
flu (influenza) noun	many types of respiratory or intestinal infections passed on through a virus	People who have the flu should not visit hospital patients.
fracture noun fractured adj	broken or cracked bone	Your wrist is fractured and needs a cast.
germ noun	a micro-organism, especially one that causes disease	Flowers are not allowed in the ward to avoid the risk of germs being brought in.
genetic adj	a medical condition or physical feature that is passed on in the family	The disease is part genetic and part environmental.
growth noun	a ball of tissue that grows bigger than normal, either on or under the skin	That growth on your shoulder is starting to worry me.
heart attack noun	instance in which blood stops pumping through the heart	People who smoke are at greater risk of having a heart attack.
HIV noun	the virus that infects the human T-cells and leads to AIDS	HIV can be passed down from the mother to her fetus.
hives noun	bumps that appear on the surface of the skin during an allergic reaction	I broke out in hivesafter I ate that potato casserole.
illness noun ill adj	general term for any condition that makes a person feel sick for a certain period of time	Her illness went away when she started eating better.
immune system noun	the parts of the body that fight diseases, infections, and viruses	You can't have visitors because your immune system is low.
immunizationnoun immunize verb	an injection that protects against a specific disease	Babies are immunized three times in their first year.
incision noun	cut in the body made during surgery	I had to have stitches to close the incision.
inconclusive adj	Unclear	We have to do more x-rays because the first ones were inconclusive.

infant noun	young baby	The nurse will demonstrate how to bathe an infant.
infection noun infected adj	diseased area of the body (viral or bacterial)	The wound should be covered when you swim to prevent it from becoming infected.
inflamed adj	appearance (red and swollen) of an injured body part	My right ankle was so inflamed it was twice the size of my left one.
injury noun	damage to the body	Her injuries were minor; just a few cuts and bruises.
intensive care unit (ICU) noun	section of the hospital where patients get constant attention and doctors rely on specialized equipment	She will remain in the ICU until she can breathe on her own.
internal adj	under the skin, inside the organs	The doctors will be monitoring her for any internal bleeding.
itchy adj	feeling discomfort on the skin's surface	If you are allergic to this medication your skin will get red and itchy.
IV noun	a tube that pumps liquids and medication into a patient's body	The toddler was so dehydrated that the doctor decided to get him on an IV.
lab results *noun*	tests that come back from a laboratory and help doctors make a diagnosis	The lab results have come in and you are free to go home.
lab (laboratory) *noun*	place where samples of blood/urine etc. are taken for testing	I'll take these samples down to the lab on my way out.
life support *noun*	a machine that keeps patients alive by helping them breathe	The woman has severe brain damage and is currently on life support.
life-threatening *adj*	when injuries and conditions are extremely serious	The victim was shot in two places but the bullet wounds are not life-threatening.
light-headed *adj*	feeling of dizziness and being off-balance, caused by lack of oxygen in the brain	If you are feeling light-headed again, lie down and call me.
malignant *adj*	expected to grow and get much worse (especially related to cancerous cells)	I'm afraid at least one of the tumours is malignant.
medical school (med.	place where someone trains to be a	After eight years of medical school I

school) *noun*	doctor	can finally practice medicine.
newborn *noun*	an infant that is less than three months old	You have to support her neck because she is still a newborn.
numb *adj*	no feeling in a certain body part	The needle will make your lower body feel numb.
OR (operating room) *noun*	the place where major surgeries and operations take place	You must wear a face mask and gloves while you are in the OR.
operation*noun* operate on*verb*	a medical procedure that involves going inside a person's body in an attempt to fix a problem	The operation lasted seven hours, but it was successful.
pain *noun*	strong discomfort in certain areas of the body	We gave your husband some medicine to relieve some of the pain.
pain killer, pain reliever *noun*	type of medicine that takes away some or all of the discomfort of an illness or injury	You can take two pain killers every four hours.
paralyzed *adj*	unable to move certain areas of the body	We thought her legs were paralyzed for life, but she is learning how to walk.
patient *noun*	a person staying in a hospital or medical facility	The patients in Room 4 are not getting along.
pharmacist *noun*	a person who fills a doctor's prescription and gives people advice about medication	Ask the pharmacist if there is a generic brand of this medication.
pharmacy, drugstore *noun*	a place where people go to buy medication and other medical supplies	You should be able to buy a bandage at the pharmacy.
physician *noun*	Doctor	Ask your family physician to refer you to a specialist.
poison *noun* poisonous*adj*	a substance that is very dangerous if it enters the human body	The child was bitten by a poisonous snake.
prenatal *adj*	of the time period leading up to giving birth	The woman was well prepared for labour because she took the prenatal classes.
prescription*noun* prescribe*verb*	the correct amount and type of medication needed to cure an	You will need to visit your doctor to get another prescription.

	illness or relieve symptoms	
privacy *noun* private *adj*	being alone; personal (eg test results)	You will have to pay for a private hospital room if you don't want a room-mate.
radiation *noun*	high energy X-rays that destroy cancer cells	If the radiation doesn't kill all of the abnormal cells, the cancer will come back.
residency resident *noun*	part of a doctor's training that takes place in the hospital; a student working under a doctor	John is a resident under Dr Brown.
routine check-up *noun*	a doctor's appointment to check a person's general health	I'd like to see you a year from now for a routine check-up.
scrubs *noun*	plain uniform (usually green, white, or blue) worn by medical professionals	I have some extra scrubs in my locker.
scrub up *verb*	carefully wash hands before and after seeing a patient	I have to scrub up and get ready for surgery.
second opinion *noun*	input from a second doctor about an illness or symptom	I went to another doctor to get a second opinion about these headaches.
seizure *noun*	sudden violent movements or unconsciousness caused by electrical signal malfunction in the brain	People who suffer from epilepsy are prone to seizures.
shock *noun*	body not getting enough blood flow	The woman was in shock after being pulled from the river.
side effects *noun*	other symptoms that might occur as a result of a certain medication or procedure	One of the side effectsof antidepressants is a loss of appetite.
sore *adj*	Painful	I have a sore throat and a runny nose.
spasm *noun*	the uncontrollable tightening of a muscle	Ever since I injured my leg I've been having muscle spasms in my upper thigh.
specialist *noun*	a doctor that is an expert in a certain kind of medicine	My family doctor is sending me to a specialist.

sprain *noun/verb*	an injury (less serious than a break) to a joint (ankle, wrist, knee etc)	I sprained my knee playing soccer.
stable condition *noun*	a patient is stable if their medical condition is no longer changing rapidly	You can see your husband now; he is in a stable condition.
sting *noun/verb*	sharp, temporary pain	It may sting when I insert the needle.
stress *noun* stressed *adj*	worry that causes muscles to tighten and blood pressure to rise	You need to take some time off work and relieve some of your stress.
swelling*noun* swollen *adj*	ligaments (parts that hold the joints together) growing bigger and rounder after an injury to a joint	I knew my ankle was sprained because it was so swollen.
symptoms *noun*	pain or physical changes that occur because of an illness or disease	You have all of the symptoms of a diabetic.
temperature *noun*	amount of heat measured in a body; higher than normal temperature	We brought Jesse to emergency because he was running a (high) temperature.
tender *adj*	painful when touched or used	The incision was tenderafter the surgery.
test results *noun*	medical information that helps doctors understand a patient's condition or body	The test results came back negative. You aren't pregnant.
therapy *noun*	treatment aimed at improving a person's mental or physical condition	I was able to go back to work a few weeks after starting the therapy.
transplant *noun*	moving of an organ from one human to another	The heart transplantsaved your life.
ultrasound *noun*	a test that examines the body's internal organs and processes using sound waves (often used during pregnancies)	The ultrasound shows that we are expecting a baby boy.
umbilical cord *noun*	the lifeline from the mother to the fetus (when cut at birth this forms the belly button)	I had an emergency C-section because the umbilical cord was wrapped around the baby's neck.
unconscious *adj*	alive, but appearing to be asleep and unaware of the surroundings	I hit my head on the steering wheel and was still unconscious when the ambulance arrived.

urine sample *noun*	a small amount of the body's liquid waste that is tested for different medical reasons	The urine sample tells us how much alcohol is in your blood.
vein *noun*	the thin tubes that transport blood around the body and back to the heart	I'm just looking for the best vein in which to insert the needle.
virus *noun*	a dangerous organism that causes the spread of minor and major diseases	The virus is contractable through the exchange of bodily fluids.
visiting hours *noun*	time of day when friends and family are allowed to visit patients in hospital	I'm afraid you'll have to come back during visiting hours.
vomit *noun/verb*	discharge of a person stomach contents through the mouth	The pregnant woman can't stop vomiting.
ward *noun*	a section of a hospital or health facility where patients stay	I should warn you that we're entering the mental health ward.
wheelchair *noun*	a chair on wheels used for transporting patients from place to place	If you get in the wheelchair I'll take you down to see the garden.
wound *noun* wounded*adj*	injury to body ("flesh wound" means not deep)	The wounded soldiers are being airlifted to the hospital.
x-ray *noun/verb*	a photograph of a person's bones and organs	The technician took x-rays of my shoulder to make sure it wasn't broken.

FACULTY THERAPY

treatment

6.1 TYPICAL PROGRAM

O`ZBEKISTON RESPUBLIKASI
OLIY VA O`RTA MAXSUS TA`LIM VAZIRLIGI

Рўйхатга олинди
№ 11.6A120502-2.2
20 йил «17» мартда

Ўзбекистон Республикаси
Олий ва ўрта махсус таълим
Вазирлигининг 20 йил «17»
даги «103» сонли
Буйруғи билан тасдикланган

Fanning namunaviy o`quv dasturi

ICHKI KASALLIKLAR VA XALQ TABOBATI
fanining
O`QUV DASTURI

Bilim sohasi:	700000	– Sog`liqni saqlash va ijtimoiy ta`minot
Ta`lim sohasi:	720000	– Sogliqni saqlash
Ta`lim yo`nalishi:	572010	– Davolash ishi
	5140900	– Kasbiy ta`lim (5720100 – Davolash ishi)

Toshkent – 2014

Fanning o`quv dasturi Oliy va o`rta maxsus, kasb-hunar ta`limi o`quv-uslubiy birlashmalari faoliyatini Muvofiqlashtiruvchi Kengashning 2014 yil «____»dagi «_____»-son majlis bayoni bilan ma`qullangan.

Fanning o`quv dasturi Toshkent tibbiyot akademiyasida ishlab chiqildi.

Tuzuvchilar:

Rizamuxamedova M.Z.	– davolash fakulteti “fakultet va gospital terapiya, sharq tabobati, tibbiy profilaktika fakulteti ichki kasalliklar” kafedra mudiri t.f.d. professor
Alyavi A.L.	– tibbiy pedagogika fakulteti “fakultet va gospital terapiya, sharq tabobati, stomatologiya fakulteti ichki kasalliklar” kafedra mudiri t.f.d. professor
Daminov.B.T.	– tibbiy pedagogika fakulteti “fakultet va gospital terapiya, sharq tabobati, stomatologiya fakulteti ichki kasalliklar” kafedrasi t.f.d. professor
Burxanova F.A.	– davolash fakulteti “fakultet va gospital terapiya, sharq tabobati, tibbiy profilaktika ichki kasalliklar” kafedrasi, t.f.d., dotsent
Li B.N.	–0 davolash fakulteti “fakultet va gospital terapiya, sharq tabobati, stomatologiya fakulteti fakulteti ichki kasalliklar” kafedrasi, t.f.n., dotsent.
Abduvaliev A.A.	–1 davolash fakulteti “fakultet va gospital terapiya, sharq tabobati, tibbiy profilaktika fakulteti ichki kasalliklar” kafedrasi, t.f.n., dotsent.
Umarova Z.F	– tibbiy profilaktika “fakultet va gospital terapiya, sharq tabobati, stomatologiya fakulteti fakulteti ichki kasalliklar” kafedrasi, t.f.n., dotsent.
Qurbonova SH.R.	–2 davolash fakulteti “fakultet va gospital terapiya, sharq tabobati, tibbiy profilaktika fakulteti ichki kasalliklar” kafedrasi, katta o`qituvchi

Taqrizchilar:

Raximov.SH.M.	– Toshkent Tibbiyot Pediatriya institutining fakultet va gospital terapiya kafedrasi professori.
Zaxidova M.Z.	– Toshkent Malaka Oshirish instituti UASH kafedrasi professori.

Fanning o`quv dasturi Toshkent tibbiyot akademiyasi Ilmiy-uslubiy kengashida tavsiya qilingan (2013 yil _____ dagi “_____” “____”- sonli bayonnoma).

Kirish

Ichki kasalliklar va sharq tabobati – keng tarqalgan kasalliklarning etiologiyasi, patogenezi, tasnifi, klinik kechishi, laboratoriya, asbob-uskunalar, klinik ko`rsatmalar yordamida tashxis qo`yish, oqibati, asorati, oldini olish choralari, kechiktirib bo`lmaydigan holatlarda tezkor yordam ko`rsatish, mustaqil ravishda tekshirish o`tkazish, ishga layoqatliligini bilish, davolash asoslarini o`rgatadigan fan bo`lib, umumiy amaliyot shifokori-bakalavr mutaxassisligiga oid tafakkur va dunyoqarashni shakllantirishda katta ahamiyatga egadir. Talaba tibbiy yordam ko`rsatish bo`yicha sharq tabobati usullari bilan davolashning asosiy ko`nikmalarini hosil qilib amaliy va nazariy bilim olishga mo`ljallangan. Asosiy vaqt ekstremal holatlarda xalq tabobati usullarini qo`llab, malakani oshirishga qaratilgan.

Ushbu dastur Davlat ta`lim standarti va umumiy amaliyot shifokorini tayyorlash dasturi asosida tuzilgan, tibbiyot oliy o`quv yurtlarining davolash, tibbiy-pedagogika fakul'tetlarining talabalariga ichki kasalliklar va sharq tabobatidan ta`lim berish uchun mo`ljallangan.

Fan bo`yicha talabalarning bilimiga, ko`nikma va malakasiga qo`yiladigan talablar

"Ichki kasalliklar va xalq tabobati" o`quv fanini o`zlashtirish jarayonida amalga oshiriladigan masalalar doirasida bakalavr:

-bemorlardan anamnestik ma`lumotlarni yig`a bilish (kasallik va hayot tarixi). Bemorni organlar bo`yicha umumiy ko`rikdan o`tkazish. Taxminiy tashxisni asoslash. Bemorni tekshirish rejasini tuzish. Umumiy klinik laborator tekshiruvlar natijalarini va qon, siydik, balg`am, axlatning bakteriologik ekish natijalarini interpretatsiya qila olish. qonning bioximik tekshiruvlari natijalarini tahlil qila olish. Ko`krak qafasi organlari, oshqozon - ichak trakti va siydik yo`llari rentgenologik tekshiruvlari natijalarini interpretatsiya qila olish. eKGni olish va o`qishni bilish YUrak va qon tomirlari, qorin bo`shlig`i organlari va buyraklar UTT tekshiruvlari natijalarini tahlil qila olish. Klinik tashxisni asoslash. qiyosiy taqqoslash. YAkuniy tashxisni asoslash. Parxez stolini va rejali davolashni tavsiya etishni va foydalana olishni igna reflesoterapiyani ta`sir mexanizmini, fitoterapiyani, tavsiya va qarshi ko`rsatmalari, asoratlarini, davolashni tavsiya etishni, xalq tabobati asoslari qontseptsiyasining ahamiyatini, (igna bilan davolash yoki fitoterapiya va boshqalarning nazariy va amaliy aspektlarini), igna refleksoterapiya (IRT) va fitoterapiyaning ta`sir mexanizmlarini, ignalar va ularni muolajaga tayyorlashni yoki dorivor o`simliklarni yig`ish vaqtini, biologik faol nuqtalarga ta`sir ko`rsatish usullarini yoki qaynatma, damlamalarni tayyorlash yo`llarini, igna bilan davolash yoki fitoterapiyada bo`ladigan asoratlar va ularning profilaktikasi, sharq tabobati usullarini qo`llab davolanadigan kasalliklar: nafas a`zolari; yurak qon-tomir sistemasi; ovqat hazm qilish a`zolari; asab sistemasi; siydik tanosil sistemasi ***bilishi kerak.***

- eng ko`p tarqalgan ichki a`zolar kasalliklarining etiologiyasi, patogenezi, klinikasi, asoratlari, davollash usullari; Tekshiruv va kompleks davo rejasini tuzish; asosiy tibbiy xujjatlarni bilish; eKG yuklamali sinama bilan; eKG-monitoring; exokardiografiya, doplerografiya bilan; FKG, Rentgenografiya, Komp'yuter tomografiya, yader-magnit rezonans, Angiografiya va yurak kateterizatsiyasi; Vaqtinchalik va doimiy kardiostimulyatsiya; elektroimpul's davo; Balg`amni bakteriologik ekish; Plevra bo`shlig`ini punktsiyasi; Bronxografiya; Spirografiya; Broxoskopiya; Najasni bakteriologik ekish; Najasni disbakteriozga tekshirish; Oshqozon shirasi va duolenal tarkibini tekshirish; Punktsiya (bo`shliqlarni va bo`g`im oralig`i); Gepatitning makerlarini aniqlash; UTT; eGDFS; Kolonoskopiya; Biopsiya; Immunologik tekshiruvlar, RF, TSIK; Bo`g`im oralig`iga punktsiya qilish, sinovial suyuqlikni tekshirish bilan; Peshob bakterialogik ekmasi va antibiotikogramma to`g`risida, sharq tabobat Xitoyda, Koreya, YAponiya, Tibet, Mo`g`ilistonda ilk bor rivojlangan bo`lib, davolashning eng qadimgi turlaridan biridir. Bu usulning asosiy omillaridan biri dori vositalarini qo`llamasdan organizmning ichki resurslarini ishlatishdir, sharq tabobatining kelib chiqishi. SHarќ tabobatining er yuzida qo`llanilishi. Asosiy nazariy yo`nalishlar (u-sin, in'-yan), klassik meridianlar va igna bilan davolash usullarining zamonaviy talqini to`g`risida ***tasavvurga ega bo`lishi lozim:***

- ichki kasalliklarning ichki a`zolar kasalliklarini tekshirish; bemorni professional so`roq va ko`rikdan o`tkazish; eKG olish va o`qishni bilish; pikfloumetriya qilish; mos parxez va davolash rejasini buyurish; ichki a`zolar kasalliklariga dastlabki va klinik tashxis ko`ya bilish, ignalarni tozalash va sterillash, dorivor o`simliklarni yig`ish tartibini, biologik aktiv nuqtalarga ta`sir qilish usullari, damlama va qaynatmalarni tayyorlash, igna bilan davolashda va fitoterapiyadagi asoratlar va ularni oldini olish ***malaka ega bo`lishi kerak.***

Fanning o`quv rejadagi boshqa fanlar bilan o`zaro bog`liqligi va uslubiy jihatdan uzviy ketma-ketligi

Ichki kasalliklar va xalq tabobati 7-8 semestrlarda fakultet terapiya fani va 9-10 semestrlarda gospital terapiya va xalq tabobati fani o`qitiladi. Dasturni amalga oshirish o`quv rejasida rejalashtirilgan anatomiya, gistologiya embriologiya va tsitologiya bilan birgalikda, biologiya, tibbiy genetika, biofizika va informatika, normal fiziologiya, mikrobiologiya, patanatomiya, patofiziologiya, topografik anatomiya, operativ xirurgiya, tuberkulyoz, farmakologiya, rentgenologiya va tibbiyot radiologiyasi, ichki kasalliklar propedevtikasi, fakul'tet terapiya, fizioterapiya, LFK, endokrinologiya, gematologiya XDT bilan, kasb kasalliklari fanlardan etarli bilim va ko`nikmalarga ega bo`lishlik talab etiladi.

