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THE ROLE OF MICROBIOLOGICAL MONITORING IN THE SYSTEM OF EPIDEMIOLOGICAL SURVEILLANCE OF HOSPITAL INFECTIONS

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Abstract:

Purpose of the study: *Analysis of the prevalence of etiologic structure and antibiotic resistance profile of pathogens associated with health care (HAI) in surgical and intensive care units of the Belgorod Regional Clinical Hospital of St. Joasaph in dynamics for 2014-2015.*

Materials and methods: *The material provided by the results of clinical observation of purulent inflammatory infections (PII) and bacterial complications in patients over the last 2 years. We used conventional microbiological methods for isolating a pure culture of the pathogen and determine its sensitivity to the antibiotic disk diffusion method and by bacteriological analyzer Walk Away. Studies have blood cultures performed on the analyzer BACTEC Becton Dickinson. We used data qLIS laboratory information system containing information about pathogens HAI in dynamics for 2014-2015 years.*

Results: *In the etiological structure of catheter-related infections were the dominant pathogens S. aureus (15.6%) S. epidermidis MRSA (9%). S. epidermidis (1.7%) and K. pneumoniae (11.3%). and Ent. aerogenes (3.5%). In the microbial landscape of respiratory infections and lung leading microflora were Str. species (31.6%), S. aureus (7%) and P. aeruginoza (6.5%). K. pneumoniae (6.3%) as well as fungi of the genus Candida (8.8%). The etiology of skin and soft tissue infections were problematic pathogens P. aeruginoza (11.7%) E. coli (6.6%) K. pneumoniae (3.9%) and Gr + bacteria S. aureus (20.7%) S. epidermidis (8.8%). Urinary tract infections were mainly caused by E. coli (28.5%). K. pneumoniae (9,1%), Ent. aerogenes (7,5%) and E. faecalis (7%). E. faecium (11%). The etiology intraabdominal infections were problematic pathogens P. aeruginoza (10.7%). E. coli (6.9%). K. pneumoniae (4.9%) and S. aureus (17%) S. epidermidis (8.6%) All cases of nosocomial infections caused by CNS .nt. aerogenes (33.3%) K. pneumoniae (16.7%) A. baumannii (16.7%) and S.epidermidis (16.7%). S. haemolyticus (16.7%).*

Selected strains of microorganisms characterized by multidrug-resistant to most used antimicrobials in the hospital.

Conclusion: *The problem of the development of rational treatment algorithms for each hospital remains quite relevant. Without predicting microbiological monitoring, the effectiveness of treatment HAI, it is quite difficult. The study of patterns of spread of pathogens epidemiologically important species allows to predict the intensity and nature of patient infection. Status HAI resistance of pathogens to antibiotics is an important parameter for the rational empirical and then the causal treatment and prevention foundation PII in critically ill patients.*

Keywords: *Nosocomial infections, infectious agents associated with medical care, antibiotic resistance.*

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INTRODUCTION:

Hospital-acquired infections (HAI) represent one of the most important problems of modern medicine. Studies in different countries show that nosocomial infections are the most common complication of hospitalization [1]. Also. HAI is the fourth most common cause of hospital mortality of patients - after diseases of the cardiovascular system, malignant tumors and stroke. [2]

So far. there is no consensus about the true intensity of the epidemic process of HAI. There is no reliable information on the incidence of nosocomial infections. According to the centre for the control of infection, 3-10% of patients suffer nosocomial infections in European countries. Their frequency is up to 20% in the ICU. In our country. in the year is recorded from 50 to 60 thousand cases of nosocomial infections [3].

In the event of HAI increased costs of treatment at 23-100%, while the cost of treating patients with nosocomial infections on average three times higher than in non-infected patients. Minimum economic losses in Russia, caused by nosocomial infections each year is 5 billion roubles [4].

HAI lead to increased hospital stay by an average of 10-12 days, significantly reduce quality of life and cause the development of stress in patients and. consequently - loss of reputation of the hospital, it is difficult to assess in financial terms [5].

Development and implementation of effective measures for the prevention of HAI is impossible without organization in every health care setting surveillance, which is an important branch of microbiological monitoring. [6]

Microbiological monitoring of HAI is a complex of measures to ensure the continuous monitoring of the circulation of opportunistic bacteria among patients in a hospital environment and facilities. as well as studying epidemiologically significant properties of these organisms, including their antimicrobial resistance [7].

