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HOSPITAL (nosocomial) INFECTIONS

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Plan

1. The concept of hospital infections
2. Pathogens of nosocomial infections
- 3 The properties of hospital strains
4. Antibiotic resistance of hospital strains
5. nosocomial pneumonia
6. ventilator-associated pneumonia

HOSPITAL INFECTIONS

-infectious disease resulting from:

- Patients infected in hospital;**
- infection of medical personnel,
who working in health care
settings.**

By nosocomial infections DOES NOT include:

- **case of patient in hospital in the incubation period;**
- **cases of intranatal infection and infection of the newborn during the passage through the birth canal.**

Causative agents of nosocomial infections

Gram-negative aerobes (**Klebsiella, Pseudomonas aeruginosa, Salmonella, Enterobacter**);

Gram-positive bacteria (**staphylococcus, streptococcus**);

Viruses (**hepatitis B and C, HIV**);

Protozoa, fungi.

Hospital epidemic process differs from anhospital and depends on characteristics of pathogen population, contingent features of hospitalized patients, and conditions under which this epidemic process developing

Preventive measures for the prevention of introduction of community-acquired pathogens in hospital

- **For hospitalization is necessary to check in history the earlier infectious diseases, leaving a stable and long-lasting immunity (measles, chicken pox, mumps and others);**
- **vaccination history;**
- **check contact with infectious patients in residence or study for a maximum incubation period .**

CHARACTERISTICS OF HOSPITAL bacterial pathogens

- **are resistant to adverse environmental factors: UV rays, dryness (hospital strains of *Pseudomonas aeruginosa* retain their pathogenicity on rubber surfaces - 30 days, on the glass - 20 days, in furacillin solution - 7 days).**
- **some bacteria not only themselves possess resistance plasmids, but may transmit resistance factors other bacteria (hospital strains of *Pseudomonas aeruginosa* resistance transmit to salmonella and *Neisseria*)**

CHARACTERISTICS OF HOSPITAL bacterial pathogens

- **have multidrug-resistant to antibiotics (hospital strains of Klebsiella and Staphylococci resistant to 5 or more antibiotics).**
- **possess high virulence.
Enough to infect a smaller dose than for community-acquired strains**

Increased incidence of nosocomial infections due to conditions in which developing epidemic process of hospital infections

the establishment of large well-equipped diagnostic devices general hospitals

many instrumental intervention, invasive diagnostic and therapeutic procedures

Increased incidence of nosocomial infections due to conditions in which developing epidemic process of hospital infections

using a large number of drugs (antibiotics - which leads to the development of dysbiosis; immunodepressants, cytostatics - which leads to the development of immunodeficiency), which reduces the resistance of the organism to infectious diseases

Lack of supervising the epidemiological measures (disinfection, sterilization)

**In-hospital except natural routes
of transmission, connect
additional ways and factors of
transmission**

**Respiratory secretions from medical staff and
surgical departments *S. aureus* *Pseudomonas*
aeruginosa causes patients to these offices is
not a respiratory tract infection, and to
wound infection**

**The main route of transmission of hospital
strains of *Salmonella* is contact-household.
Transfer factors are the hands of medical staff
(including medical staff if there are patients or
carriers).**

In the structure of hospital infections accounted for 15% of hospital (nosocomial) pneumonia

- **Nosocomial pneumonia** - a disease characterized by the appearance on the radiograph new focal-infiltrative changes in the lungs after 48 hours or more after admission in combination with clinical symptoms, with the exclusion of infections that are in the incubation period at the time of admission to the hospital.

Classification of nosocomial pneumonia

early

- occurs within 5 days from the time of hospitalization and due to pathogens, that patient has before hospitalized
- **Str. Pneumoniae**
- **H. influenzae**
- **S. aureus methicillin sensitivity**

later

- develops not earlier than 6 days of hospitalization and due hospital microflora
- **Pseud. aeruginosa**
- **Acinetobacter spp.**
- **S. aureus methicillin resistant**

Ventilator-associated pneumonia - occurs within 48 hours after the start of mechanical ventilation with absente lung infection at the time of intubation

early

- **occurs within 5 days from the time the ventilator**
- **Str. pneumoniae**
- **H. influenzae**
- **S. aureus sensivity**
- **Other representatives normal microflora of the oral cavity**

later

- **developed after 5 days of mechanical ventilation and due hospital microflora**
- **Pseud. aeruginosa**
- **Acinetobacter spp.**
- **S. aureus resistant**