Sog`liqni saqlash tizimidagi o`rni

Ichki kasalliklar va xalq tabobati fani zamonaviy tibbiyot amalietida muxim o`rin tutadi. Xozirgi vaqtda axoli orasida pnevmoniya, o`pkaning surunkali obstruktiv kasalliklari, bronxial astma, yurak ishemik kasalligi, revmatik isitma, yurak illatlari, oshqozon va 12 barmoq ichak yara kasalligi, gepatit va jigar sirrozi, revmatoid artrit kabi kasalliklar ko`rsatkichi oshib bormoqda. Ayniqsa yuqoridagi kasalliklar asorati oqibatida o`lim ko`rsatkichi oshib bormoqda. SHu nuqtai nazardan olib qaralganda ichki kasalliklar fani UASH faoliyatida muxim o`rin egallaydi. Ichki kasalliklar va xalq tabobati fani amaliyotda uchraydigan kasalliklarni erta tashxislash, ularni samarali davolash usullarini takomillashtirish va profilaktika choralarini o`rgatishni o`z oldiga maqsad qilib qo`yyadi. Bu fanni chuqur o`qitilishi UASH uchun xam nazariy xam amaliy axamiyat kasb etadi.

Fanni o`qitishda zamonaviy axborot va pedagogik texnologiyalar

Talabalarning ichki kasalliklar va xalq tabobati fanini o`zlashtirishlari uchun o`qitishning ilg`or va zamonaviy usullaridan foydalanish, yangi informatsion-pedagogik texnologiyalarni tatbiq qilish muhim axamiyatga egadir. Fanni o`zlashtirishda darslik, o`quv va uslubiy qo`llanmalar, ma`ruza matnlari, tarqatma materiallar, komp'yuter dasturlari, elektron materiallardan foydalaniladi. Ma`ruza va amaliy darslarda mos ravishdagi ilg`or pedagogik texnologiyalar qo`llaniladi.

Asosiy qism
Fakultet terapiya
Nafas olish a`zolari kasalliklari
O`tkir va surunkali bronxitlar. O`tkir traxeit. O`RK. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Krupoz zotiljam. Plevritlar. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Bronxial astma. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.
O`pka emfizemasi. Pnevmoskleroz Bronxoektatik kasallik. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.

Yurak va qon-tomir a`zolari kasalliklari
Revmatik lixoradka. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. YUrak mitral illatlari**.** Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.
YUrak aortal illatlari. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va

profilaktikasi. Miokarditlar. Perikarditlar. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Miokardiodistrofiyalar. Neyrotsirkulyator distoniya. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Gipertoniya kasalligi. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Ateroskleroz. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Ratsional ovqatlanish. Autotrening. qariyalar mua`mmosi. Tibbiy-genetik maslaxat. YUrak ishemik kasalligi. Stenokardiya. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. YUIK. Miokard infarkti. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. YUrak qon tomir kasalliklarini erta aniqlash skrining dasturi. YUrak aritmiyalari. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, eKG taxlili, davollash printsipi va profilaktikasi. YUrak blokadalari. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, eKG-diagnostikasi.

Ovqat xazm qilish a`zolari kasalliklari

qizilo`ngach va oshqozon funktsional kasalliklari. ezofagitlar. Gastroezofagal reflyuks kasalligi. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali gastritlar. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Oshqozon va 12-barmoq ichak yara kasalligi. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali enteritlar Gipovitaminoz. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali kolitlar. Ta`sirlangan ichak sindromi.Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali xoletsistitlar. O`t yulining diskineziyasi. Xoletsistektomiyadan keyingi sindrom. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali gepatitlar. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.

Buyrak kasalliklari

Glomerulonefritlar. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Surunkali pielonefrit. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.

Bo`g`imlar kasalliklari

SHakl buzuvchi osteoartroz. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Podagra. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi,

tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi. Parxezning axamiyati.
Revmatoid artrit. Kasallikning etiologiyasi, patogenezi, patologik anatomiyasi, tasnifi, klinikasi, tekshirish uslublarini o`rganish, laborator tahllilar javoblarini interpritatsiya qilish, davollash printsipi va profilaktikasi.

Gospital terapiya
Nafas a`zolari kasalliklari
O`choqli pnevmoniyalar: pnevmokokkli, stafilokkli, streptokokkli, mikoplazmali, virusli va boshqalar. etiologiya, patogenez, tasnifi, klinikasi, etiologiyasiga ko`ra kechish xususiyatlari. Krupoz pnevmoniya va o`pkaning boshqa kasalliklari bilan qiyosiy taqqoslash. Klinik tashxisni asoslash. Davolashni tavsiya etish. O`pka yuragi (o`tkir, nimo`tkir, surunkali). Nafas etishmovchiligi (o`tkir va surunkali) etiologiya, patogenez, tasnifi, klinikasi. qiyosiy taqqoslash, rejali davolash. O`tkir o`pka yuragida tezkor terapiya.
qon aylanish a`zolari kasalliklari
YUIK miokard infarkti. Atipik kechish variantlari. Asoratlari. Kardiogen shok. O`tkir chap qorincha etishmovchiligi. YUrak ritmi va o`tkazuvchanligining o`tkir buzilishlari. (ekstrasistolii, yurak ritm boshqarishning migratsiyasi, yurak ritmining paroksizmal buzilishlari, STSS, MAS sindrom). YUrakning o`tkir va surunkali anevrizmasi. Tromboemboliyalar, yurak yorilishi. qorinchalar fibrillyatsiyasi. Dresslar sindromi va qaytar miokard infarktlari. Diagnostikasi. Davolash. Tezkor yordam. Postinfarkt kardioskleroz. qo`shma mitral nuqsonlar. qo`shma aortal nuqsonlar. qo`shma trikuspidal nuqsonlar. Mitro-aortal nuqsonlar, mitro-aortal –trikuspidal nuqsonlar. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. Davolash usuli. Tug`ma yurak nuqsonlari bilan qiyosiy taqqoslash. Davolash usuli. Xirurgik davolashga ko`rsatmalar.Infektsion endokardit. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Kardiomiopatiyalar (KMP). Dilatatsion KMP, gipertrofik KMP, restriktiv KMP. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Simptomatik arterial gipertoniyalar. Buyrakka aloqador gipertoniyalar. endokrin gipertoniyalar. Gemodinamik gipertoniyalar. Markaziy asab sistemasining zararlanish bilan aloqador gipertoniyalar. Klinikasi diagnostikasi. qiyosiy taqqoslash. Davolash usuli. qon aylanish etishmovchiligi (qAE). O`tkir va surunkali qAE. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. O`tkir qon aylanish etishmovchiligida tezkor terapiya.

Hazm qilish a`zolari kasalliklari
Nospetsifik yarali kolit. Kron kasalligi. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Pankreatitlar. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Jigar sirrozlari. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Jigar etishmovchiligi. Jigar komasi. etiologiya, patogenez, tasnifi, klinikasi, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Tezkor terapiya:

Biriktiruvchi to`qima va bo`g`im a`zolari kasalliklari
Biriktiruvchi to`qimaning diffuz kasalliklari (BTDK). Sistemali qizil yugurdak (SqYU). etiologiya, patogenez, tasnifi, kechishi, klinikasi, asoratlari, diagnostikasi, diagnostik mezonlari. qiyosiy taqqoslash. Davolash usuli. Sistemali sklerodermiya. Dermatomiozit. **e**tiologiya, patogenez, tasnifi, kechishi, klinikasi, asoratlari, diagnostikasi, diagnostik mezonlari. Sistem vaskulitlar. Tugunchali periarterit nospetsifik aortoarteriit. etiologiya, patogenez, tasnifi, kechishi, klinikasi, asoratlari, diagnostikasi, diagnostik mezonlari. Seronegativ spondiloartritlar. Reaktiv artritlar. Psoriatik artrit. etiologiya, patogenez, tasnifi, kechishi, klinikasi, asoratlari, diagnostikasi, diagnostik mezonlari. Bexeterev kasalligi. etiologiyasi, patogenezi, tasnifi, kechishi, klinikasi, asoratlari, diagnostikasi, diagnostik mezonlari.

Buyrak kasalliklari
Nefrotik sindrom. Buyraklar amiloidozi. Nefropatiyalar. etiologiya, patogenez, tasnifi, klinika, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. Surunkali buyrak etishmovchiligi (SBE) etiologiya, patogenez, tasnifi, klinika, diagnostikasi. qiyosiy taqqoslash. Davolash usuli. gemodializga ko`rsatma va qarshi ko`rsatmalar.

Allergik kasalliklar
Dori allergiyasi. Allergik reaktsiyalar tiplari. etiologiya, allergik reaktsiyalar bosqichlari. Psevdoallergiya. Layell sindromi. Diagnostika. Tezkor yordam. Anafilaktik shok. Diagnostikasi. Tezkor yordam.
Xalq tabobati
Refleksoterapiyada nuqtalarning topografiyasi va ularni sistemalash
Xozirgi vaqtda 1500 dan ziyod nuqtalar bo`lib ulardan 670 tasi meridianlarda, 543 tasi meridianlardan tashqarida, 458 ta «yangi» nuqtalar va 200 taga yaqin aurikulyar nuqtalar. Bizning tsiklimiz qisqaligini hisobga olgan holda, biz faqat 14 ta doimiy klassik meridianlarda to`xtadik. Meridianlar frantsuz indeksi bilan xalqaro sistemada sanalib, xitoychaning rus transkriptsiyasida beriladi.
Biologik aktiv nuqtalarga ta`sir qilish usullari
Igna bilan ta`sir qilishda ikkita asosiy usuldan foydalaniladi: qo`zg`atuvchi (tonizatsiyalashtiruvchi), tinchlantiruvchi (sedativ). Bular o`z navbatida ikki variantga bo`linadi – kuchli (I) va kuchsiz (II). Ќo`zg`atuvchi va tinchlantiruvchi usullarning I va II varianti qo`llanilishining klinik misollari.

Xalq tabobatida terapevtik usullar
Igna bilan davolash usuli sharq tabobatida asosiy yo`nalishlardan biridir, bu usul kasallikni oldini olishga, engillashtirishga va davolashga qaratilgan. Tez yordam ko`rsatish usullari ichida igna qo`yib tez yordam ko`rsatish usuli sharq tabobatida eng samarali usullardan biridir. Bu terapevtik usul kasallar shok holatida bo`lganlarida, yurak xurujida, bronxial astmaning xurujida, oshqozon-ichak kasalliklarida, bel-but radikulitida, uch shoxli nerv nevralgiyasida, buyrak xurujida, dispepsik holatlarda va h.k.larda qo`llaniladi.

Amaliy mashg`ulotlarini tashkil etish bo`yicha ko`rsatma va tavsiyalar

1.Amaliy mashg`ulotlar amaliy ko`nikmalarni qadamma-qadam o`zlashtirish ichki kasalliklarning turli hil ko`rinishlarida klinik tashhisni to`g`ri qo`yish va rejali davolashni tavsiya etish maqsadini o`z ichiga oladi.
2. Bemorlarni kuniga kuratsiya qilishdan tashqari, talabalar sinov uchun o`z ishiga taxminiy, klinik, qiyosiy va yakuniy tashxislarni asoslagan, bemorning tekshirish rejasi va davolashni tavsiya etgan kasallik tarixini to`ldirishadi.
3. Har bir amaliy mashg`ulot 3 qismdan iborat: nazariy, amaliy va analitik.
4. Nazariy qismda o`qitishning interfaol usullaridan foydalanilgan, holda talabalar ichki organlar turli kasalliklarning etiologiyasi, patogenezi, klinikasi, diagnostikasi va davolash bo`yicha o`z bilimlarini namoyish etishadi.
5. Mashg`ulotning amaliy qismida o`qituvchi talabalar bilan birgalikda tematik bemorlarni tahlil qiladi va mustaqil kuratsiya uchun bemorlarni bo`lib beradi.
6. Mashg`ulotning analitik qismida esa, talabalar vaziyatli masalalarni echishadi, eKG, rentgenogrammalar, laborator tekshiruvlar natijalarini tahlil qiladi, retseptlar yozishadi.
7. SHuningdek, ba`zi mavzular bo`yicha videofil'mlar namoyish qilinadi, audiokassetalar qo`yib eshittiriladi, mul'timediyadan foydalanilgan holda komp'yuter orqali prezentatsiya o`tkaziladi. Kam uchraydigan mavzular bo`yicha rolli o`yinlar o`tkaziladi.
8. SHarq tabobati davolash jarayoni uchun ignalarni tayyorlash, ignalarni sanchish usullari va yo`llari, dorivor o`simliklarni yig`ishda kalendar reja. «Tez yordam» nuqtalarining topografiyasi, tez yordam usullari.
9. Akupunkturalar uchun ignalar, ularni muolajaga tayyorlash igna sanchish usuli mahorati, dorivor o`simliklarni yig`ish vaqti. "Tez yordam" nuqtalari topografiyasi; igna bilan davolash va fitoterapiyani qo`llash bilan "shoshilinch yordam" (xushsizlik, shok, kollaps) ko`rsatish; ignalarni qo`yish mahorati mashqi.
10. Bronxial astma va bronxitlarda igna refleksoterapiya (ITR) nuqtalari shu kasalliklarda qo`llaniladigan dorivor o`simliklarni yig`ish. Gipertoniya kasalligi va stenokardiyada ITR nuqtalari topografiyasi shu kasalliklarni giyohlar (o`tlar) bilan davolash amaliyotida qo`llanadigan retseptlar CHjen-TSzyu terapiyasi tarixidan. Oshqozon yarasi (gastrit) 12-barmoqli ichak va oshqozon yallig`lanishi kasalligida ITR nuqtalari topografiyasi va fitoterapiya.

11. Bel-But radikuliti, yuz nervi nevriti va 3 shoxli nerv nevrologiyasida ITR nuqtalari topografiyasi va noan`anaviy davolash usullari. Nefrit, pielonefrit, buyrak sanchig`i, tsistit va tsistalgiyalarda ITR nuqtalari topografiyasi va shu kasalliklarda qo`llaniladigan dorivor o`simliklarni yig`ish.
12. Xalq tabobati usullarini qo`llashning mumkin va mumkin emasligi. Igna sanchish maqorati attestatsiyasi.

