**Read theoretical information on the topic!**

**Topic: Definition of hospital hygiene and general requirements for hospitals**

**The objective:** toimprove theoretical knowledge about the requirements for organizations engaged in medical activities.

**The main questions of the study:**

1. Definition of hospital hygiene.

2. General requirements for hospitals.

3. Prevention of hospital acquired infections.

4. Non-specific prevention of hospital acquired infections.

5. Safe disposal of medical waste.

**Question 1**

**Definition of hospital hygiene**

**Hospital (medical) hygiene** is a hygiene field which develops hygienic standards and requirements for medical organizations directed towards the prevention of a disease or incidence minimization.

***Hospital hygiene practices include:***

- Isolation or quarantine of infectious persons or materials to prevent spread of infection.

- Sterilization of instruments used in surgical procedures.

- Use of protective clothing and barriers, such as masks, gowns, caps, glasses and gloves.

- Safe disposal of medical waste.

- Disinfection of reusables (i.e. linen, pillows, uniform)

- Scrubbing up, hand-washing, especially before an operation

- [Optimization](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d0%be%d0%bf%d1%82%d0%b8%d0%bc%d0%b8%d0%b7%d0%b0%d1%86%d0%b8%d1%8f&translation=optimization&srcLang=ru&destLang=en) of medical staff [working conditions](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d1%83%d1%81%d0%bb%d0%be%d0%b2%d0%b8%d1%8f%20%d1%82%d1%80%d1%83%d0%b4%d0%b0&translation=working%20conditions&srcLang=ru&destLang=en)

Most of these practices were developed in the 19th century and were well established by the mid-20th century. Some procedures (such as disposal of medical waste) were refined in the late-20th century in response to disease outbreaks, notably AIDS and Ebola.

Specificity of Medical hygiene problems is primarily related to the peculiarity of contingent being admitted to medical institutions. The organism of a patient unlike the healthy person is characterized with:

1. High sensitivity to the effects of environmental factors (noise, smell, excessive or insufficient [illuminance](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d0%be%d1%81%d0%b2%d0%b5%d1%89%d1%91%d0%bd%d0%bd%d0%be%d1%81%d1%82%d1%8c&translation=illuminance&srcLang=ru&destLang=en), etc.).

2. Low resistance to the action of pathogenic biological agents;

3. Change of psychological conditions related to disconnecting from work, family, anxiety about the treatment and outcome of the disease, dramatic changes in normal life routine.

**Question 2**

**General requirements for hospitals**

Hospital is a health care institution providing treatment to patient, with specialized staff and equipment.

Some patients go to hospital just for diagnosis, treatment, or therapy and then leave it without staying overnight ('outpatients'); while others are 'admitted' and stay overnight or for several days, weeks or months ('inpatients'). Hospitals are usually distinguished from other types of medical facilities by their ability to admit and provide care for inpatients whilt others are often called clinics.

There are the following ***types of hospitals***:

***General***

The best-known type of hospital is the general hospital, which is set up to deal with many kinds of diseases and injuries, and normally has an emergency department to deal with immediate and urgent threats to health. Larger cities may have several hospitals of varying sizes and facilities. Some hospitals, especially in the United States and Canada, have their own ambulance service.

***District***

District hospital typically is the major health care facility in its region, with large numbers of beds for intensive care and long-term care.

***Specialized***

Types of specialized hospitals include trauma centers, rehabilitation hospitals, children's hospitals, geriatric hospitals, and hospitals for dealing with specific medical needs such as psychiatric problems, certain disease categories such as cardiac, oncological, or orthopedic problems, and so forth.

The principal requirements for healthcare buildings are to facilitate the efficient delivery of quality healthcare and provide a positive environment for speedy patient recovery.

The basic form of hospital is, ideally, based on its functions:

- bed-related inpatient functions

- outpatient-related functions

- diagnostic and treatment functions

- administrative functions

- service functions (food, supply)

- research and teaching functions

A hospital may be a single building or a number of buildings on a campus.