Factors of nosocomial pneumonia

- **factors associated with the state of the microorganism (age, the severity of the underlying disease, the presence concomitant pathology).**
- **Factors that increase the risk of colonization of the oropharynx and stomach pathogens of nosocomial pneumonia**

Factors of nosocomial pneumonia

- **factors that contribute to reflux and aspiration (mechanical ventilation, tracheostomy, a nasogastric tube, invariably horizontal position of the patient on the back).**
- **Factors that impede the normal expectoration (intubation, use of morphine preparations, immobilization).**

Empirical antibiotic therapy patients early GP without the presence of risk factors for multidrug-resistant strains of pathogens

Etiology	Treatment
<p data-bbox="175 648 919 879">Str.pneumoniae, H.influenzae, S.aureus sensitivity,</p> <p data-bbox="104 911 996 1142">E.coli, K.pneumoniae, Enterobacter spp., Proteus spp., P.marcescens</p>	<p data-bbox="1058 576 1837 1219">ceftriaxone or Ftoroquinolone III-IV generation or protected aminopenicillins (amoxicillin / clavulanic acid) or a carbapenem (meronem, imipenem)</p>

In health care, the conditions for the implementation of parenteral transmission of hepatitis B and C, HIV

Apply a variety of medical instruments and devices, including bronchoscopy, cystoscopy, reliable sterilization which is difficult

Transfusion of blood and blood components

Control measures to prevent infection with hepatitis viruses B and C, HIV

- **Early detection cases of the disease in patients;**
- **Control of donated blood and blood products;**
- **Use disposable instruments for parenteral manipulations;**
- **Careful sterilization apparatus and instruments reusable.**
- **Use of gloves during any parenteral manipulations.**

HIV infection

any damage of skin, mucous membranes nurses, pollution of their biomaterial patients during help qualify as a possible contact with the material, which contains HIV!

Nature of the medical exposure has a different probability of infection rates

- **after contact wounds with HIV-infected blood likelihood of HIV infection is 0,3%.**
- **after being hit by HIV-infected blood on intact mucous membranes of the probability of HIV infection is 0,09%.**
- **intact skin after exposure to HIV-infected blood or other body fluids, the likelihood of HIV infection is not installed.**

Conducting post-exposure prophylaxis (PEP) Order from 05.11.2013 № 955

- **A short course of antiretroviral drugs to reduce the likelihood of HIV infection after contact with body fluids associated with the risk of HIV infection.**

Indications for PEP

(Order of 05.11.2013 № 955)

- ✓ **Damage to the skin with a sharp object contaminated with blood, body fluids with visible admixture of blood or other potentially infectious materials;**
- ✓ **Bite caused HIV-infected patient who has a visible source of bleeding in the mouth;**
- ✓ **Contact with the blood, fluid with blood or other potentially infectious materials to mucous membranes of the mouth, nose and eyes;**
- ✓ **Contact with blood, fluids with visible admixture of blood or other potentially infectious materials on damaged skin (open wounds, abrasions, chapped or affected areas)**

Steps in case of contact

- If patient's HIV status is **negative**- the PCP not be held.
- If HIV - status of patient check **impossible**, it is considered to HIV - positive and the PCP is appointed.
- If the status of the health worker is **HIV-positive** - meaning the infection occurred before, and the PCP is not assigned.

If health worker HIV - negative status, and at the source (the patient) assigned a positive 4-week course of preventive treatment.

PCP prescribe in the first 2 hours after contact – but not later than 72 hours

a combination of 3 drugs: 2 nucleoside reverse transcriptase inhibitors (NRTIs 2)

+

(protease inhibitor ritonavir (PI / r)

TDF + FTC (or lamivudine) + LPV / r

28 days

Health care provider or other person at the PCP

- abstain from sexual intercourse without a condom;
- for 6 months not be a blood donor;
- stop breastfeeding;
- blood, biochemistry - 10 days, and at the end of the course;
- acquainted with the possible side effects of therapy
- HIV testing at 3, 6 (12) months

IF after 6 months seroconversion not happen - HIV ABSENT !!!