Amaliy mashg`ulotlarning taxminiy tavsiya etiladigan mavzulari:

Fakultet terapiya
1. O`tkir va surunkali bronxitlar.
2. Krupoz zotiljam. Plevritlar.
3. O`pkaning yiringli kasalliklari (gangrena, abstsess).
4. Bronxial astma.
5. O`tkir revmatik isitma .
6. Mitral illatlar.
7. Aortal illatlar.
8. YUrak aritmiyalari.
9. YUrak blokadalari.
10.Miokarditlar.
11.Perikarditlar.
12.Miokardiodistrofiya. NTSD.
13.Gipertoniya kasalligi
14.Ateroskleroz
15.YUIK. Stenokardiya
16.Miokard infarkti
17.qizil o`ngach va oshqozonfuktsional kasalligi
18.Surunkali gastrit
19. 12 barmoqli ichak va oshqozon yara kasalligi
20.Surunkali enterit
21. Surunkali kolit
22.Surunkali gepatit
23.Surunkali pielonefrit
24.Glomerulonefritlar
25.Revmatoid artrit
26.Osteoartroz
27. Podagra

Gospital terapiya

1. Tizimli qizil bo`richa
2. Sistemali sklerodermiya. Dermatomiozit
3. Sistemali vaskulitlar. Tugunchali periarteriit. Nospetsifik aortoarteriit.
4. Seronegativ spondiloartritlar. Reaktiv artritlar. Bexterev kasalligi.
5. Nefrotik sindrom. Buyrak amiloidozi
6. Surunkali buyrak etishmovchiligi
7. Nospetsifik yarali kolit
8. Jigar sirrozi. Jigar etishmovchiligi
9. Pankreatit.
10.O`choqli zotiljam.
11.O`pka yurak, nafas etishmovchiligi
12.Bronxial astma asoratlari.

13.Miokard infarkti asoratlari, atipik variantlari.
14.YUrak mitral, aortal, trikuspidal qo`shma nuqsonlari
15.YUrak mitraaortal, mitraaortaltrikuspidal nuqsonlari
16.Infektsion endokardit
17.Kardiomiopatiya
18.YUrak ritmi va utkazuvchanligining murakkab buzilishlari
19.Arterial gipertoniya
20.qon aylanish etishmovchiligi

Xalq tabobati
1. Mutaxassislikka kirish. Meridian va akupunktur nuqta (AN) haqida tushuncha. Nuqtalarni topish orientirlari. Meridianlar haqida tushuncha (M). Doimiy meridianlar tavsifi va tasnifi.
2. Meridianlardagi standart nuqtalar va ularning tasnifi. O`pka va yo`g`on ichak meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
3. Ignalarni sanchish usullari. Asboblar va ularning sterillash. Ignaterapiyada ta`sir etish uslublari. Oshqozon va oshqozon soti bezi-taloq meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
4. Ignaterapiyaga ko`rsatmalar va qarshi ko`rsatmalar. YUrak va ingichka ichak meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
5. Ignaterapiyaning asoratlari. Favqulotli holatlarda qo`llaniluvchi birinchi yordam nuqtalari. Buyrak va siydik pufagi meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
6. Perikard, tananing uch qismi, oldingi o`rta va orqa o`rta meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
7. Jigar, o`t pufagi meridianlari. Tavsifi, qo`llashga ko`rsatmalar.
8. Nuqtalarni birga qo`llash usullari. Xususiy ignaterapiya.
Amaliy mashg`ulotlarni tashkil etish bo`yicha kafedra professor-o`qituvchilari tomonidan ko`rsatma va tavsiyalar ishlab chiqiladi. Unda talabalar asosiy ma`ruza mavzulari bo`yicha olgan bilim va ko`nikmalarini amaliy masalalar echish orqali yanada boyitadilar. SHuningdek, darslik va o`quv qo`llanmalar asosida talabalar bilimlarini mustahkamlashga erishish, tarqatma materiallardan foydalanish, ilmiy maqolalar va tezislarni chop etish orqali talabalar bilimini oshirish, masalalar echish, mavzular bo`yicha ko`rgazmali qurollar tayyorlash va boshqalar tavsiya etiladi.

Mustaqil ishlarni tashkil etishning shakli va mazmuni
Talaba mustaqil ishini tayyorlashda fanning xususiyatlarini hisobga olgan holda quyidagi shakllardan foydalanish tavsiya etiladi:
darslik va o`quv qo`llanmalar bo`yicha fan boblari va mavzularini o`rganish;
tarqatma materiallar bo`yicha ma`ruzalar qismini o`zlashtirish;
avtomatlashtirilgan o`rgatuvchi va nazorat qiluvchi tizimlar bilan ishlash;
maxsus adabiyotlar bo`yicha fanlar bo`limlari yoki mavzulari ustida ishlash;
YAngi texnikalarni, apparaturalarni, jarayonlar va texnologiyalarni o`rganish;
talabaning o`quv-ilmiy-tadqiqot ishlarini bajarish bilan bog`liq bo`lgan fanlar bo`limlari va mavzularni chuqur o`rganish;
faol va muammoli o`qitish uslubidan foydalaniladigan o`quv mashg`ulotlari;
masofaviy (distantsion) ta`lim.

Tavsiya etilayotgan mustaqil ishlarning mavzulari:
Fakultet terapiya
1. O`pka emfizemasi. Pnevmoskleroz.
2. Surunkali xoletsistit
3. Bronxoektatik kasallik
Gospital terapiya
1. Psoriatik artropatiya
2. Dori allergiyasi
3. Vegenera kasalligi

Xalk tabobati

1. Refleksoterapiya O`zbekistonga fan sifatida kirishi.
2. In’ va yan ni tabobatdagi uzaro munosabati.
3. U-sin qontseptsiyasi bilan odam organizmdagi uzaro bogliklik.
4. AT topografiyasi, axamiyati.
5. «CHi» xayot energiyasini urganish.
6. Ignarefleksoterapiyaga kursatmalar.
7. Ignarefleksoterapiyaga karshi kursatmalar.

Dasturning informatsion-uslubiy ta`minoti

Mazkur fanni o`qitish jarayonida ta`limning zamonaviy metodlari, pedagogik va axborot-kommunikatsiya texnologiyalari qo`llanilishi nazarda tutilgan.

- barcha mavzular bo`yicha ma`ruza mashg`ulotlarida zamonaviy komp’yuter texnologiyalari yordamida prezentatsion va elektron didaktik texnologiyalarni;
- fanning umumiy va xususiy bo`limlariga tegishli mavzularida o`tkaziladigan amaliy mashg`ulotlarda aqliy hujum, qora quti, o`rgimchak ini, guruhli fikrlash pedagogik texnologiyalarini qo`llash nazarda tutiladi.

Foydalaniladigan asosiy darsliklar va o`quv qo`llanmalar ro`yxati

Asosiy darsliklar va o`quv qo`llanmalar

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6.2 WORK PROGRAM

MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION
MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN

BUKHARA STATE MEDICAL INSTITUTE

CHAIR OF FACULTY AND HOSPITAL THERAPY

"APPROVED"
Registered in
Educational department № _____
«_____» _____ 2017
Vice-rector for Academic Affairs
c.m.s., docent_____ S.Sh Olimov
«_____» _____ 2017

WORKING PROGRAMM
On the subject of FACULTY THERAPY
For the students of IV year of medical and medical-pedagogical faculty

Knowledge Area - 510000 "Healthcare"
The direction of education:
5510100 - Medical Practice
5111000 - Vocational education (5510100 - Medical practice)

Labor intensity in hours - 168
Including: - 108
Lectures - 16
Practical classes - 38
Clinical studies - 54
Independent work - 60

Bukhara - 2017

Compilers:

Boltaev K.Dj. - c.m.s. docent Head of the Department of Faculty and Hospital Therapy
Khamidova N.K. - assistant of the Department of Faculty and Hospital Therapy

Reviewers:
Nurboev F.E. candidate of medical sciences, Head of the Department of Folk Medicine, Rehabilitation, Physiology, Occupational Diseases and Sports Medicine

Badriddinova M.N. candidate of medical sciences Head of the Department of Internal Medicine and Endocrinology

The work program is compiled on the basis of the curriculum and curriculum on the direction of the curative and professional education, discussed and approved at the meeting of the department. Protocol No. _____ of "____" _____ 2017

Head of the department: **Boltaev K.Dj.** c.m.s docent _____
. (signature)

Head of IMC: **Oblokulov A.R.** c.m.s docent _____
(signature)

The work program was compiled on the basis of the curriculum and curriculum on the direction of curative medicine and professional education, discussed and approved by the Scientific Methodological Council of BUKMI
Protocol No. _____ of "____" _____ 2017

Methodist: Dzhumaeva Sh.B. _____
(signature)

Introduction

Improving the quality of medical education by updating curricula is an ongoing process. Universities should respond to evolving medical needs, improving practices and scientific achievements. Teachers should understand and analyze the importance of changing circumstances for practical medicine and medical education and they must, accordingly, update the training program.

1.1. Goals and objectives of the work program

The purpose of the training is to develop the habit of setting a nontological diagnosis and the principles of treatment for atypical forms of the most common diseases, their complications and typical variants of rare diseases of internal organs.

Learning objectives: Formation of knowledge on etiology, pathogenesis, classification, clinical manifestation, complications, prognosis, treatment and prevention of diseases of internal organs;

Development of the ability to collect anamnesis and clinical examination of the patient according to the systems;

Training to identify the main clinical criteria of the disease;

Training in the substantiation and formation of a preliminary and clinical diagnosis;

Training in drawing up a survey plan, medical tactics and the appointment of comprehensive treatment;

Training in interpreting the results of laboratory and instrumental research;

Formation of knowledge on the principles of differential diagnosis and the setting of a final diagnosis;

Developing the skill of providing emergency assistance in certain emergency situations;

1.2. Requirements for knowledge and skills

In accordance with these goals and objectives after completing the study of the discipline of hospital therapy, the student should know:

Etiology, pathogenesis, clinic, complications, prognosis, principles of treatment of the most common diseases of internal organs;

To be able to collect anamnesis and examine a patient on the systems by identifying the main diagnostic criteria of the disease;

Own methods of examination and the formation of a preliminary and clinical diagnosis;

Know and be able to draw up a plan for examination, medical tactics and the appointment of comprehensive treatment;

Be able to interpret the results of additional studies;

Know and be able to use the principles of differential diagnosis and the setting of a final diagnosis;

Know the basic medical documentation.

The student should be able to:

- To conduct professional interviews with complaints of the male, to be able to collect anamnesis;
- To survey the patient on systems with revealing of the basic diagnostic criteria of disease;
- Possess the methods of examination and the formation of a preliminary and clinical diagnosis;
- know and be able to draw up a survey plan
- be able to interpret the results of additional studies;
- know and be able to use the principles of differential diagnosis and the setting of a final diagnosis;
- To know and be able to do medical tactics and prescribe complex treatment;
- Know the basic medical documentation.

A student must have the skills:

- To conduct professional interviews with complaints of the male, to be able to collect anamnesis, to examine the patient according to the systems with the identification of the main diagnostic criteria of the disease;
- To conduct peak flowery in obstructive pulmonary diseases;
- To remove an electrocardiogram and to decipher an electrocardiogram at nosologies;
- know and be able to prescribe a diet and complex treatment.

1.3. Interactive methods of teaching

Information and methodical support.

In the educational process, tables, thematic stands, slides, training and monitoring programs are used to obtain information using interactive programs, the Internet. In practical exercises, new pedagogical technologies are used to stimulate students' mental activity (snowball, brainstorming, short esse, etc.), methods stimulating the learning process in the group (solving situational tasks and tests, business clinical games).

In accordance with modern requirements, the following business games are included in the program for students:

Using the Cluster Method

Cluster is the union of several homogeneous elements, which can be considered as an independent unit with certain properties

Data clustering is the task of splitting a given selection of objects (situations) into subsets, called clusters, so that each cluster consisted of similar objects, and the objects of different clusters differed significantly. The task of clustering refers to statistical processing, as well as to a wide class of learning tasks without a teacher. Cluster analysis is a multidimensional statistical procedure that collects data that contains information about the selection of objects, and then sorts objects into relatively homogeneous groups.

Using the "WEB" method

Steps:

1. Preliminary to students the time is given for the preparation of the question on the passed lesson
2. Participants sit in a circle
3. One of the participants is given a skein of thread, he asks his prepared question (to which the full answer should know), holding the end of the thread and throwing a skein to any student.
4. The student who received the skein answers the question (the student who asked him this question, comments on his answer) and passes the baton of the question further. Participants continue to ask questions and answer them until everyone is in the web.
5. As soon as all students finish asking questions, the student holding the skein returns it to the participant, from whom he received the question, while asking his question, until the ball is completely unwound.

Note. Warn students that you need to be attentive to every answer, because they do not know who will throw the skein.

Using the method "BUSINESS GAME"

A business game is an imitation of the work process, modeling, a simplified reproduction of the real production situation. The participants of the game are given tasks similar to those that they solve in their daily professional activities.

Using the "ROTATION" method

Rotation is a method of independent learning, in which the employee temporarily moves to another position in order to acquire new skills. Rotation is widely used by enterprises requiring polyvalent skills from employees, i.e. Possession of several professions. In addition to the purely learning effect, rotation has a positive effect on employee motivation, helps overcome stress caused by monotonous production functions, and expands social contacts in the workplace.

Using the CASE STUDY method

Case study is a learning technique that uses a description of real economic, social and business situations. Trainees should analyze the situation, understand the essence of problems, suggest

possible solutions and choose the best of them. Cases are based on actual factual material or are close to the real situation

Using the "VIENNA DIAGRAM" method

The Venn diagram is one of the types of graphic organizers that allows analysis and synthesis to be performed when two or more objects (phenomena, facts, concepts) are considered.
Step-by-step description of the method
1. Students (in pairs) fill two circles, each of which lists the characteristics of two concepts (objects, phenomena).
2. We unite students into small groups (4-5 people each) to compare the diagrams and supplement them.
3. Students in small groups are invited to identify common features of these concepts (objects, phenomena)
4. A representative of one of the groups read out the characteristics of one and the other concept. Others, if necessary, supplement.
5. A representative of another group reads out the features that unify the two concepts (general). Others, if necessary, offer their options.

Using the "3-STAGE INTERVIEW" method

The group of students is divided into three subgroups of 3 people: I - patient, II - doctor, III - "expert". "Patients" are given an anonymous diagnosis. Each group consults for 10-15 minutes. "Expert" evaluates and records the doctor's actions in 3 sections:
1) What is done correctly? 2) What is done wrong? 3) How it was necessary to make?

The result is given by the teacher, who evaluates the actions of all three subgroups and presents to each participant the corresponding ball, which is taken into account at the end of the lesson in the final evaluation

3. The volume of the training load

Labor intensity	**Distribution of the volume of training load by types Classroom hours (per hour)**				
	Total	Lectures	Practical lessons	Clinical practice	Independent works
168	108	16	38	54	60

4. Lecture course

4.1. Thematic plans for lecture classes

№ lectures	Title of lecture topics	hours
1.	Acute pneumonia.	2
2.	Bronchial asthma	2
3.	Acute rheumatic fever	2
4.	Arrhythmias and cardiac blockade	2
5.	IHD. Angina pectoris. Myocardial infarction	2
6.	Chronic hepatitis.	2
7.	Glomerulonephritis. Chronic pyelonephritis.	2
8.	Rheumatoid arthritis. Gout	2
	Total	16

Lecture number 1.

Lecture theme: Acute pneumonia - 2 hours
1.1 Purpose of the lecture. Familiarization of students with etiology, clinic, diagnostics, differential diagnostics, complication and treatment of acute pneumonia.
1.2 Expected results. This topic is one of the main in therapy. This is due to the high incidence of respiratory system, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.
1.3 Equipment of the lecture: multimedia, slides, roentgenograms, slide scope.
1.4 References: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 2.

Lecture theme: Bronchial asthma - 2 hours.

2.1. Purpose of the lecture: Familiarization of students with etiology, pathogenesis, clinic, diagnostics, differential diagnosis, complication and treatment of bronchial asthma.

2.2. Expected results. This topic is one of the main in therapy. This is due to the high incidence of bronchial asthma, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

2.3. Equipment of the lecture: multimedia, slides, roentgenograms, slide scope.

2.4. References: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 3.

Lecture theme: Acute rheumatic fever - 2 hours.

3.1 Purpose of the lecture. Familiarization of students with etiology, pathogenesis, clinching, diagnosis, differential diagnosis, complication and treatment of acute rheumatic fever.

3.2 Expected results. This topic is one of the main in therapy. This is due to the difficulty in diagnosing heart defects, the extraordinary importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

3.3 Equipment of the lecture: multimedia, slides, ECG tape, slides cope.

3.4.Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 4.

Subject of the lecture: Arrhythmias and heart block 2 hours

4.1 Purpose of the lecture. Acquaintance of students with etiology, pathogenesis, clinical diagnostics, differential diagnosis, complication and treatment of arrhythmia.

4.2 Expected results. This topic is one of the main in therapy. This is due to the difficulty in diagnosing arrhythmia, the extraordinary importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

4.3 Lecture equipment: multimedia, slides, ECG tape, slidescope.

4.4.Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 5.

Subject of the lecture: IHD. Angina pectoris. Myocardial infarction - 2 hours.

5.1 Purpose of the lecture. Familiarization of students with etiology, pathogenesis, clinic, diagnosis, differential diagnosis, complication and treatment of angina and myocardial infarction.

5.2 Expected results. This topic is one of the main in therapy. This is due to the difficulty of diagnosing IHD, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

5.3 Lecture equipment: multimedia, slides, ECG tape, slidescope.

5.4. Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 6.

Subject of the lecture: Chronic hepatitis. 2 hours

6.1 Purpose of the lecture. Familiarization of students with etiology, pathogenesis, clinical diagnosis, differential diagnosis, complication and treatment of hepatitis.

6.2 Expected results. This topic is one of the most important in therapy. This is due to the difficulty of diagnosing hepatitis, the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

6.3 Equipment of the lecture: multimedia, slides, slidescope.

6.4. Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 7.