***General requirements for hospitals****:*

- Hospitals should be located within the residential area, far from [industrial enterprise](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d0%bf%d1%80%d0%be%d0%bc%d1%8b%d1%88%d0%bb%d0%b5%d0%bd%d0%bd%d0%be%d0%b5%20%d0%bf%d1%80%d0%b5%d0%b4%d0%bf%d1%80%d0%b8%d1%8f%d1%82%d0%b8%d0%b5&translation=industrial%20enterprise&srcLang=ru&destLang=en)s or other sources of pollution

 - Promote staff efficiency by minimizing distance of necessary walking between frequently used spaces

- Group or combined functional areas with similar system requirements

- Sufficient natural lighting

- Hospitals must be easy to clean and maintain

- Conditions for comfortable access and stay of people with limited mobility should be provided by hospitals

-Hospitals must have a system of water supply, sewerage and ventilation

**Question 3**

**Prevention of hospital acquired infections**

**Health Care-Associated Infections (HAIs)**, or “nosocomial” and “hospital” infections affect patients in hospital or other health-care facility. They also include infections acquired by patients in the hospital but appearing after discharge, and occupational infections among staff. Health care-associated infections, or HAIs are infections that people may catch while they are receiving treatment for another condition in a health care setting. HAIs can be acquired at any health care institution, including inpatient acute care hospitals, outpatient settings such as ambulatory surgical centers and end-stage renal disease facilities, and long-term care facilities such as nursing homes and rehabilitation centers.

Hundreds of millions of patients are affected by health care-associated infections worldwide each year, leading to significant mortality and financial losses for health systems.

The endemic burden of health care-associated infection is also significantly higher in low- and middle-income countries than in high-income countries, in particular in patients admitted to intensive care units and in neonates.

**Health care-associated infections in high-income countries**. At any given time, the prevalence of health care-associated infection in developed countries varies between 3.5% and 12%. The European Centre for Disease Prevention and Control reports an average prevalence of 7.1% in European countries.

**Health care-associated infections in low- and middle-income countries**. Recent analysis by WHO showed that health care-associated infections are more frequent in low- and middle-income countries than in developed countries. And the prevalence of health care-associated infection in these countries varies between 5.7% and 19.1%. Furthermore, in some developing countries the frequency of infections associated with the use of ALV catheters and other invasive devices can be up to 19 times higher than those reported from Germany and the USA.

**HAIs may be caused** by any infectious agent, including bacteria, fungi, and viruses, as well as other less common types of pathogens.

It should be noted that HAIs are caused by [special](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d0%be%d1%81%d0%be%d0%b1%d1%8b%d0%b9&translation=special&srcLang=ru&destLang=en) clinical strains that are more virulent for humans, resistant to environmental factors, and multiresistant to antibiotics. At present HAIs are [typically](http://www.lingvo-online.ru/ru/Translate/en-ru/typically) caused by the following species of microorganisms: Staphylococcus aureus, Klebsiella, Pseudomonas aeruginosa, anaerobes.

**The majority of HAIs includes:**

* Urinary tract infections
* Surgical site infections
* Bloodstream infections
* Pneumonia

**HAI sources:**

1. Patients treated in medical organizations.

2. Medical staff. It has been found (Kovaleva E.P.1982) that in [maternity](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d1%80%d0%be%d0%b4%d0%b8%d0%bb%d1%8c%d0%bd%d1%8b%d0%b9%20%d0%b4%d0%be%d0%bc&translation=maternity%20hospital&srcLang=ru&destLang=en) hospitals 15-45% of parturient and from 15 to 80% of medical staff are carriers of infection. More often nurses are carriers of infections.

3. Visitors (relatives, friends, colleagues), as well as students of higher education institutions and [college](http://www.lingvo-online.ru/ru/Search/Translate/GlossaryItemExtraInfo?text=%d0%ba%d0%be%d0%bb%d0%bb%d0%b5%d0%b4%d0%b6&translation=college&srcLang=ru&destLang=en)s.

All categories may become the source of HAI provided that:

1. They are ill with acute, latent and chronic infection, including wound infection.

2. They are the carriers of various types of pathogenic microorganisms.

**Ways and factors of HAIs transmission:**

- Droplet or airborne ways (e.g., rubeola virus (measles), varicella virus (chickenpox), M. tuberculosis);

- Contact way (through patient-care items, clothes, medical instruments, equipment, as well as the hands of the medical staff);

- Parenteral (with the introduction of infected blood products, isotonic solutions and other drugs);

-Alimentary/foodborne way (through milk, drinking solutions, food).