Emergency prevention (Order of 05.11.2013 № 955)

- 1. First Aid organized and carried out immediately after the event or interruption of exposure to a potential HIV infection associated with the performance of professional duties.**

Emergency prevention (Order of 05.11.2013 № 955)

2. First aid comprises treating the contact points:

a) when wounded needle or other sharp instrument contaminated with blood or other biological material of human:

- point of contact is washed with soap and water;**
- wounded surface is thoroughly under running, ater for several minutes or until the bleeding stops;**
- in the absence of running water damaged area is treated with a solution of disinfectant gel or hand wash.**

WITH THE EXCEPTION OF COMPRESSION OR FRICTION DAMAGED PLACES, EXTRUSION OR SUCTIONING BLOOD FROM A WOUND, USING A SOLUTION OF ETHYL ALCOHOL, IODINE, HYDROGEN PEROXIDE

Emergency prevention (Order of 05.11.2013 № 955)

- b) in contact with blood or other potentially dangerous biological fluids on intact skin contact point is washed with soap and water;**
- c) the bite of a violation of the integrity of the skin:
the wound was washed with water, and removes the dead tissue debridement carried disinfectants (20% aqueous solution of chlorhexidine, 3% hydrogen peroxide);
appointed by antibiotic therapy;**

**Emergency prevention
(Order of 05.11.2013 № 955)**

d) After contact with blood or other potentially dangerous biological fluids in the eye:

- **eyes, flush with water or saline.**

With the exception of: rinsing soap or disinfectant solution;

- **removal of contact lenses during eyewash.**

**Emergency prevention
(Order of 05.11.2013 № 955)**

e) when blood or other potentially dangerous biological fluids oral mucosa:

- ingress into the mouth, spit out,**
- oral cavity washed several times with water or saline solution;**
- Mouth wash can not use soap or disinfectant solutions.**

Viral hepatitis B

**Annually in the world
8-16 million people are
infected with different
invasive medical
manipulations and
endoscopy**

- **HBV-infected health care workers can be a source of infection for their patients;**

every surgeon patient with hepatitis B infects 2,3% of their patients in a year (23 patients per 1000 surgical interventions)

Viral hepatitis B

Indications for plan vaccination:

- ☐ Medical workers;**
- ☐ military personnel, firemen;**
- ☐ staff and patients of closed institutions (psychiatric clinical, etc.);**
- ☐ staff and persons in prisons;**
- ☐ personnel services, who have professional contact with human body fluids (hairstylists, beauty salons personnel, masseurs, etc.);**

Viral hepatitis B

Indications for plan vaccination:

- people who use drugs intravenously,
- HIV-infected,
- persons who frequently change sexual partners;
- women who provide sexual services;
- men who have sex with men;
- patients with chronic diseases and cancer,
- chronic liver failure;
- persons who traveling to endemic areas of hepatitis B

Vaccines, registered in Ukraine, for the prevention of hepatitis B containing recombinant antigen HBs

1) Heberbiovac HB® (Cuba);

2) Hepavax-Gene® (Korea);

3) ENGERIX™ B (Belgium);

4) EUVAX B (Korea);

5) PROFI gen B™ (Ukraine)

Viral hepatitis B

CONTRAINDICATIONS

- universal for all vaccines;
- Pregnancy and lactation -NOT are contraindications.

The vaccine is used intramuscularly into the deltoid muscle.

Injection in the gluteal region considered invalid and must be repeated vaccination.



Viral hepatitis B

Vaccination schedules

1) **BASIC** – Scheme 3 doses of 0, 1 and 6 months (after 3 doses of antibody concentration check anti - HBs serum);

2) **Acceleration** - use in adults (before leaving in endemic areas, before surgery).
Scheme (4 primary vaccination dose): 0, 7, 21 days and 12 months;

3) patients without immune response to primary vaccination series (anti-HBs 1-2 months after the primary vaccination <10 IU / L \rightarrow repeat the full scheme of the primary vaccination.

Emergency prevention of hepatitis B in not immune health professionals: Effective in the first 48 hours after exposure!

- **Specific immunoglobulin in dose of 0,06 – 0,12 ml (not less than 5 IU / ml) per 1 kg of body weight**
- **Vaccination scheme 0-1-6 month**