Subject of the lecture: Glomerulonephritis. Chronic pyelonephritis. 2 hours

7.1 Purpose of the lecture. Familiarization of students with etiology, pathogenesis, clinical diagnosis, differential diagnosis, complication and treatment of CKD.

7.2 Expected results. This topic is one of the most important in therapy. This is due to the difficulty in diagnosing CKD and the urgent importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

7.3 Equipment of the lecture: multimedia, slides, slidescope.

7.4. Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

Lecture number 8.

Lecture theme: Rheumatoid arthritis. Gout. 2 hours

8.1 Purpose of the lecture. Familiarization of students with etiology, pathogenesis, clinical diagnosis, differential diagnosis, complication and treatment of RA and gout.

8.2 Expected results. This topic is one of the most important in therapy. This is due to the difficulty of diagnosing RA and gout by the extreme importance of timely diagnosis of the disease. The importance of the main signs of diseases, the principles of modern treatment is extremely important in the daily life of the doctor.

8.3 Equipment of the lecture: multimedia, slides, slidescope.

8.4. Literature: M-1,2,3,4,5, A -1,2,4,5,6,7,8.

5. Thematic plans for practical exercises

№	Topics of practical / seminar topics	Number of hours		
		practice	clinical practice	total
1.	Acute pneumonia. Pleurisy	1	3	4
2.	Bronchial asthma	1	3	4
3.	Acute rheumatic fever	1	3	4
4.	Mitral and aortic heart defects	3	3	6
5.	Heart arythmy	1	3	4

6.	Blockade of the heart	3	3	6
7.	Hypertonic disease	3	3	6
8.	IHD. Angina pectoris	1	3	4
9.	IHD. Myocardial infarction	3	3	6
10.	Chronic gastritis	3	3	6
11.	Peptic ulcer of stomach and duodenum	3	3	6
12.	Irritable Bowel Syndrome	3	3	6
13.	Chronic hepatitis	1	3	4
14.	Glomerulonephritis	1	3	4
15.	Chronic pyelonephritis	3	3	6
16.	Rheumatoid arthritis	1	3	4
17.	Deforming osteoarthritis	3	3	6
18.	Gout	3	3	6
	Total	38	54	92

5.1 The content of practical training topics

№	The title of the topic of the practical lesson and their brief content with an indication of the new pedagogical technologies	Literature
1.	***Acute pneumonia.*** D*efinition of pneumonia.* • *Etiology.* • *Pathogenesis* • *Clinical picture and classification* • *Diagnostics and differential diagnostics* • *Treatment.* ***Interactive method: Cluster method***	M-1,2,3,4,5; A-1,2,4,5,6,7,8

2.	***Bronchial asthma.*** Definition of bronchial asthma. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Business game***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
3.	***Acute rheumatic fever.*** Definition of ORL • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Venn diagram method***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
4.	***Mitral and aortic heart defects.*** Definitions of mitral and aortic defects. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ECG signs of aortic valve failure. ECG signs of stenosis of the aortic valve. ***Interactive method: Rotation method***	M-1,2,3,4,5; A -1,2,4,5,6,7,8
5.	***Heart arythmy.*** Definitions of arrhythmia. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Case method.***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
6.	***Blockade of the heart.*** Definitions of the blockade • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Cluster***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
7.	***Hypertonic disease.*** Definitions of GB. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Business game***	M-1,2,3,4,5; A-1,2,4,5,6,7,8

8.	***IHD. Angina pectoris.*** Definitions IBS.Stenokardii. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Venn diagram***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
9.	***IHD. Myocardial infarction.*** Definitions of MI • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Three-step interview.***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
10.	***Chronic gastritis.*** Definitions of HG. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Web method***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
11.	**Stomach ulcer and 12 duodenum.** Definitions of SU and 12 d. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. **Interactive method: Business game**	M-1,2,3,4,5; A-1,2,4,5,6,7,8
12.	**Irritable bowel syndrome.** Definitions of IBS. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. **Interactive method Three-step interview.**	M-1,2,3,4,5; A-1,2,4,5,6,7,8
13.	***Chronic hepatitis.*** Definitions of HG. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: web method***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
14.	***Glomerulonephritis.*** Definitions of GB. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method:: Case study***	M-1,2,3,4,5; A-1,2,4,5,6,7,8

15.	***Chronic pyelonephritis.*** Definitions of PN. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Rotation method***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
16.	***Rheumatoid arthritis.*** Definitions of RA. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Venn diagram***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
17.	***Deforming osteoarthritis.*** Definitions of DOA. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Web***	M-1,2,3,4,5; A-1,2,4,5,6,7,8
18.	***Gout.*** Definitions of Gout. • Etiology. • Pathogenesis • Clinical picture and classification • Diagnostics and differential diagnostics • Treatment. ***Interactive method: Cluster***	M-1,2,3,4,5; A-1,2,4,5,6,7,8

5.2. Clinical practice.

Clinical practice is carried out in the therapeutic departments of the Bukhara Medical Multiprofile Center and in the polyclinic.

№	Clinic practice
1.	**Acute pneumonia. Independent curation.**

	1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, sputum analysis, roentgenogram) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
2.	**Bronchial asthma. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, sputum analysis, roentgenogram) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
3	**Acute rheumatic fever. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, rheumatic test, ECG, echocardiogram, radiograph) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
4.	**Mitral and aortic defects of the heart. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG, echocardiogram, radiograph) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
5.	**Heart arythmy. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
6.	**Blockade of the heart. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
7.	**Hypertonic disease. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG, echocardiogram, radiograph)

	4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
8.	**IHD. Angina pectoris Self-contained curative.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG, echocardiogram, radiograph, angiography) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
9.	**Myocardial infarction. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ECG, echocardiogram, radiograph, angiography) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
10.	**Chronic gastritis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ultrasound and FGDs) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
11.	**Stomach ulcer and duodenal ulcer. Self-curative.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general blood test, urine, biochemical analysis, ultrasound and FGDs) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
12.	**Irritable bowel syndrome. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and ultrasound) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
13.	**Chronic hepatitis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and ultrasound) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.

14.	**Glomerulonephritis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and ultrasound) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
15.	**Chronic pyelonephritis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and ultrasound) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
16.	**Rheumatoid arthritis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and radiography) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
17.	**Deforming osteoarthritis. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and radiography) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.
18.	**Gout. Independent curation.** 1. Inspection of a thematic patient (complaints, Status present objective) 2. Physical examination (palpation, percussion and auscultation) 3. Laboratory and instrumental studies (general analysis of blood, urine, biochemical analysis, ECG and radiography) 4. Treatment (recipes) The conclusion of the teacher on the passed employment, an estimation of activity of each student and announcement of results. Developing tasks to prepare for the next lesson.

6. Independent work of students
Thematic plans for independent work of students

№	The name of IW of students	hours
1.	Internet search for methods of studying lung diseases. The study of the functions of external respiration.	3
2.	Methods of preventing rheumatism.	3
3.	Prolapse of the mitral valve. Internet search	4
4.	Anatomical and functional characteristics of the organs of the blood.	4
5.	Internet search for modern ways of treating myocarditis.	4
6.	The main groups of antihypertensive drugs (formulation). Online search for lipid metabolism.	4
7.	Functional diagnostics in IHD.	4
8.	Recipe for myocardial infarction	3
9.	Internet search for new methods of diagnosing chronic gastritis	4
10.	Internet search for new methods of treatment of peptic ulcer.	3
11.	Functional bowel disease. Dysbacteriosis.	4
12.	Chronic cholecystitis. Study of morphofunctional liver states	3
13.	Functional diagnostics of kidney diseases	3
14.	Pyelonephritis. Formulation of antibiotics and uroseptics	3
15.	Methods of examination of patients with joint diseases.	3
16.	Differential Diagnosis of Articular Syndrome	4
17.	Recipe for nosteroid and steroid anti-inflammatory drugs	4
	Total	60

List of practical skills

1. Technique of pleural puncture.

2. ECG recording technique and decoding
3. Technique of testing antibiotics
4. The technique of measuring blood pressure.
5. Technique examination of bronchoscopy.
6. The technique of curative enemas
7. The technique of determining the boundaries of the liver according to Kurlov
8. The technique of gastric lavage
9. Auscultation of the heart.
10. Determination of the pulse and its peculiarity.
11. The Nechiporenko and Zimnetskii sample techniques
12. Percussion of the heart (determination of the boundaries of the heart)
13. Technique of spirography.
14. Macro and microscopic analysis of sputum.
15. Palpation of the lung
16. Percussion of the lung
17. Auscultation of the lung
18. Description of chest X-ray
19. Palpation of joints and examination.
20. Technique of articular puncture and examination of synovial fluid.
21. Palpation of the abdomen
22. Colonoscopy technique.
23. Analysis of Echocardiography
24. Indication and contraindication of excretory urography.

Pulmonology

Task number 1.

In patient M., 27 years, two weeks ago there was weakness, sweating, subfebrile temperature, shortness of breath, chest pain left. It was treated with the diagnosis of acute respiratory disease without improvement. Dyspnea increased, the body temperature rose to 39,00 C, although the pain in the chest on the left decreased.

Objectively: the state is satisfactory. Skin wet, ordinary color. The left half of the chest lags behind in the act of breathing. Percussion left below the 1U rib defines blunting. Breathing in this zone is not heard. Abdominal organs are not changed.

Blood test: er. - 4,2x1012, Нв - 140 g / l, l - 12x109, p - 2, c - 80, l - 12, m - 6, ESR - 38 mm / hour.

Sputum was not found in the sputum.

1. Establish a preliminary diagnosis taking into account the etiology of the disease.
2. Outline a plan for further investigation with possible outcomes.
3. Carry out differential diagnostics.
4. Assign treatment.

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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2._____
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VII. Tactics of the GP.
1._____
2._____

Task number 2.

A patient M., 36, a worker, entered the department. Complaints about cough with sputum discharge with an unpleasant putrefactive odor (about 250-300 ml per day). Cough intensifies in the patient's condition on the right side.
When examined, positive signs of "drum fingers" and "watch glasses" were found.

WHAT ARE THE MOST PROBABLE LOCALIZATION AND NATURE OF THE PATHOLOGICAL PROCESS IN THE LEGGIES?

• Pleural injury
• Chronic inflammatory process in the bronchi
• Purulent inflammation in the bronchi (bronchiectasis) or in the lung (abscess)
• Isolated alveolar lesion
• Inflammation of the alveoli and bronchi (bronchopneumonia)

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 3

A patient O., 32, an erectionist, entered the department. Complaints of severe pain in the right side of the chest, intensifying with a deep breath, to increase the body temperature to 37.90C. The patient lies on his right side, the right half of the chest lag behind the act of breathing.

WHAT ARE THE MOST PROBABLE LOCALIZATION AND NATURE OF THE PATHOLOGICAL PROCESS IN THE LEGGIES?

• Pleural injury
• Chronic inflammatory process in the bronchi
• Purulent inflammation in the bronchi (bronchoextasis) or in the lung (abscess)
• Isolated alveolar lesion
• Inflammation of the alveoli and bronchi (bronchopneumonia).

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 4.

T. Patient, 50, an engineer, entered the department. Complaints of pain in the right side of the chest, worse with breathing, a quiet dry cough accompanied by pain in the right side of the chest, an increase in body temperature to 37.50C. The situation is forced - the patient lies on the right side, pressing the right half of the thorax with his hand.

WHAT ARE THE MOST PROBABLE LOCALIZATION AND NATURE OF THE PATHOLOGICAL PROCESS IN THE LEGGIES?

• Pleural injury
• Chronic inflammatory process in the bronchi
• Purulent inflammation in the bronchi (bronchoextasis) or in the lung (abscess)
• Isolated alveolar lesion
Inflammation of the alveoli and bronchi (bronchopneumonia)

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 5.

In the department, patient S., 49 years old, accountant entered. Complains of an attack of suffocation, originated 2 hours ago at home, on a cough with a small separation of viscous vitreous sputum.
INSPECTION: The condition is heavy. The situation is forced: the patient sits in bed, leaning on it with his hands. The thorax is emphysema. The number of respiratory movements is 30 min., Exhalation is greatly hampered. There is marked diffuse cyanosis, swelling of the cervical veins.

WHAT IS THE MOST PROBABLE CAUSE OF DYSPNOE?

• Reduction of the respiratory surface of the lungs (lobar inflammatory seal)
• Decreased elasticity of the lungs due to emphysema
• Spasm of small bronchi
• Mechanical obstruction in the upper respiratory tract (larynx)
• Mechanical obstruction in the trachea or large bronchus

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 6.
The patient was hospitalized by K., aged 34, a teacher. Complaints about resting at rest, increasing with physical exertion, on raising the temperature to 37.90C, for coughing with a small compartment of "rusty" sputum, for pain in the right half of the chest associated with breathing. When examined, there is diffuse cyanosis, herpes. The right half of the chest lags behind in the act of breathing. The number of respiratory movements is 36 per min.

WHAT IS THE MOST PROBABLE CAUSE OF DYSPNOE?

• Reduction of the respiratory surface of the lungs (lobar inflammatory seal)
• Decreased elasticity of the lungs due to emphysema
• Spasm of small bronchi
• Mechanical obstruction in the upper respiratory tract (larynx)
• Mechanical obstruction in the trachea or large bronchus

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 7.

Patient K., 63 years old. Complaints about a cough with light sputum, the amount of which increases in the position on the left side: expiratory bladder at usual physical exertion, after coughing. He considers himself sick for 20 years, periodically worries about coughing with phlegm, a year ago there was shortness of breath. The last deterioration is noted during the week when, after supercooling, dyspnea increased, cough became superficial, paroxysmal, the amount of sputum was reduced. Taking teofedrine improved the condition - cough decreased, sputum was easier to withdraw. The patient suffers from the appearance of weakness, sweating, especially at night. Increase in body temperature to 37.3-37.5 ° C. Objectively: a satisfactory condition, cyanosis of fingers. The chest is barrel-shaped, the excursion of the lower edge of the lungs is limited, with percussion the sound is boxed. Breath weakened, vesicular, on both sides, more painful on the right, dry wheezing. On the part of other organs and systems, no pathological changes were found.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 8.
Patient K., 56 years old, worker. Complaints about a cough with a small amount of phlegm-purulent sputum, repeated chills, acute sweating, an increase in body temperature to 39.7 ° C. It was acutely acute after hypothermia. Surveys in the clinic - on day 5 of the disease with a preliminary diagnosis. Unsuccessfully he was treated by outpatient antibacterial tablets. After X-ray examination - focal pneumonia, was hospitalized. From anamnesis: the last 7 years suffers from diabetes mellitus. Against the background of taking 2 tablets of bucarban, glycemia is 6.7-9.2 mmol / L, glucosuria is 0-0.5%. Obektivno: a state of moderate severity, clear consciousness, hyperhidrosis is noted. The left half of the chest lags behind in the act of breathing. From the level VII of the rib between the anterior, axillary and paravertebral lines, dullness of the percussion sound is determined. Auscultation is also sharply reduced respiratory noise. BH - 26 in 1 minute. The rhythm of the heart is correct, the tones are muffled. The pulse of 120 units per minute, AD - 100/60 mm. gt; Art. The liver protrudes from under the edge of the reabsoric arch by 1 cm, the edge is dense, painless. The spleen is not palpable. General blood test: er. - 4,8xl012 / l, Hv -132 g / l, CPU - 0,95, watering can. - 12x109 / l, e. - 2, item-12, seq. -50, lymph. - 28, mon. - 8, ESR - 60 mm / hour. Against the background of treatment with penicillin, and then with ampicillin, the body temperature remained febrile, signs of intoxication increased, chills repeated. A week after hospitalization, with a morning cough, suddenly there was a purulent sputum with blood veins in the amount of up to 300ml. Body temperature decreased to subfebrile digits. The effects of intoxication decreased. At an auscultation at the angle of the left scapula began to listen to moist medium ¬ bubble rales.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 9

During the last 2 months, a patient who often had inflammations of the lungs, had attacks of suffocation, more often at night, accompanied by a cough with a small amount of sputum mucous. Objectively: the condition is severe, the position is orthopnea, acrocyanosis is expressed. The veins of the neck are swollen, do not pulsate. Breathing rhythmic, with a whistle. Expiratory breathlessness, the number of breaths per minute - 26. Percutary sound over the lungs with a boxed tint. Auscultatory: breath vesicular, sharply weakened, scattered wheezing dry wheezes. Heart sounds are rhythmical, muffled. The heart rate is 96 per minute. Pulse is the same on both hands, soft. Organs of the abdominal cavity within normal limits.Preliminary diagnosis:

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Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

1._____

2._____

Task number 10.

Patient A, 18 years old, a student, complains of the periodic breathing difficulties (mostly exhalation), "whistling in the chest," dry cough attacks, especially frequent at night and in the morning, subfebrile temperature, sweating. Zaboleva 2 weeks ago, when after hypothermia appeared a strong cold. I did not measure temperature, did not lecture, continued to attend classes at the institute. After 2-3 days there were pains in the throat, hoarseness of the voice, paroxysmal dry cough, sweating. After 5 days I woke up at night with a feeling of shortness of breath, accompanied by a "whistle in my chest" and a mild dry cough. After a hot drink, I felt better, was treated with home remedies, but the symptoms described above were repeated every 24 hours. Objectively: temperature 37.3 ° C A marked sweating, a slight hyperemia of the mucous throat. The entire length of both lungs is clear pulmonary sound, hard breathing, scattered a few dry wheezes. During forced expiration, the number of high dry wheezing increases. The rest of the data of the physical examination without any special features.I.

Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Cardiology

Situational problem № 1.
A man of 26 years has addressed to the doctor in connection with complaints to a dyspnea or short wind at a small physical activity. In the anamnesis, frequent angina in childhood. At the age of 12, there was an episode of pain in the knee joints during the week. Against the background of diclofenac, the pain was gone within 1 week. Later I felt well. Over the past three years, he noted the worsening of exercise tolerance due to dyspnoea. Tolerance to stress has dropped dramatically over the past 6 months: dyspnea began to occur when walking at normal speed. I did not go to doctors. A week ago he noticed an attack of frequent irregular heartbeat, which stopped on his own after 5 hours. When examined: the skin of the usual color, cyanosis of the lips, the tip of the nose, the "blush" of the cheeks, there is no rattling in the lungs, BH 20 / min, percussion - level II intercostal space, the rest of the border-within the limits of the norm. At the top is a three-beat rhythm, clapping the first tone, diastolic noise. Tones rhythmic, heart rate 90 \ min, blood pressure 100/60 mm Hg. The abdomen is painless. The liver + 2 cm from the edge of the costal arch, the spleen is not palpable.
The most likely disease of the patient is:

I. Preliminary diagnosis: _____

Objective and sub-objective data

_____

II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

1._____

2._____

Situational task number 2.
To the patient K., 60 years old the ambulance was called. The patient was immobile and complained of a sharp pressing pain behind the sternum, which spread to the left arm, neck, jaw, under the left scapula.
Objectively: a mild pallor of the skin is noted, the pulse is frequent, the heart sounds are muffled at the apex, the second tone on the aorta is strengthened.
What kind of pathology of the cardiovascular system should the doctor think? What additional research should he do on a mandatory basis? How to explain the irradiation of pain? What kind of therapy should the doctor do?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Situational task number 3.
The district doctor was summoned repeatedly to the house to the patient T., 28 years old. The patient complained of persistent pressing pains in the region of the heart during the week: dyspnea increased, especially in the horizontal position. Twice before the doctor's arrival there was vomiting.
Objectively: puffiness of the face and neck area in the form of a collar, cyanosis, cervical veins swollen attracts attention. The patient sits on the edge of the bed, leaning forward. Pulse is frequent, small filling, apical impulse is not defined. The heart is expanded in all sizes, on the roentgenogram has a triangular shape. The liver is enlarged, coming out from under the costal margin by 2 cm.
What pathology of the heart should a doctor first think about? What can he listen to with auscultation of the heart? How to explain swelling in the neck and face?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Situational problem 4.

T. patient, 40, complained of rheumatology, with complaints of chills, sweating, and a fever during the month to 37.5 -38.0 C. In the anamnesis: rheumatism, insufficiency of the mitral valve, about which was on the account at the rheumatologist.
Objectively: the paleness of the skin with a mild icteric color is noticeable, a scattered single petechial rash. The pulse is rapid, rhythmical, satisfactory filling. The heart is widened to the left to the midclavicular line, the apical impulse in the region of the sixth intercostal space, the first tone on the apex is weakened, the second tone on the aorta is weakened, systolic murmur at the tip and diastolic is heard - in the second intercostal space on the right. Arterial pressure 150/60 mm. / Hg. The abdomen, liver and spleen are moderately enlarged.
What should the doctor suspect? What important research should he assign to confirm his thoughts?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Situational task number 5.

Patient K., 28 years old, by the end of the working day, turned to the doctor with complaints of shortness of breath, which occurs with physical exertion, palpitation, rapid fatigue. The doctor paid attention to cyanosis of the lips, moderate swelling in the ankle joint area. Objectively: the heart is widened to the left, the 1st tone at the apex is weakened, the systolic murmur that is carried to the axillary region is heard.
What kind of defeat of the heart should the doctor (muscular or valve) think? What research needs to be done to clarify the diagnosis?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task number 6

Patient D., 34 years old, locksmith. At admission I complained of an inspiratory dyspnea with physical exertion, palpitations. From the history it is known that for three weeks he was outpatiently treated for bronchitis, two days ago, during physical exertion, pressing pains behind the breastbone lasted about 60 minutes.
Objectively: the general condition is satisfactory, increased nutrition. Pulse 100 beats per minute, rhythmic, weak filling. The heart is muffled, rhythmic; in the precordial region, the transient pericardial friction noise; at the top: I tone is weakened, short systolic noise. Boundaries of the heart within the maximum norm. In the lungs, the breath is vesicular. The abdomen is soft, the liver is at the edge of the costal arch. There is no edema. Leukocytes 9,5x109 / l, ESR 20 mm / hour.
1. Name the leading syndrome.
2. Make a preliminary diagnosis.
4. With what diseases it is necessary to carry out differential diagnostics.
5. Assign additional studies.
6. Justify treatment, methods of secondary prevention.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task No. 7

Patient K. 48 years old complains of sharp pains in the left side of the chest, radiating into both hands, the left shoulder blade and the interscapular space, a feeling of lack of air, weakness. The attack of pain lasts more than two hours, the pain does not

It is stopped by the repeated administration of narcotic analgesics. A similar bout of pain was four days ago. For 8 years, suffers from hypertension.

When examined, the condition of the patient is of moderate severity. Skin pale, moist, cyanosis of the lips. The number of breaths is 20 per minute. Pulse 90 per minute. Blood pressure 80/60 mm Hg The borders of the heart are widened to the left, the voices are deaf, the rhythm is correct. The abdomen is soft, painless. The temperature is 37.60C. According to the analysis: in peripheral blood of leukocytes - 11,0x 109 / l, ESR - 17 mm / h, CRB ++.

1. Name the leading syndrome.
2. Between what diseases should be carried out differential diagnosis.
3. Make a clinical diagnosis.
4. What are the possible complications?
5. What additional research methods are needed for differential diagnosis?
6. Explain the causes of changes in blood indicators**.**

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Task number 8.

Patient K. 63 years old was taken to the hospital with complaints of a sudden onset of suffocation. In 1996, he suffered a myocardial infarction, since 1997 he has noted seizures of angina pectoris. Objectively - the state is heavy, the patient sits, leaning his hands on the bed. Breathing is difficult, 32 per minute. The skin is covered with cold sweat, pale, cyanosis of the lips, the tip of the nose. Blood pressure 80/40 mm Hg. Art.

Pulse 120 beats per minute, determined with difficulty. Percutally: the heart is moderately widened to the left. Auscultatory: heart sounds are deaf, wet rhonchuses are listened to in the back areas of the lungs. ECG is recorded.

1. Make a clinical diagnosis.
2. What is the variant of the onset of the disease in this patient?
3. Between what diseases should differential diagnosis be performed?
4. Justify urgent medical measures, indicate the indicators that require monitoring in the management of the patient.
5. What are the most modern methods of treatment and prevention of cardiogenic shock?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Problem number 9.
Patient A. 58 years old turned to the doctor with complaints of recurrent pains behind the sternum with irradiation of them into the left arm and left shoulder blade. These pains appeared about two months ago, arise when climbing one floor. The pains are very pronounced, last two to three minutes and suddenly disappear. During a painful attack, the patient has a "sense of fear", he tries to "freeze" in the position in which he was caught by pain. Outside the attack, the patient feels well. Objectively: no pathological abnormalities were detected on the part of organs and systems. Blood pressure 140/80 mm Hg. Art. Pulse 70 beats. in a minute.
1. What is your presumptive diagnosis?
2. What diagnostic tests should I do?
3. What method of treatment is most effective for this patient

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task number 10.
A 45-year-old patient, an engineer by profession, turned to the doctor with complaints about the periodically onset numbness of the fingers of his left hand. This state lasts a few minutes and spontaneously passes. More often the numbness of the fingers of the left hand comes in the time of psycho-emotional stress. Objectively: there were no pathological abnormalities on the part of organs and systems. ECG is recorded at rest and under load
1. Describe the pathogenesis of the described attack.
2. Presumptive diagnosis?
3. What are the criteria for a positive loading test?
4. What provocative tests should be used for this patient?
5. The most preferred drugs for drug treatment of a patient.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Gastroenterology

Situational task number 1

Patient P., 56 years old, complains of a feeling of heaviness and nausea in the epigastric region 2-3 hours after eating, belching. The appetite is lowered.

With an objective examination, bloating was found in the epigastric region, especially after eating, when the stomach begins to contour.

When palpation is detected, the noise of splashing in the stomach after 6-7 hours after ingestion.

What pathology can be suspected in this patient? What additional research should be done to clarify the diagnosis?

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Situational problem number 2

Patient G., 50 years old complains of a feeling of raspiraniya in the abdomen, persistent diarrhea, usually in the morning, false desires, in the stool presence of blood and mucus. The patient has nausea, poor appetite, unpleasant taste in the mouth. When palpation, soreness is detected along the course of the large intestines, rumbling, splashing noise.

What disease can the doctor suspect on the basis of the picture described? How can this be caused? What research needs to be done to clarify the diagnosis?

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Situational task number 3

Patient P., 45 years old, is concerned about belching with air, sometimes with rotten eggs, nausea, a feeling of heaviness in the epigastric region. Objectively: in the area of the stomach diffuse, inconspicuous soreness. Fractional analysis of gastric juice revealed the absence of free hydrochloric acid in all portions, sharply reduced the total acidity. After administration of histamine, the acidity did not increase. The secretory function of the stomach is decreased (the reaction with diphenylamine is increased).
What kind of disease could the doctor think? What other research can be done to clarify the diagnosis?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Situational problem 4

Patient N., 27 years old, suffers from peptic ulcer disease for 5 years. Over the past 2 months, the condition has changed, cramping pains appeared in the epigastric region, appearing after eating and at night, especially in the prone position, accompanied by a swelling in the epigastric region. At the height of pain, vomiting of food eaten, and often eaten the day before. Pain ceases after vomiting. When the examination revealed a swelling in the epigastric region, the stomach is clearly contoured in the form of anti-peristalsis. When palpation is determined by the compaction in the region of the stomach.

What complication of peptic ulcer can be assumed in a patient? What additional research needs to be done?

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Situational problem №5

Patient G., 32 years old, worried about epigastric pain, paroxysmal, appearing 2-3 hours after eating or fasting. Pain is accompanied by nausea, vomiting, after vomiting they disappear. When palpation of the abdomen is determined soreness at the level of the navel on the right.
In the study of gastric juice, a sharp increase in the secretory and acid-forming functions of the stomach and violation of evacuation are found. What diseases can be assumed in a patient and what additional research can be done?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Situational task No. 6

A 27-year-old patient complains of pain of the epigastric region, which occurs after eating, especially acute and rough. The pain radiates into the chest area, accompanied by nausea and vomiting, soon after eating. Vomiting facilitates the patient's condition. In addition, the patient is concerned about bloating, flatulence and belching sour. Objectively: The ventral wall is weakly involved in the act of breathing, is strained in the epigastric region, sharply painful below the xiphoid process.
What kind of disease can you think of and what research should be done for the final diagnosis?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Situational problem №7

Patient M., 63 years old for 15 years, suffered from chronic gastritis with decreased secretion. Recently, disgust for food, especially meat, has appeared disgusting and nausea. I began to lose weight, there was weakness, apathy. When examined, the pallor of the skin was found, weight loss. When palpation in the epigastric region, a painless seal is found.
Whether it is possible to explain all changes by presence of a gastritis with the lowered secretion? What kind of disease can you think of? What additional research is needed?

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task number 8

The patient S., 34 years old, turned to the doctor with complaints about pain in the epigastric region, arising 10-15 minutes after eating, accompanied by nausea and eructations, pain intensification provokes spicy and salt food. From the anamnesis it is known that such sensations are already troubling for 3 years with a frequency of 2-3 times a year. When esophagogastroduodenoscopy - the phenomenon of moderate atrophy in the pyloric section of the stomach, edema and hyperemia in the fundus of the stomach. A biopsy is taken from the antral and base parts of the mucous membrane of the stomach.

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Task number 9

A patient, 44 years old. For 15 years, the patient has suffered from peptic ulcer. Over the past year, the patient's condition worsened: his appetite dropped, he began to lose weight, a feeling of heaviness and raspiraniya in the epigastric region, especially in the evening, a belch with an unpleasant odor, often vomiting pischa, eaten the day before. After vomiting, the feeling of heaviness in the epigastric region decreases. When examining the abdomen there is visible peristalsis in the epigastrium, the lower border of the stomach is lowered, the noise of fasting splash is determined.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task number 10

Patient D., 30 years old, transferred to the therapeutic department from an infectious hospital with complaints of pain in the right upper quadrant, jaundice, lack of appetite, fever to 37.5 ° C. From anamnesis, it is known that she abuses alcohol for 5 years. At inspection: the skin and mucous membranes are icteric, the liver acts from under a costal edge on 5 sm, is morbid at a palpation. This clinical symptomatology appeared after consuming a large amount of alcohol. In the blood tests: alanine aminotransferase -110 IU (norm up to 28 ME), asparagine aminotransferase - 80 ME (norm up to 35 ME), gamma-glutamate transpeptidase 240 IU (norm up to 106 ME), leukocytes 12.0 109 / L.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
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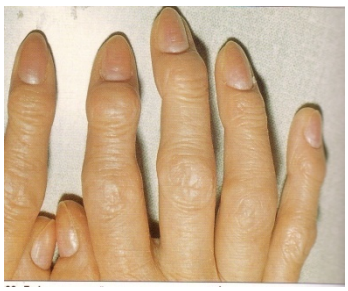
Rheumatology



Task number 1

A 58-year-old patient has long-term pain and limited mobility of interphalangeal joints of hands. When viewed in the field of distal interphalangeal joints, dense, moderately painful nodules 0.5 cm in size were identified. These joints are slightly deformed, their movements are limited (photo). Radiographically: narrowing of the joint gap, osteoporosis. ESR of 15 mm / h. Which judgments are true?

1. Localization of joint damage is characteristic of rheumatoid arthritis.
2. Reaction to the rheumatoid factor in the blood is likely to be negative.
3. Small doses of prednisolone are indicated.
4. The patient has osteoarthrosis of distal and proximal interphalangeal joints

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
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Task number 2

Patient P., 32, complains of pain and swelling of the joints of hands and feet, wrist joints, ogrechanie their mobility, morning stiffness. She considers herself to be sick during the last 4 months, when general weakness, weight loss, deterioration of sleep, appetite first appeared, the temperature increased to 37.3-37.5 ° C. In the last 2 months, pains in the elbow joints have joined.Objectively: the general condition is satisfactory. He is of the right physique, low nutrition. Skin and visible mucous membranes of normal color. Metacarpophalangeal and proximal interphalangeal joints of the hands are swollen, painful in palpation, movements in them are limited. There is a restriction of mobility due to pain in intervertebral joints. Peripheral lymph nodes are not palpable. Percutally above the lungs a pulmonary sound, vesicular breathing, wheezing is not heard. The boundaries of relative cardiac dullness are within normal limits. Heart sounds are sonorous, the rhythm of heart activity is correct. Pulse 82 in 1 min., Satisfactory filling. Blood pressure 130/80 mm Hg. Art. The abdomen is soft, painless when palpated. The liver is not palpable. Radiography of the brushes: epiphyseal osteoporosis, moderate narrowing of the joint cracks in the metacarpophalangeal and proximal interphalangeal joints of the II-IV fingers. Blood test: er. - 3,7x1012 / l, Hb - 130 g / l, leukocytes - 8,4x109 / l, e - 1, pal - 4, seq. - 66, lymph .- 24, mon. - 5, ESR - 40 mm per hour; CRP ++; alpha 2 - globulin up to 15%.

Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Task number 3

Patient S., 53, complained of aching pains in the knee joints and small joints of the brushes, which increased in the evening after physical exertion. From anamnesis revealed that for 6 years, the pain of crunching in the knee joints, which are aggravated by prolonged walking, especially on the stairs, is disturbed for 6 years. The last two years there were intermittent pains in the interphalangeal joints, in the early morning hours a short stiffness. The condition deteriorated two weeks ago. The profession is associated with frequent lifting and wearing heaviness over 20 kg. Obviously: the general condition is satisfactory. Hypersthenic constitution, increased nutrition (height - 158 cm, weight - 98 kg). Skin covers are clean, normal color. There is a moderate deformation of the distal (Geberden's nodules) and proximal interphalangeal joints. Movement in the joints are limited, accompanied by soreness-Knee joints are not externally changed, with movements in them marked with a delicate crunch, moderate soreness. Naked lung percussion is a pulmonary sound. Breath vesiculary, rales are not heard. BH - 18 in 1 min. The border of relative cardiac dullness is within normal limits. The tone of the heart is moderately muted at the top, the rhythm of the heart activity is correct. Pulse 78 in 1 min, satisfactory filling and tension. Blood pressure - 140/90 mm Hg. Art. The abdomen is soft, painless when palpated. The liver is palpated.