An important provision of the fight against HAI is the organization database microbiology laboratory, which would provide a meaningful epidemiological analysis, bringing the results of the analysis to interested professionals. rational purchase of antibiotics and development of preoperative prophylaxis. Knowledge of these indicators will allow more effectively combating nosocomial infections, optimizing their causal treatment and thus reducing economic losses of medical institutions [8].

MATERIALS AND METHODS:

The work was done on the basis of the Belgorod Regional Clinical Hospital of St. Joasaph. It includes 23 specialized departments at hospitals 1055 beds, the prenatal centre 485 beds diagnostic and paraclinical units.

During the evaluated results of clinical observation of ICG and bacterial complications in patients of surgical and intensive care units in dynamics for the last 2 years.

During the period 2014-2015. in surgical and intensive care units surveyed 606 patients with bacterial complications, including 72 with urinary tract infections. 320 with intra-abdominal infections. 61 with catheter-associated bloodstream infections. 6 with infections of the central nervous system (CNS). 65 with respiratory tract infections and lung. 82 from the skin and soft tissue infections.

The study included microorganism strains isolated from patients in the said compartments 48 hours.

The material for the study is based on bronchoalveolar lavage, sputum, exudates from the peritoneal cavity drainage catheter. venous blood, wound discharge urine. the contents of the abscess. Cyst. scraping from the cervix and other materials. During the period 2014-2015. 4898 studied microbial cultures. including in 1827 when urinary tract infections. intra-abdominal infections. with 713. 53. when the catheter-related bloodstream infections. CNS infections at 54. 989 in infections of the respiratory tract and lungs. 780 infections of the skin and soft tissues.

Isolation of microorganisms was performed using conventional culture media and methods (order of the Ministry of Healthcare the USSR of April 22. 1985 № 535 "On the unification of microbiological (bacteriological) research methods used in clinical diagnostic laboratories of medical institutions").

The identification of isolated cultures and determination of antibiotic resistance spectrum conducted disk diffusion method with standard drives. as well as bacteriological analyzer Walk A way which determined the minimum inhibitory concentration (MIC) of antibiotics. The obtained MIC values were estimated using EUCAST criteria. The studies were conducted on blood cultures analyzer BACTEC Becton Dickinson.

In the course of this work were used epidemiological and statistical methods.

Epidemiological methods included descriptive and evaluative and analytical techniques. Descriptive and assessment methods were used in conducting a retrospective analysis of the incidence according to its official registration and the results of the study of accounting and reporting documentation versatile hospital for 2014-2015.

Research Purpose: Prevalence analysis etiologic structure and antibiotic resistance profile of pathogens HAI, in surgical and intensive care units of

the Belgorod Regional Clinical Hospital of St. Joasaph in dynamics for the period 2014-2015.

RESULTS AND DISCUSSION:

Every year in the Belgorod Regional Hospital St. Joasaph receive outpatient and inpatient care of over 160 thousand inhabitants of the region, carried out more than 36.000 surgical interventions. adopted more than 5000 births.

A high level of surgical activity causes a high risk of HIS both among patients and facility staff.

At the end of 2015 incidence IHS was 0.37 cases per 1000 hospitalizations, 26% less than the average republican parameter and 2 times less than in Russia.

The dynamics for the period 2010-2015. There is a decrease in the incidence of IHS to 72% (from 1.32 to 0.37 cases per 1000 hospitalizations), which does not reflect the true situation on the IHS in the hospital due to a significant underestimation of cases of HAI diseases.

In the structure of the leading forms of HAI dominated postoperative infection - 40%, and nosocomial pneumonia - 50%.

Over the past 6years the highest number of IHS registered offices in cardiac surgery (12.8%). eye microsurgery (9.9%). urology (8.5%). intensive care unit №5 (7.9%). rheumatology (7.9%) and trauma and orthopaedic (7.7%). In these offices together registered more than half of all cases of HAI in the hospital which indicates that these offices were "offices at risk" by the appearance of cases of IHS among patients. as well as the fact that these offices provide a "real" information about cases HAI registration.

In order to identify the true epidemiology of HAI hospital used active methods to identify HAI. Including viewing the results of the microbiological laboratory of crops by qLIS laboratory information system.