**These infections are associated with a variety of risk factors, including:**

* Use of permanent medical devices such as bloodstream, endotracheal, and urinary catheters
* Surgical procedures
* High-risk and sophisticated procedures;
* Contamination of health care environment
* Transmission of communicable diseases among patients and healthcare workers
* Overuse or improper use of antibiotics

Health care-associated factors for ***developing countries***:

• inadequate environmental hygienic conditions and waste disposal;

• poor infrastructure;

• insufficient equipment;

• understaffing;

• overcrowding;

• poor knowledge and application of basic infection control measures;

• lack of knowledge about injection and blood transfusion safety;

• absence of local and national guidelines and policies.

**Question 4**

**Non-specific prevention of hospital acquired infections**

Prevention of hospital infections include:

1. ***Specific (vaccination) prevention of hospital infections***

2. ***Non-specific prevention of hospital infections***

 Constructing and planning measures: isolation of hospital units, hospital wards, operating theatre units; strict division into clean and septic patients; zoning of the hospital area; rational layout of hospital departments on floors.

Sanitary and technical measures: ventilation; air supply; sanitary devices; air-conditioning.

Sanitary and antiepidemic measures: control over the sanitary conditions in hospital; sanitary and educational work among the medical staff and the patients; early detection of the carriers among the medical staff and the patients (through bacteriological and daily examinations); control over bacterial dissemination in hospital.

Disinfecting and sterilizing measures: physical means (mechanical processing, thermal treatment, UV-radiation, γ-radiation).

***The use of ultraviolet bactericidal radiation for prevention of hospital acquired infections.***

The use of ultraviolet (UV) bactericidal radiation in different types of therapeutic and preventive institutions is aimed at solving one of the most important problems of preventive medicine that is considerable reduction of infectious disease prevalence, including hospital infections.

For disinfection of the air and surfaces special mobile and stationary bactericidal irradiators are used.

The number of lamps used for the air sanation and the duration of the sanation depend on the size of the room. The duration of the air sanation should be as long as possible; the minimum duration of the air sanation should be 15-20 minutes.

The air sanation in the presence of people is the most effective (way of sanation), because people seem to be the main source of bactericidal contamination of the air in hospital premises. The air sanation in the presence of people may be carried out with the use of shielded bactericidal lamps. The total duration of the air irradiation indoors should not exceed 8 hours per day.

**Question 5**

**Safe disposal of medical waste**

**Medical waste** can be attributed to one of four different categories: infectious, hazardous, radioactive, and general.

**Infectious waste** (Biomedical waste) describes waste that has the possibility of causing infections to humans. It can include human or animal tissue (blood or other body parts), blood-soaked bandages, used surgical gloves, cultures of microorganisms. Much of this category, including human or animal tissue can also be labeled as pathological waste which requires specific treatment methods.

**Hazardous waste** describes waste that has the possibility to affect humans in non-infectious ways. Hazardous waste can also include chemicals, both medical and industrial. Old drugs, including chemotherapy agents, are sometimes hazardous.

**Radioactive waste** can be generated from nuclear medicine treatments, cancer therapies and medical equipment that use radioactive isotopes.

**General waste** makes up at least 85% of all waste generated at medical facilities, and does not differ from general household or office waste, and includes paper, plastics, liquids and any other materials that do not fit into the previous three categories.

**Biomedical waste** is distinct from normal trash or general waste, and differs from other types of hazardous waste such as chemical, radioactive or industrial waste.

Biomedical waste is waste that is either putrescible or potentially infectious.

Biomedical waste may be solid or liquid. Examples of infectious waste include: blood, sharp things, unwanted microbiological cultures and stocks, identifiable body parts, other human or animal tissue, used bandages and dressings, used gloves, other medical supplies that may have been in contact with blood and body fluids, and laboratory waste that exhibits the characteristics described above. Waste sharp things include needles, scalpels, lancets and other devices capable of penetrating skin.