I. Preliminary diagnosis: _____
Objective and sub-objective data
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II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
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Task number 4

Patient E., 28 years old entered the hospital with complaints of pain in the small joints of hands and feet, muscles of the extremities, unpleasant sensations at the fingertips that arise during excitement or contact with cold water, subfebrile temperature, weight loss, brittle hair, general weakness of increased fatigue. She is sick for three years. In the beginning there were pains in the joints, I took indomethacin on my own, after which the pains stopped, continued to work. A year ago, she noted pains in her chest, dry cough with little breathlessness. It was treated with home remedies (gorjchichniki, soda inhalations), the state of health has improved. Conducted subsequently in the medical examination fluorography revealed pleuro-diaphragmatic adhesions. Summer drew attention to the appearance of reddish spots in the cheeks and back of the nose, which was explained by excessive stay in the sun. For the first time she turned to the doctor in connection with resumption of pain in the joints of the hands, strengthening of muscle weakness and persistent subfebrile condition. In the general analysis of urine, proteinuria was found to be 0.99 g / l, erythrocyturia - 25-30 per p / zr, leukocyturia - 8-12 p / sp. The patient is hospitalized. Obektivno: under-nutrition. Skin covers are pale. Hair dull, brittle, nails are frayed. Peripheral lymph nodes of all groups are moderately enlarged, mobile, painless. An unambiguous defoguration of proximal interphalangeal joints of brushes due to periarticular edema. Minor tenderness when palpation of the muscles of the limbs. With auscultation of the lungs respiration is vesicular, the noise of friction of the pleura on both sides. The boundaries of relative cardiac dullness are shifted to the left 1 cm and up to the II intercostal space. 1 tone at the apex is weakened, systolic noise is carried out in the axillary region, the accent of the 2nd tone on the pulmonary artery. Pulse - heart rate 88 in 1 min. Blood pressure - 140/90 mm Hg. Art. The abdomen with palpation is mild, moderately painful in the right hypochondrium. The liver is 2 cm below the edge of the ribbed arch, its edge is even, sensitive at palpation. In the left hypochondrium the lower pole of the spleen is palpable.

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Task number 5

Patient D., 50 years old, complained of aching pain in the wrist and small joints of the fingers. In the morning, their stiffness, stiffness, fatigue, and general weakness are noted. She is several years old, was repeatedly treated in a hospital, the last exacerbation for 5-6 months.
Objectively: the temperature is 37.2 ° C. The general condition is satisfactory. The skin is clean. There are soreness and deformity of the metacarpophalangeal and proximal interphalangeal joints of 2,3,4 fingers, movement in these joints is limited. Vesicular breathing. Cardiac rhythms, clear, heart rate of 82 per min. Blood pressure 120/80 mm Hg Abdominal pathology was not revealed.

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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Task number 6

In the patient 18 years after the vaccination against the flu, fever, erythema on the face, pain in the large joints of the hands and feet. After six months, edema on the face, arms, legs was added. Since the beginning of the disease, I lost 6 kg. In the anamnesis there is an intolerance to penicillin, papaverine. In the general analysis of urine, the protein is 1.65 g / l, individual erythrocytes, hyaline and granular cylinders.

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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6._____

VII. Tactics of the GP.

1._____

2._____

Task number 7.

A young woman is concerned about pain in the joints, a decrease in diuresis, edema throughout the body, shortness of breath, cough dry, fever.
When viewed: erythema on the face, palpated enlarged lymph nodes. Above lungs - sharply weakened vesicular breathing, below the angle of the scapula - breathing is not audible. In the general analysis of urine: protein - 6.6 g / l, altered erythrocytes - 3-5, single granular and waxy

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 8 A patient of 60 years complains of weakness and pain in the muscles of the hands and feet. When
the examination of the muscle is increased in volume, painful upon palpation.

In a general blood test: hemoglobin -70 g / l, ESR-55 mm / h,
in the biochemical analysis of blood - a marked increase in transaminases and cretinin.

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
_____
_____

III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 9

The patient is 45 years old, complains of pain in the fingers of both hands. in the knee joints, especially, are expressed at night, increased A / D, headaches, dizziness, aching pain in the lumbar region, dry mouth.

Objectively increased nutrition, in the area of the elbow joints, along the edges of the auricles under the skin there are tofuys of different sizes, the border of the heart is widened to the left, A / D is increased.

Diagnosis? Survey plan?

I. Preliminary diagnosis: _____

Objective and sub-objective data

_____

II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

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2._____

Task number 10

To the patient of 48 years, after a banquet, at night has woken from the strongest pains of fingers of a foot, the temperature of a body up to 39 has raised. From an anamnesis, he abuses red wine, chocolate.
Objectively: the general state of the average degree of severity,
the skin around the joints of the foot is hyperemic, palpation notes pain in these joints.
I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

NEPHROLOGY

Task number 1
The patient is 23 years old, got sick acutely. After a sore throat 3 weeks later, dull pains appeared in the lower back, swelling on the face, more in the morning, headaches, the amount of urine decreased.
Objectively: the patient is pale, swelling on the face, hips, legs. Pulse 68 in min. AD 170/110 mm. / Hg. The liver and kidneys are not palpable. The symptom of effleurage is positive on both sides. Daily diuresis 800 ml, 1200 ml of liquid are drunk. Urine is the color of "meat slops".
Urinalysis: weight 1018, alkaline reaction, protein - 310 mg / l, fresh erythrocytes, leached, 10-12 in the field of view, leukocytes 3-5 in the field of view.
Blood test: hemoglobin - 130 g / l, red blood cells 4.0 * 10 12 \ L, leukocytes - 7.0 * 10 9 \ L, ESR - 18 mm per hour.

Biochemical blood test: total protein - 68 g / l, albumins - 58%, globulins - 42% (* 1 - 8.4% * 2 - 9.8% * - 16.3% * - 17.7%), blood cholesterol - 5,2 mmol / liter.
Make a diagnosis. Indicate the main syndromes of the disease. What is the significance of angina in a history of the disease? Does the patient have hematuria? Does the patient have a dysuric syndrome? Does the patient have signs of a violation of the nitrogen excretory function of the kidneys?

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 2
The patient is 40 years old. From the age of 20 she was repeatedly treated for chronic glomerulonephritis. In the history of an increase in blood pressure to 180 \ 110 mm./ Hg. Figures of AD for the last 2 years are constantly raised. Diuresis was not disturbed. A month ago she had ARVI, her condition worsened, her diuresis decreased, her face and trunk appeared edemas.
Objectively: the patient is pale, at the waist, anterior abdominal wall, legs. The border of the heart is enlarged to the left, the apical impulse is palpated in the V intercostal space along the left sredneklyuchichnoy line. I tone at the top is muffled, the accent is II tone over the aorta. Pulse 92 per minute, rhythmic, intense. AD 190 \ 120 mm. gt; Art. The liver is palpated at the edge of the costal arch. The symptom of effleurage is negative on both sides.
Urinalysis: weight 1006, reaction - alkaline, protein - 3000 mg / l, erythrocytes leached 10-12 in the field of view, cylinders grainy (+)

Blood test: hemoglobin - 90 g / l, erythrocytes 2.6 * 10 12 \ L, leukocytes - 5.6 * 10 9 \ L, ESR - 36 mm per hour.
Biochemical blood test: total protein - 56 g / l, albumins - 32%, globulins - 58% (* 1 - 15.2% * - 7.1% * - 35%), blood cholesterol - 14.8 mmol / l .
Make a diagnosis. Indicate the main syndromes of the disease. Are there signs of chronic renal failure? What additional research methods should be used to clarify the diagnosis? What explains the change in the boundaries of the heart and auscultative symptoms?

I. Preliminary diagnosis: _____
Objective and sub-objective data
_____

II. Basic research plans: _____
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III.Additional studies: _____
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IV.The basis of the clinical diagnosis _____
V. Differential Diagnostics
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VI. Treatment
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VII. Tactics of the GP.
1._____
2._____

Task number 3

The patient is 38 years old. In the history of frequent ARVI, sore throats. I got sick 6 days ago: subfebrile temperature, runny nose, headaches, dull pain in the lumbar region, swelling on the face.

On examination: pallor of the skin, face pasty, edema on the body net.I tone on the top of the heart is muffled. AD 180/80 mm. / Hg. Pulse 80 per minute, rhythmic. The kidneys are not palpable. The symptom of effleurage is positive on both sides.

Urinalysis: weight 1009, protein - 2800 mg / l, erythrocytes 20-25 in the field of vision, renal epithelium - many, hyaline cylinders, granular 7-9 in the field of view.

Biochemical blood test: total protein - 56 g / l, albumins - 34%, globulins - 66% (* 1 - 3.8% * 2 - 8.6% * - 7.9% * - 34%), blood cholesterol - 10 mmol / l

Make a diagnosis. Indicate the main syndromes of the disease. What is the manifestation of urinary syndrome? Does the patient have hypostenuria? Is the renal excretion function impaired? What is the cause of low back pain and a positive symptom in the lumbago in the lower back?

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

1._____

2._____

Task number 4

The patient is 20 years old. She got sick after hypothermia, had a cold, cough, sore throat. In the anamnesis frequent ARI, sore throat. At the age of 16 she underwent tonsillectomy. Within 3 days, headaches, swelling on the face, urine of the color of "meat slops", the amount of urine decreased. Pain in the lower back.

Objectively: The patient is pale, his face is swollen, his body is swollen. Pulse 62 per minute, rhythmic. I tone at the top is muffled. Blood pressure 130 \ 80 mm. / Hg. The liver and kidneys are not palpable. The symptom of effleurage is positive on both sides.

Urinalysis: weight 1025, alkaline reaction, protein - 3200 mg / l, fresh erythrocytes, leached 25-30 in the field of vision, renal epithelium - many, hyaline cylinders 8-10 in the field of view.

Blood test: hemoglobin - 130 g / l, erythrocytes 3.8 * 10 12 \ L, leukocytes - 9.2 * 10 9 \ L, ESR - 28 mm per hour.

Biochemical blood test: total protein - 60 g / l, albumins - 42%, globulins - 58% (* 1 - 4.6% * 2 - 10.2% * - 8% * - 26.9%), blood cholesterol - 12 mmol / l.

Make a diagnosis. Indicate the main syndromes of the disease. What is the significance of anamnesis in the diagnosis of the disease? Is there a hematuria in the patient? Is there a need for Zimnitsky's trial? Is there a violation of the nitrogen excretory function of the kidneys?

I. Preliminary diagnosis: _____

Objective and sub-objective data

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II. Basic research plans: _____

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III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

1._____

2._____

Task number 5

A patient of 40 years complains of dull pain in the right lumbar region. Body temperature rises to 39-40 ° C with chills, fever. He notes a somewhat rapid and painful urination. The disease is associated with hypothermia. When swelling on the right lumbar region is determined by sharp soreness.

What pathology can you think of? What additional research needs to be done to confirm this assumption?

I. Preliminary diagnosis: _____

Objective and sub-objective data

_____

II. Basic research plans: _____

_____

_____

III.Additional studies: _____

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IV.The basis of the clinical diagnosis _____

V. Differential Diagnostics

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VI. Treatment

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VII. Tactics of the GP.

1._____

2._____

6.4 TESTS

Tests 1 rights. answers

1. The most informative method of research in chronic bronchitis:

A. Determination Blood gas
B. Rentgenography of Chest
C. Scintigraphy of lungs
D. Bronchoscopy*
E. Fluorography

2. Auscultation in patients with chronic bronchitis auscultated:

A. Noise friction pleura
B. Wet voiced wheezing
C. Dry and wet wheezing*
D. Crepitus
E. Dry wheezing

3. What group of drugs should not be prescribed for chronic bronchitis:

A. Bronhodilyatatory
B. Immunomodulators
C. Biostimulators
D. Beta Blockers*
E. Calcium antagonists

4. When acute bronchitis is defined by:

A. Box sound
B. Percussion stupidity
C. Timpanic sound
D. Unchanged lung sounds*
E. Weakening vesicular breathing

5. Complications of chronic bronchitis

A. Emfizema light
B. "lung" heart
C. Resriratory failure
D. All the listed*
E. Pneumosklerosis

6. Triad characteristic of chronic obstructive bronchitis

A. Cough Without sputum, rales
B. Cough, sputum, shortness of breath*
C. Cough, Sputum, rales
D. Cought, Dyspnea, crackles
E. purulent Sputum, wheezing ringing wet

7. During exacerbation of chronic bronchitis auscultation auscultated

A. Dry humming, wheezing*
B. Bronchial breath
C. Crepitus
D. Wet finely sonorous wheeze
E. Wet not voiced wheezing

8. To bronchiectasis characterized by

A. Liquid in the pleural cavity
B. Cavern
C. Tumors
D. Pus in bronchiectasis*
E. Gangreny

9. The disease is characterized by inflammation in the development of advanced

A. Bronchs
B. abstsess easy
C. bronchiectasis*
D. Tuberculosis
E. lung cancer

10. The patient selects the phlegm in the morning when a full mouth

A. Bronchiectasis*
B. Bronchial asthma
C. Lobarpneumonia
D. Wet pleurisy
E. Chronic obstructive pulmonary disease

11. The most informative method of diagnosis of bronchiectasis

A. Spirometriya
B. Rentgenoskopy of chest
C. Spirografiya
D. Fluorography
E. Bronchography*

12. Fingers as "drumsticks" and nails in the form of "time windows"

A. Local pneumonia

B. Meet at
C. Acute bronchitis
D. Bronchiectasis*
E. Lobar pneumonia

13. mucolytics include everything except:
A. Atsetiltsistina
B. Bromgeksina
C. Mukaltina
D. Phenolphthalein*
E. Ambroksana

14. For the sputum of bronchiectasis is characterized by:
A. Eozinophiles
B. ElasticFibers
C. Streaks of blood*
D. Helices Kurshmana
E. Kristallov Charcot-Leyden

15. When bronchiectasis most informative:
A. Obzornaya X-ray light
B. Auskultation
C. Perkussion
D. Bronchography*
E. Studies ERF

16. For the characteristic of bronchiectasis (delete superfluous)
The presence of streaks of blood in the sputum
A. Paltsy As "drumsticks"
B. Charcot-Leyden crystals*
C. Zhelto- Green phlegm
D. Soykie Crackles
E. None of the above

17. What is true of bronchiectasis:
A. Localisation -preimuschestvenno Lower lung
B. Availability Suppurative process in the bronchi
C. Extension of the deformation of bronchi
D. All of the above*
E. SHronic Nature of the disease

18. What is the essence of bronchiectasis:
A. Increase Intrabronchial pressure cough
B. Increase The negative intrapleural pressure
C. Suppuration + formed bronchiectasis*
D. Violation Mechanisms cough
E. Degeneration Cartilage plates and muscle of the bronchi

19. Specify the exogenous factor of chronic bronchitis:
A. Professional Hazard
B. Tobacco smoke
C. Pollution of Air basin
D. Any of the above*
E. Viral infection

20. What is not included in the exogenous factors of chronic bronchitis:
A. Patologiya Nasopharynx
B. Nasledstvennaya Predisposition
C. Passive smoking*
D. Metabolic disease
E. local Upper respiratory tract infection

21. What plays a role in the pathogenesis of chronic bronchitis:
A. Violation Patency of the bronchi
B. Changing the structural and functional properties of the mucosa
C. inflammation of Mucosa
D. All of the above*
E. Violation Drainage function of bronchi

22. Note the causes of obstructive syndrome with chronic bronchitis
(delete superfluous)
A. Allergic Changes in bronchial mucosa
B. SpasmMuscles of the bronchi
C. Gipersekretsiya Mucus
D. Hyposecretion mucus*
E. Kollaps Small bronchi

23. Note the sign of airflow obstruction in chronic bronchitis:

A. Drywheezing on exhalation
B. Long exhalation during quiet breathing
C. Any of the above*
D. Simptoms of obstructive emphysema
E. Long forced expiratory breath

24. What is the purpose bronchoscopy (delete superfluous)?
A. Estimate Active inflammation
B. Rating respiratory function*
C. Clarify Nature of inflammation
D. Reveal Functional impairment of the tracheobronchial tree
E. It helps in the diagnosis of tumor

25. Note the distinctive figure in the ERF obstructive bronchitis:
A. Smoking
B. Pollution Air basin
C. Immunosuppression *
D. Climate
E. Infection

26. The special forms of chronic bronchitis is
A. Obstructive
B. Kataral
C. Purulent
D. Fibrinous*
E. Purulent – Obstructive

27. The presence of bronchospastic component of chronic bronchitis
auscultation evidenced by the following symptoms
A. The presence of dry wheezing on exhalation, with its extension*
B. Availability Voiced finely wheezing
C. Availability Diffuse weakened vesicular breathing
D. Availability Not voiced finely wheezing in the lower lung
E. Hard Dry droning breath wheezing

28. The most informative method of research in chronic bronchitis:
A. Chest X-ray
B. Lung scintigraphy
C. Determination Blood gas
D. Bronchoscopy*
E. KT

29. Auscultation in patients with chronic bronchitis auscultated:
A. Wet Voiced wheezing
B. Noise friction pleura
C. Crepitus
D. Suhie Wheezing
E. Dry and wet wheezing*

30. What group of drugs should not be prescribed for chronic bronchitis:
A. Immunomodulyatory
B. Biostimulators
C. Bronhodilators
D. Beta Blockers*
E. Mucolithics

31. When acute bronchitis is defined by:
A. Unchanged + lung sounds*
B. Box sound
C. Percussion stupidity
D. Timpanic sound
E. Weakening Vesicular breathing

32. Cough in chronic bronchitis is most often:
A. Evening
B. Night
C. All day*
D. Morning
E. No Correct answer

33. Complications of chronic bronchitis
A. All the listed*
B. “lung” Heart
C. resriratory Failure
D. Emfizema Light
E. Pneumosklerosis

34. Triad characteristic of chronic obstructive bronchitis
A. Cough Without sputum, rales
B. Cough, sputum, shortness of breath*

C. Cough, Sputum, rales
D. Cought, Dyspnea, crackles
E. Purulent Sputum, wheezing ringing wet

35. During exacerbation of chronic bronchitis auscultation auscultated
A. Bronchial Breath
B. Crepitus
C. Dry humming, wheezing*
D. Wet Finely sonorous wheeze
E. Wet not voiced wheezing

36. To bronchiectasis characterized by
A. Tumors
B. cavern
C. Pus in bronchiectasis*
D. liquid in the pleural cavity
E. gangreny

37. The patient selects the phlegm in the morning when a full mouth
A. lobarpneumonia
B. Bronchial asthma
C. Bronchiectasis*
D. Wet pleurisy
E. Chronic obstructive pulmonary disease

38. The most informative method of diagnosis of bronchiectasis
A. Spirografiya
B. Rentgenoskopy of chest
C. Bronchography*
D. Fluorography
E. Spirometriya

39. Fingers as "drumsticks" and nails in the form of "time windows"
A. Acute bronchitis
B. Meet at
C. Bronchiectasis*
D. Local pneumonia
E. Lobar pneumonia

40. Call 1 symptom that observed in patients with acute bronchitis vperifericheskoy blood:
A. Leykopeniya
B. Leukocytosis*
C. Neytropeniya
D. Delayed esr
E. Trombotsitopeniya

41. Name the form of chronic bronchitis:
A. Fibrinos bronchitis
B. Chronic obstructive*
C. Hemorrhagic
D. Polyposis
E. Allergic

42. Name of microbes commonly found in the sputum of patients with acute bronchitis:
A. Escherichia coli
B. Pseudomonas coli
C. Influenza bacillus*
D. Klebsiella coli
E. Enterogen streptococcus

43. Specify the localization of the inflammatory process in acute bronchitis:
A. Nasopharynx
B. Bronchiols
C. Alveol
D. Trachea*
E. Bronchs

44. What kind of sputum, characteristic of acute bronchitis:
A. Purulent
B. Mucous*
C. Malin' jelly
D. Bloody
E. Red

45. Name complaints, the most characteristic of patients with acute bronchitis:
A. Attacksuffocation
B. An ample cough
C. More than when coughing and sneezing in the chest
D. Dry cough*
E. None of the above

46. Name The physical changes that may occur in acute bronchitis:

A. Auskultativ- vesicular breathing with prolonged exhalation (breathing hard)
B. Percussion - a clear lung sounds*
C. Dry whistling and buzzing rattles
D. Percussion - box sound
E. Sometimes timpanic

47. What are the signs that have been observed in patients with acute bronchitis in the peripheral blood:

A. Leykopeniya
B. Increase esr
C. Neutrocytosis*
D. Neytropeniya
E. Delayed esr

48. Name the form of chronic bronchitis:

A. Fibrinosis bronchitis
B. C blood, chronic
C. Simple uncomplicated catarrhal*
D. Hemorrhagic
E. No rights. Answers

49. Name the types of microbes commonly found in the sputum of patients with acute bronchitis:

A. Pseudomonas
B. Escherichia coli
C. Influenza bacillus*
D. Klebsiella
E. Enterogen streptococcus

50. Name complaints, the most characteristic of patients with acute bronchitis:

A. More than when coughing and sneezing in the chest
B. An ample cough
C. Dry cough*
D. Attac suffocation
E. None of the above

51. For chronic gastritis type A characteristic type secretion

A. Increased
B. Reduced*
C. Achilios
D. Normal
E. Inacidity

52. Chronic gastritis is necessary to differentiate

A. With gastric ulcer
B. With Stomach Cancer
C. With all of the above*
D. With chronic pancreatitis
E. With chronic cholecystitis

53. By precancerous Diseases relate all listed, except

A. Chronic atrophic gastritis with secretory insufficiency
B. Polyps of the stomach on a broad basis
C. Erosive gastritis *
D. Polypoid gastritis
E. Rigid antral gastritis

54. Drug treatment of chronic atrophic gastritis include

A. Cementing and enveloping means
B. Methyluracil
C. All of the above*
D. Vitamins
E. Replacement therapy

55. For chronic gastritis type B at more characteristic type secretion

A. Reduced
B. Increased *
C. Achilios
D. Normal
E. Hyperkriniya

56. On Helicobacter Pilori has act

A. Gastrotsepin
B. Gastrofarm
C. Trichopolum*
D. Almagell
E. Maalox

57. By blocker H - 2 receptors histamine applies.
A. De-nol
B. Platifillin
C. Kvamatel *
D. Festal
E. Maalox

58. Preventing gastritis based
A. On the right mode and nature of power
B. In all of the above*
C. On the elimination of occupational hazards
D. On the refusal of alcohol
E. In the treatment of diseases causing chronic gastritis

59. Which of these drugs cause the development of erosive gastritis?
A. Riboxinum, mildronat
B. Prednizolon, indomethacin*
C. Courant trental
D. Gastrotsepin, Maalox
E. None of the above

60. By the histamine H2-blockers not applicable
A. Kvamatel
B. Gastrotsepin*
C. Cimetidin
D. Ranitidin
E. Maalox

61. Describe the preparation for reparants gastric mucosa
A. Cerukal
B. Solkoseril*
C. No-spa
D. Atropin
E. Maalox

62. Specify antigelikobakter antibacterial drug
A. Atropin
B. Fosfolyugel
C. Trihopol*
D. De-nol
E. Maalox

63. Specify the characteristic symptom of chronic gastritis
A. Constipation
B. Diarrhea
C. Dull epigastric pain*
D. Melena
E. None of them

64. What is the drug helps damage the gastric mucosa
A. Prednizolon*
B. Aktovegin
C. Solkoseril
D. Metiluratsil
E. None of them

65. What preparation is not used in the treatment of H. pylori infection
A. Tetracycline
B. Ciprofloxacin*
C. Amoxicillin
D. Trichopolum
E. None of them

66. What does not stimulate gastric secretion
A. Gistamin
B. Almagel*
C. Pentagastrin
D. Prozerin
E. None of them

67. Pain and heaviness in the epigastrium, worse after meals 10-15 min., Heartburn, acid regurgitation, constipation are more typical for
A. Peptic ulcer 12 duodenal ulcer
B. Chronic gastritis with the secret is not enough
C. Chronic gastritis from increased secr etion*
D. Chronic gastritis with stored secretion
E. None of them

68. at a dose of ranitidine is produced
A. 200 mg
B. 100 mg
C. 150 mg*
D. 110 mg

E. none of them

69. For chronic gastritis type A characteristic type of secretion
A. Reduced
B. Increased*
C. Akhil
D. Normal
E. None of them

70. For chronic gastritis type B more distinctive type of secretion
A. Normal
B. Heightened
C. Akhil
D. Reduced*
E. None of them

71. The drug stimulates gastric secretion
A. Almagel
B. Plantaglyusid*
C. Serukal
D. Gastrotsepin
E. None of them

72. exerts on helicobacter pilori action
A. Gastrotsepin
B. Gastrofarm
C. Trixopol*
D. Almagel
E. None of them

73. blockers of histamine $_{H}$ 2 receptor relates
A. De- nol
B. Kvamatel*
C. Platifillin
D. Festal
E. None of them

74. The dose release pantaprazola
A. 60 mg
B. 40 mg *
C. 5 mg
D. 15 mg
E. none of them

75. Release of omeprazole dose
A. 60 mg
B. 20 mg *
C. 5 mg
D. 15 mg
E. none of them

76. Which pharmacological group includes pantaprazol
A. ACE inhibitors
B. H-2 histamine blockers
C. To inhibitors proton Pump*
D. Holinoblokators
E. Polyvitamins

77. Which class of drugs are contraindicated in the treatment of gastritis?
A. Stimulants regeneration
B. Nonsteroidal anti-inflammatory preparations*
C. Polyvitamins
D. Ace inhibitors
E. Holinoblokators

78. What is the etiological factor in gastritis?
A. Physical and chemical factors
B. Helicobacter pylori*
C. Error in the diet
D. Long reception nsaids
E. None of this

79. The group of histamine blockers for the treatment of gastritis include?
A. Metiluratsil pentoksil
B. Raglan, reglan
C. Ranitidine, nizatidine*
D. Aluminium phosphate gel, almagel
E. None of this

80. The most common cause of gastritis ...
A. Bacteria
B. HP*
C. Coxsackie virus
D. Alcohol
E. None of this

81. At the beginning of where the localized HP ...
A. Fundus

B. Antral*
C. Kardialnoy area
D. The body of the stomach
E. Pylorus

82. Where is the entrance to the stomach
A. Right from the spinal column of 12 thoracic or lumbar vertebrae 1.
B. The left of the spine at the level of 10 or 11 thoracic vertebra*
C. To the left of the spine at the level of 12 thoracic or lumbar vertebrae 1
D. In front of the spine, below the diaphragm
E. None of this

83. What is adjacent the front surface of the stomach
A. To the lower surface of the left lobe of the liver and the abdominal wall
B. Lower surface left share liver, diaphragm and front abdominal wa ll*
C. Square lobe of the liver, gallbladder and pancreas
D. The spleen and the left flexure of the colon
E. None of this

84. Acceptance of the drug can cause canker gastrointestinal mucosa:
A. Metronidazole
B. Atenolol
C. Atsetilsalitsilovoy acid*
D. Eufillina
E. Digoxin

85. Which of the following drugs cause the development of erosive gastritis?
A. Riboxinum, mildronat
B. Courant trental
C. Prednisolone, indomethacin*
D. Gastrotsepin, Maalox
E. Obzidan, Concor

86. Specify the characteristic symptom of chronic gastritis:
A. Nausea
B. Constipation
C. Dull pain in the epigastric*
D. Diarrhea
E. Melena

87. What stimulates gastric secretion (delete superfluous)
A. Histamine
B. Pentagastrin
C. Almagel*
D. Neostigmine methylsulfate
E. A nicotinic acid

88. What preparation is not used in the treatment of Helicobacter pylori infection:
A. Tetracycline
B. Amoxicillin
C. Ciprofloxacin*
D. Trichopolum
E. Clarithromycin

89. Pain and heaviness in the epigastrium, worse after meals 10-15 min., Heartburn, acid regurgitation, constipation are more typical for:
A. Chronic gastritis with the secret is not enough
B. Peptic ulcer 12 duodenal ulcer
C. Chronic gastritis with stored secretion
D. Chronic gastritis with increased secretion*
E. Stomach cancer

90. Gastrin is secreted:
A. fundal stomach
B. duodenal mucosa
C. antrum*
D. Brunner's gland
E. Pyloric

91. Debit - an hour of free hydrochloric acid in the basal portions of normal is:
A. 5-6 mmol
B. 0.5-2.5 mmol
C. 5-10 mmol
D. 1-4 mmol*
E. 15 mmol

92. De-Nol is a means of pathogenetic treatment of:

A. Reflex gastritis
B. Erosive gastritis
C. Gastritis with a reduced secretory function
D. Hypertrophic gastritis
E. Gastritis associated with kompilobakter*

93. Additional cells of the gastric mucosa secrete

A. Bicarbonates
B. Mucin*
C. Gastrin
D. Secretin
E. Bombesin

94. From the non-drug treatments for gastritis use all of these, except

A. Magnetotherapy
B. Reflexology*
C. Hyperbaric oxygen therapy
D. Radon baths
E. None of them

95. To blockers histamine H2-receptor does not apply:

A. Cimetidine
B. Ranitidine
C. Eglonil*
D. Famotidine
E. Venter

96. To blockers H2-histamine receptors are:

A. Venter
B. Rother
C. Atropine
D. Eglonil
E. Cimetidine*

97. What dietary table is indicated for chronic gastritis with secretory insufficiency:

A. Table №4
B. Table №2*
C. Table №5
D. Table №1
E. Table №7

98. The most informative method of examination in chronic gastritis:

A. X-ray study
B. A biopsy of the gastric mucosa
C. Esophagogastroduodenoscopy*
D. The study of gastric secretion
E. MRI

99. Total acidity of gastric juice in the basal portions of normal is:

A. 10-30 m. Units.
B. 20-50 m. Units
C. 40-60 m. Units.*
D. 60-80 m. Units
E. 80-100 m. Units

100. The main mechanism in the development of gastritis type B:

A. Autoimmune factor
B. Violation diet
C. Infection*
D. Smoking
E. Cold

101. What is important in the pathogenesis of GB?

A. Increased cardiac output
B. All of the above*
C. Increased total peripheral resistance
D. Increasing the calcium content of myofibrils
E. Activation of the sympathetic-adrenal system

102. What is characteristic of stage II GB (delete superfluous)?

A. . Left ventricular hypertrophy on electrocardiogram
B. .Left ventricular hypertrophy on rentgenissledovaniyu chest
C. The history of heart attack or stroke*
D. .Angiopathy of the vessels of the fundus
E. Left ventricular hypertrophy on US

103. For stage III GB is characterized by:

A. Pain in the heart

B. LV hypertrophy
C. D. In the history of myocardial infarction*
D. Hypertensive crises
E. The need for treatment of a blood pressure

104. Which diseases should be differentiated GB?
A. Chronic glomerulonephritis
B. Thyrotoxicosis
C. NCD of hypertensive type
D. All listed*
E. Chronic pyelonephritis

105. What used to treat GB (delete superfluous)?
A. Rabeprazole*
B. Nifedipine
C. Atenolol
D. Hypothiazid
E. Valsartan

106. Specify the most common complication of GB:
A Thrombosis of renal arteries
B. Hypertensive crisis*
C. Swelling of the brain
Primary-contracted kidney
E. Bleeding in the retinal vessels

107. Possible causes of hypertensive crises are all but:
A. Abruptly canceled clonidine
B. Abruptly canceled aspirin*
C. Stress
D. Physical inactivity
E. Sudden changes in the weather

108. Which option hypertensive crisis does not exist?
A. Convulsively
B. Adrenalovogo
C. Autonomic
D. Vodnosolevogo
E. Asthmatic*

109. Specify the means are not used in the treatment of hypertensive crisis?
A. Corinfar
B. Nifidipin
C. Triampur*
D. Sodium nitroprusside
E. Lasix

110. What is not used for the relief of hypertensive crisis?
A Sodium nitroprusside
B. Lasix
C. Corinfar
D. Magnesium sulfate
E. Amlodipine*

111. What is a diuretic used for the relief of hypertensive crisis?
A. Uregei
B. Veroshpiron
C. Furosemide*
D. Aldactone
E. Triamterene

112. Please select cardioselective β-blocker:
A. Talinolol
B. Atenolol
C. Metoprolol
D. Propranolol*
E. Bisoprolol

113. What is your blood pressure is most characteristic of aortic insufficiency
A. 100/60 mm Hg
B. 160/30 mm Hg*
C. 120/70 mm Hg
D. 160/120 mm Hg
E. 180/100 mm Hg

114. Which of the following has a depressor effect in hypertension
A. Norepinephrine
B. Adrenalin
C. Bradykinin
D. Angiotensin II*
E. Angiotensin I

115. Increased blood pressure is associated with all processes except
A. Increase in the activity of sympathetic adrenal system
B. Increased production of prostaglandin F2a
C. Hyposecretion catecholamines*
D. Total peripheral resistance

E. Increased allocation of vasopressin

116. The basic principle of treatment of severe hypertension is

A. Individual selection of drugs
B. Term Therapy
C. Physiotherapy Balneotherapy
D. Long-term continuous antihypertensive therapy*
E. Monotherapy

117. In hypertensive disease stage II is characterized by

A. Systolic murmur at the right base of the heart
B. Accent II tone of the aorta
C. Reducing the borders of the heart
D. Offset borders of the heart to the left*
E. Can be heard III tone

118. What is the cause of pulmonary edema with hypertension

A. Increased pulmonary capillary permeability
B. Acute left ventricular failure arising*
C. Reduction of the protein content in the blood
D. Delay of sodium chloride and water
E. Increased secretion of aldosterone

119. Cardiac asthma - a manifestation

A. A long-term lung disease
B. Chronic heart failure
C. Acute left ventricular failure*
D. Acute right ventricular failure
E. Pravopredserdnoy failure

120. Which drug predpochtete appoint in cardiac asthma

A. Norepinephrine
B. Lasix*
C. Anaprilin
D. Platifillin
E. Eufillin

121. Beta-blockers does not apply

A. Whiskey
B. Anaprilin
C. Kordanum
D. Reserpine*
E. Trazikor

122. With hypertension is recommended to limit the diet

A. Carbohydrates
B. Vitamins
C. Salt*
D. Proteins
E. Vegetable fibers

123. What should be limited in the diet of the hypertensive patient

A. Table salt
B. Vegetable fats
C. Spice
D. Water
E. All of the above

124. What characterizes Stage III hypertensive disease?

A. Right ventricular hypertrophy
B. Complications of target organs*
C. High blood pressure stable
D. Hypertrophy of the right atrium
E. Hypertrophy of both edudochkov