Biomedical waste is generated from biological and medical sources and activities such as the diagnosis, prevention, or treatment of diseases. Common generators of biomedical waste include hospitals, health clinics, nursing homes, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and funeral homes. In healthcare facilities (i.e., hospitals, clinics, doctors’ offices, veterinary hospitals and clinical laboratories), waste with these characteristics may alternatively be called medical or clinical waste.

***Risk of Biomedical Waste to Human Health may potentially lead to the spread of infectious disease.***

**Handling** **with Biomedical waste**

Biomedical waste must be properly treated and disposed to protect the environment, general public and workers, especially healthcare and sanitation workers who are at risk of exposure to biomedical waste as an occupational hazard. Steps in the management of biomedical waste include ***generation, accumulation, storage, treatment, transport and disposal***.

Biomedical waste should be collected in containers that are leak-proof and sufficiently strong to prevent breakage during handling. Containers of biomedical waste are marked with a biohazard symbol. The label of a red colour is generally accepted.

Used sharp things are usually collected in specialized boxes, often called needle boxes.

The goals of biomedical waste treatment are to reduce or eliminate the waste hazards, and usually to make the waste unrecognizable.

Biomedical waste is often incinerated. An efficient incinerator will destroy pathogens and sharp things. Source materials are not recognizable in the resulting ash.

An autoclave may also be used to treat biomedical waste. An autoclave uses steam and pressure to sterilize the waste or reduce its microbiological load to a level at which it may be safely disposed.

For liquids and small quantities, a 1-10% solution of bleach can be used to disinfect biomedical waste. Solutions of sodium hydroxide and other chemical disinfectants may also be used, depending on the waste characteristics. Other treatment methods include heat and the use of microwaves.

For autoclaves and microwave systems, a shredder may be used as a final treatment step to render the waste unrecognizable.

***Handling with Biomedical waste in India***

In India, the Bio-medical Waste (Management and Handling) Rules, 1998 and further amendments were passed for the regulation of bio-medical waste management. Each state's Pollution Control Board or Pollution control Committee will be responsible for implementing the new legislation.

In India, there is a number of different disposal methods, yet most are harmful rather than helpful. If body fluids are present, the material needs to be incinerated or put into an autoclave. Although this is the proper method, but there is lack of such devices. It is often found that biomedical waste is put into the ocean, where it eventually washes up on shore, or in landfills due to improper sorting in the medical facility. Improper disposal can lead to many diseases in animals as well as humans.

Many studies took place in Gujarat, India regarding the knowledge of workers in facilities such as hospitals, nursing homes, or home health treatment. It was found that 26% of doctors and 43% of paramedical staff were unaware of the risks related to biomedical waste. The rules and regulations in India work with The Bio-medical Waste (Management and Handling) Rules from 1998, yet a large number of health care facilities were found to be sorting the waste incorrectly.

Each student writes a conclusion for each of the 6 tasks in his notebook takes a photo and sends it for check!

**Case 1**

In the operating room of the surgical department, the following types of waste are generated: used gloves, cotton swabs and bandages contaminated with the biological fluids of patients, waste of tissues and organs, etc.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.
2. Name the ways of this medical waste segregation and disposal.

**Case 2**

In the chemotherapy department of the oncology clinic waste (containers, ampoules, etc.) contaminated with drug residues (including cytostatics) is generated.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.

2. Name the ways of this medical waste segregation and disposal.

**Case 3**

In the laboratory, workings with microorganisms of the 1-4th group of pathogenicity the following types of waste are formed: cultures of microorganisms, nutrient media with the culture of microorganisms, etc.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.

2. Name the ways of this medical waste segregation and disposal.

**Case 4**

In the surgical department the following types of waste are generated: discarded linen, mattresses, beddings contaminated with blood or body fluid.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.

2. Name the ways of this medical waste segregation and disposal.

**Case 5**

In the operating room of the surgical department, the following types of waste are generated: disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and with fixed needle syringes), Needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp objects that may cause puncture and cuts, etc.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.

2. Name the ways of this medical waste segregation and disposal.

**Case 6**

In the operating room of the surgical department, the following types of waste are generated: used gloves, cotton swabs and bandages contaminated with the biological fluids of patients, waste of tissues and organs, etc.

1. Determine the category end type of medical waste according to Biomedical waste management rules, 2016.

2. Name the ways of this medical waste segregation and disposal.