125. By centrally acting drugs in the treatment of hypertension include

A. Captopril, enalapril
B. Dopegit, clonidine*
C. Obzidan, Corinfar
D. Oksodolin, veroshpiron
E. Saralazin, lazortan

126. With the combination of hypertensive disease with bronchial asthma is most preferable

A. Anaprilin
B. Corinfar*
C. Trazikor
D. Kordaron
E. Obzidan

127. Patients with high plasma renin activity shows the most

A. Furosemide

B. Dopegit
C. Captopril*
D. Corinfar
E. Veroshpiron

128. Attributed to vascular hypertension
A. Post-traumatic hypertension
B. Polycystic Kidney Disease
C. Conn's syndrome
D. Renovascular hypertension*
E. Pheochromocytoma

127. Basic ECG signs of left ventricular hypertrophy
A. Absence of teeth T.
B. Lengthening the interval Q-T
C. An increase in the amplitude of the R wave in I, V-5, V-6*
D. Increase in R II, V-3, V-4
E. Negative T V-3, V-4, AVL

128. Normal blood pressure is in the range
A. 90/50 - 109/59 mm Hg
B. 140/90 - 159/94 mm Hg
C. 110/60 - 139/69 mm Hg
D. 100/60 - 139/89 mm Hg*
E. 170/100 - 189/149 mm Hg

129. Border hypertension is within mmHg
A. 110/60 - 139/89
B. 130/90 - 144/94
C. 140/90 - 159/94*
D. 150/90 - 169/94
E. 170/100 - 189/144

130. According to the WHO criteria border zone hypertension
A. 130/90 mm Hg
B. 159/94 mm Hg*
C. 135/94 mm Hg
D. 160/100 mm Hg
E. 149/94 mm Hg

131. Specify what level of blood pressure is diagnosed, "hypertension" according to experts WHO
A. 130/90 mm Hg
B. 120/80 mm Hg
C. 160/95 mm RTST*
D. 150/90 mm Hg
E. 159/94 mm Hg

132. According to the classification of hypertension according to the WHO criterion for separating stage II of I is:
A. High blood pressure numbers
B. Left ventricular hypertrophy*
C. The presence of complications
D. Treatment failure
E. The presence of concomitant diseases

133. What are the signs are the main criteria of hypertensive disease stage III
A. Sustained increase in blood pressure are not compensated for the reception of conventional antihypertensive drugs
B. Signs of kidney, heart, brain, associated with hypertension*
C. Periodic increase in diastolic blood pressure above 115 mm Hg
D. The presence of left ventricular hypertrophy
E. Frequent hypertensive crises

134. In stage I disease in hypertensive patients with no complaints
A. Bad dream
B. Heartbeat
C. Headache
D. Asthma at night*
E. Fast fatiguability

135. Complications of essential hypertension is not expected
A. Lack of blood circulation
B. Respiratory failure*
C. Acute myocardial infarction
D. Hypertensive crises
E. Strokes

136. Auscultatory sign of left ventricular failure is all but
A. Gallop
B. Tachycardia

C. Crackles
D. Muted tones
E. Dry buzzing wheezing*

137. Complications of the disease include hypertension
A. Strokes
B. Myocardial infarction
C. All of the above*
D. Hypertensive crises
E. Lack of blood circulation

138. Which of the following diseases often not accompanied by hypertension
A. Pheochromocytoma
B. Conn's syndrome
C. Coarctation of the aorta
D. Myxedema*
E. Aortic valves

139. Which of the following drugs is a peripheral vasodilator
A. Propranolol
B. Etatsizin
C. Izobarin
D. Apressin*
E. Arfonad

140. For stage I hypertensive disease is characterized by:
A. Retinopathy
B. Left ventricular hypertrophy
C. Acute stroke
D. Functional changes*
E. Proteinuria cylindruria

141. The most likely reason for the emergence of renovascular hypertension
A. Multicystic kidney disease
B. Vtorichnosmorschennaya kidney
C. Fibromuscular dysplasia*
D. Chronic glomerulonephritis
E. Diabetic nephrosclerosis

142. What's the cause of renovascular hypertension
A. Atherosclerosis
B. Non-specific aortoarteriit
C. Bacterial endocarditis*
D. Fibromuscular dysplasia
E. Thrombosis of the renal arteries

143. The basic method of treatment of hypertension when pielonefriticheski contracted kidney
A. Antibiotics
B. Antihypertensive therapy
C. Diuretics
D. Nephrectomy*
E. Spazmolitiki

144. What is not typical for hypertension in primary aldosteronizme
A. Edema-ascitic syndrome
B. Hypokalemia
C. Giperreninemiya*
D. Gipernatriyemiya
E. Muscle weakness

144. What is not typical when examining patients with the syndrome Kona
A. Lowering plasma renin
B. Hypokalemia
C. Hypernatremia
D. Increased plasma rennin*
E. Hyperaldosteronemia

145. Which drug is not used in hypertension on the background of chronic renal failure
A. Corinfar
B. Anaprilin
C. Captopril*
D. Prazosin
E. Benzogeksony

146. Under what conditions is most often combined with symptomatic hypertension, ischemic heart disease
A. Pheochromocytoma
B. Kona Syndrom
C. Atherosclerosis*
D. Cushing's Syndrome-Itsengo
E. Renal hypertension

147. Reasons for renovascular hypertension are all except:
A. Atherosclerosis of renal artery
B. Periarteritis nodosa

C. Nonspecific aortoarteritis
D. Chronic pyelonephritis*
E. Fibromuscular dysplasia

148. Specify the ECG signs characteristic of sinus tachycardia.
A. Heart rate less than 60 to 1 min.
B. Heart rate greater than 80 at 1 min
C. Different RR interval
D. Heart rate greater than 90 to 1 min.*
E. Otsustvie P wave

149. The causes of sinus tachycardia are all except:
A. Increased body
B. Unrest
C. Use of salbutamol
D. Applications anaprilina*
E. Applications of atropine

150. Specify the possible cause sinus bradycardia:
A. Exercise stress
B. B-agonists Overdose
C. Typhoid fever*
D. Increased body temperature
E. Overdose holinolitics

151. Etiological factors of peptic ulcer disease are all listed, except
A. Alcohol
B. Malnutrition
C. Emotional stress
D. Nicotine *
E. Medication

152. The mechanism of pain associated with peptic ulcer with localization of ulcers in the duodenum due to
A. Acid-peptic factor
B. Spasms piloroduodenalnoy area
C. Increased pressure in the stomach and duodenum
D. All listed *
E. Periultseroznym inflammation

153. Constipation with ulcers are caused by the impact of all these factors, in addition to
A. Ligt diet
B. Round bases*
C. Bed rest
D. Increased vagal tone
E. Drug therapy

154. For recurrent peptic ulcer rarely flow exacerbation occur
A. Three times a year
B. 2 times per year
C. 1time in 5 years
D. 1-2 2-3 times per year *
E. 4 times per year

155. From non-drug treatments for peptic ulcer using all of these except
A. Radon baths *
B. Reflexology
C. Magnetotherapy
D. Hyperbaric Oxygenation
E. Laser therapy

156. Which of the drugs prescribed for peptic ulcer disease in case of detection of Campylobacter?
A. Cimetidine
B. Trichopolum *
C. Almogel
D. Gastrotsepin
E. Ranitidine

157. Pain in the upper abdomen, depending on food intake, increased gastric acidity, the presence of occult blood in the stool, a symptom of "niche" are characteristic of the
A. Chronic gastritis with normal secretory function
B. Gastric ulcer and 12 duodenal ulcer *
C. Chronic gastritis with increased secretion
D. Chronic pancreatitis
E. Cancer of the pancreas

158. Specify the group of drugs with severe ulcerative influence:
A. Nonsteroidal anti-inflammatory *
B. -Antibiotics
C. -Antihistamines
D. -Ganglioplegic
E. -Cardiac glycosides

159. Specify the most frequent localization of ulcer:

A. Antrum, pylorus
B. Cardiac Department, a large curvature
C. Small curvature pylorus*
D. Subcardial department, small curvature
E. Pylorus, the greater curvature

160. For peptic ulcer 12 duodenal ulcer is characterized by:
A. Feeling quick nasysheniya, diarrhea
B. Pain in the right upper quadrant, bitter taste in the mouth
C. Pain on a full stomach, belching food
D. Pain fasting, night pain*
E. Pain after eating, nausea

161. Acceptance of the drug can cause canker gastrointestinal mucosa:
A. Metronidazole
B. Atenolol
C. Eufillin
D. S glyukokartiksteroid*
E. Digoxin

162. When dlititelno not heal ulcers in the stomach showing:
A. Nazanachenie physiotherapy
B. Carrying out the course of hyperbaric oxygenation
C. Re-EFGDS with a biopsy of the ulcer edges *
D. Appointment of B vitamins
E. Emergency surgery

163. When bleeding from a stomach ulcer and 12 p / c-ki shows:
A. Heparin, chimes
B. Neodikumarina, fenilin
C. Dicynonum, aminocaproic acid *
D. Vikasol, calcium gluconate
E. Maalox, vikalin

164. The most common ulcer-12 s / c-ki penetrates in:
A. Seal
B. The pancreas *
C. Transverse colon
D. All of the above is true
E. Small intestine

165. The main factors that contributes to the development of peptic ulcer does not include:
A. The presence of Helicobacter pylori
B. Nerve mentally. overstrain
C. Hypothermia *
D. Chronic gastritis, duodenitis
E. Smoking

166. Note the pain characteristic of gastric ulcer:
A. Hunger pains
B. 2 hours after a meal
C. Night pain
D. Immediately after eating*
E. 1 hour after meals

167. Note the typical figure of the secretory function of the stomach in the DU:
A. Normal level
B. Reduction
C. The sharp decline
D. Increases *
E. Slight decrease

168. Specify the direct radiological signs of stomach ulcer:
A. The regional spasm
B. Deformation of duodenal bulb
C. Symptom "niche" *
D. Increased peristalsis 12-PK-ki
E. Irritated bulb 12 s / c-ki

169. When bleeding from a stomach ulcer and 12 p / c-ki shows everything except:
A. Frost on the epigastric region
B. Heparin *
C. Aminocaproic acid
D. Dicynonum
E. Gastric lavage with cold water

170. Specify the most informative method of diagnosis of gastric ulcer:
A. Analysis of gastric juice
B. Fecal occult blood

C. X-ray of the stomach with a mixture of barium
D. Fibergastroscope biopsy *
E. Complete blood count

171. The program of treatment of peptic ulcer includes everything except:
A. Cytoprotector
B. Spazmolitikovov
C. Elimination of inactivity *
D. Helicobacter drugs
E. Smoking Cessation

172. Pain and heaviness in the epigastrium, worse after meals 10-15 min., Heartburn, acid regurgitation, constipation are more typical for:
A. Chronic gastritis with a secret is not enough
B. Peptic ulcer 12 duodenal ulcer
C. Chronic gastritis with stored secretion
D. Chronic gastritis with increased secretion *
E. Stomach cancer

173. Ranitidine produced in what dose?
A. 100 mg
B. 200 mg
C. 150 mg*
D. 110 mg
E. 130 mg

174. Pain in the upper abdomen, depending on food intake, increased gastric acidity, the presence of occult blood in the stool, a symptom of "niche" are characteristic:
A. Chronic gastritis with normal secretory function
B. Chronic gastritis with increased secretion
C. Gastric ulcer and 12 duodenal ulcer *
D. Chronic pancreatitis
E. Cancer of the pancreas

175. For peptic ulcer 12 duodenal ulcer characterized
A. A sense of rapid nasysheniya, diarrhea
B. fasting pain, night pain *
C. Pain in the right upper quadrant, bitter taste in the mouth
D. B Oli on a full stomach, belching food
E. None of the above

176. Acceptance of the drug can cause canker gastrointestinal mucosa
A. Metronidazole
B. Atenolol
C. Atsetilsalitsilovoy acid *
D. Eufillin
E. Asparkam

177. When dlititelno not heal ulcers in the stomach shows
A. Nazanachenie physiotherapy
B. A course of hyperbaric oxygenation
C. N Assigning B vitamins
D. N To Re EFGDS with a biopsy of the ulcer edges*
E. Radon Therapy

178. When bleeding from a stomach ulcer and 12-n shown guts erstnoy
A. Heparin, chimes
B. Neodikumarin, fenilin
C. Dicynonum, aminocaproic acid *
D. Vikasol,
E. Calcium gluconate

179. The most common ulcer 12-n erstnoy ulcer penetrates in
A. pancreas
B. P Operechno-colon
C. The small intestine
D. Seal *
E.Answer all correctament

180. Note the characteristic indicators of secretory function of the stomach in 12 duodenal ulcer disease kisshki
A. The normal level
B. Reduction
C. A sharp decline
D. Increasee*
E. Very high

181. Enter the direct radiological signs of the disease ulcers ennoy ludka

A. sign "niche"
B. Deformation of a bulb 12 duodenal ulcer
C. Increased peristalsis 12 duodenal ulcer
D. Regional spasm *
E.Aperistaltika 12 duodenal ulcer

182. When bleeding from a stomach ulcer and 12-n erstnoy intestine does not apply

A. heparin
B. Aminocaproic acid
C. Dicynonum
D. Cold on the epigastric region*
E.Clexane

183. Specify the most informative method of diagnosis of gastric ulcer

A. Analysis of gastric juice
B. Fecal occult bleeding
C. X-ray of the stomach with a mixture of barium
D. fibergastroscope biopsy *
E. CBC

184. Complications of peptic ulcer does not apply

A. Stenosis
B. Bleeding
C. Cholelithiasis *
D. Perforations
E. Penetration

185. What antacid used in peptic ulcer

A. M otilium
B. M aaloks *)
C. To vamatel
D. Gastrotsepin
E. F osfalyugel

186. Note antisecretory medication used for peptic ulcer

A. Meprazol*
B. F osfalyugel
C. Mr. atrium sodium
D. Almagel
E. Maalox

187. Specify contraindication to atropine with ulcers

A. Hypertension
B. NDC
C. I have ulcer disease 12 n / a
D. Glaukoma *
E. N Pull to bronchospasm

188. By the histamine H2-blockers does not apply

A. Tovamatel
B. Cimetidin
C. Hastrotsepin *
D. Panitidin
E. Nolpaza

189. Specify a drug belonging to the gastric mucosa reparants

A. Cerukal
B. MR-spa
C. Colkoseril *
D. Atropin
E. Ranitidine

190. Specify antigelikobakterna antibacterial drug

A. Gastrotsepin
B. Atropin
C. Fosfolyugel
D. De-nol
E. Mrihopol *

191. The etiology of peptic ulcer include

A. Helicobacter piylori*
B. Hyperacidity
C. Coli
D. Mixed acid
E. Enterobacter

192. Where most localized gastric ulcer?

A. Cardiac department
B. Greater curvature
C. the lesser curvature *
D. The stomach
E. Antral

193. The group of histamine blockers for the treatment of gastritis and gastric ulcer and 12 duodenal ulcer include?

A. Raglan, Reglan

B. Metiluratsil pentoksil
C. Ranitidine, nizatidine*
D. Aluminium phosphate gel, almagel
E. Ranitidine, almagel.

194. Which class of drugs are contraindicated in the treatment of gastritis and peptic ulcer disease?
A. Stimulants regeneration
B. Multivitamins
C. NSAIDs *
D. Antacid s
E. H 2 gistaminoblo to ATOR s

195. Etiological factors of peptic ulcer disease are all listed, except
A. Alcohol
B. Nicotine *
C. Malnutrition
D. Emotional stress
E. Medication

196. The mechanism of pain associated with peptic ulcer with localization of ulcers in the duodenum due to
A. Acid-peptic factor
B. Spasms piloroduodenalnoy area
C. Increased pressure in the stomach and duodenum
D. Periultseroznym inflammation *
E. All listed

197. Constipation with ulcers are caused by the impact of all these factors, in addition to
A. Light diet *
B. Bed rest
C. Increased vagal tone
D. Round bases
E. Drug therapy

198. What disease is characterized by positive symptom Mendel:
A. Chronic gastritis
B. Stomach cancer
C. Peptic ulcer *
D. Acute gastritis
E. Erosive gastritis

199. Medicinal ulcer complicated:
A. Perforated
B. Stenosis
C. bleeding *
D. Malignancy
E. Penetration

200. The most frequent early complications of peptic ulcer are:
A. Stenosis
B. Malignancy
C. bleeding *
D. Penetration
E. Perforation

6.5 EVALUATION CRITERIA

Assessment of student education	Assimilation	Evaluation
The student is prepared on the main issues to the topic, actively participates in the discussions, mastered the topic completely, independently thinks. It is fully informed about the etiology, pathogenesis, diagnosis, differential diagnosis, treatment, prevention of diseases and can justify their knowledge, can apply it in practice.	86-100	«5»
The student is prepared on the main issues to the topic, participates well in discussions, mastered the topic, independently thinks. Informed about etiology, pathogenesis, diagnosis, differential diagnosis, treatment, prevention of diseases and can justify their knowledge, will be able to apply this in practice.	71-85	«4»
The student is poorly prepared on the main issues to the topic, is not very involved in the discussions, has mastered the topic incompletely, thinks with the help of the teacher. Poorly informed about etiology, pathogenesis, diagnosis, differential diagnosis, treatment, preventive maintenance of diseases independently can not apply it in practice.	55-70	«3»
The student does not understand the topic on the main issues. Not informed about the etiology, pathogenesis, diagnosis, differential diagnosis, treatment, prevention of diseases. Self-reliant can not apply the practice of restitution.	55 and below	«2»

6.6. LITERATURE

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