Presented the program allows you to evaluate the microbial landscape of the clinical material in treatment of patients and highlight the leading micro flora. as well as to observe the levels of antibiotic resistance in microorganisms circulating in the hospital. to automate the issuance of the responses bacteriology and clinical reports. rational use of antibiotics for the treatment and prevention, taking into account the specifics of the hospital.

According to national and international recommendations for empiric antibiotic therapy may be used in preparations for which a sensitivity of 80% or more of the alleged infection of the pathogen strains.

The analysis identifies the following form HAI: catheter-associated bloodstream infections, infections of the respiratory tract and the lungs, skin and soft tissue infections, urinary tract infections, intra-abdominal infections, CNS infections.

Central line associated bloodstream infections

The etiological structure central line associated bloodstream infections are predominant pathogens Gram-positive bacteria: *S. aureus* (15.6%), S. epidermidis MRSA (9%). *S. epidermidis* (13.7%) and Gram-negative bacteria: *K. pneumoniae* (11.3%) and *Ent. aerogenes* (3.5%).

The most effective antibiotics against *S.aureus* turned levofloxacin. Vancomycin. Rifampin. Clindamycin. clarithromycin and oxacillin: more than 80% of all isolates were sensitive to these antibiotics. In strains S. epidermidis MRSA only retained sensitivity to tetracycline. and vancomycin erithorimitcin. Among the strains of *S. epidermidis*. the highest sensitivity in excess of 80% of all tested. it was to levofloxacin. vancomycin and rifampicin.

The most problematic pathogens were *K. pneumoniae* and *Ent. aerogenes*, whose sensitivity to a stored netilmicin, amikacin. and gentamicin. and virtually 100% resistance to beta-lactam antibiotics (penicillins, cephalosporins generation I-IV. Carbapenems. cephamycins).

Infections of the respiratory tract and lungs

In the etiological structure of respiratory infections and lung leading microflora were Gram (+) Str. bacteria. species (31.6%). *S. aureus* (7%) and Gram (-) bacteria *P. aeruginoza* (6.5%), *K. pneumoniae* (6.3%). as well as fungi of the genus Candida (8.8 %). Taken together, these pathogens cause more than half of all cases of IHS hospital.

In strains. Str. species sensitivity maintained to levofloxacin and vancomycin. The most effective antibiotic against *S. aureus* was levofloxacin. Vancomycin. Rifampin. Clindamycin. Clarithromycin and oxacillin. over 80% of isolates were susceptible to them.

For *P. aeruginosa* strains are characterized by natural polyresistance to most used antimicrobials in the hospital. Antibacterial drugs with high efficiency in this regard was not the originator. In *K. pneumoniae* strains retained sensitivity to netilmicin, amikacin and meropenem. *Candida albicans* is sensitive to clotrimazole.

Infections of the skin and soft tissues

In the etiological structure of the skin and soft tissue infections leading pathogens were Gram (-) *P. aeruginoza* bacteria (11.7%), *E. coli* (6.6%), *K. pneumoniae* (3.9%) and Gram (+) bacteria *S. aureus* (20.7%), *S. epidermidis* (8.8%).

With regard to *P. aeruginoza* highly effective antimicrobial agents were not. E. coli strains

susceptible to netilmicin and meropenem. In strains of *K. pneumoniae* sensitivity exceeding 80% of the tested strains it was to amikacin and meropenem.
Gram (+) bacteria: *S. aureus* and *S. epidermidis* were susceptible to vancomycin, and oxacillin.

Urinary tract infections
Over the last 2 years in the etiological structure of urinary tract infections were the dominant pathogens Gram (-) bacteria: *E. coli* (28.5%), *K. pneumoniae* (9.1%), Ent. aerogenes (7.5%) and Gram (+) bacteria *E. faecalis* (7%). *E. faecium* (11%).
E. coli strains susceptible to ceftazidime, amikacin and fosfomycin. In K. pneumoniae strains retained sensitivity to ceftazidime and amikacin. Highly effective against antibiotic Ent. aerogenes were ceftazidime and ceftriaxone.
Strains of *E. faecalis* and *E. faecium* sensitive to vancomycin and fosfomycin.

Intra-abdominal infections
The etiology intraabdominal infections were problematic pathogens Gram (-) P. *aeruginoza* bacteria (10.7%). *E. coli* (6.9%). *K. pneumoniae* (4.9%) and Gram (+) bacteria S. aureus (17%). S. epidermidis (8.6%).
The most active antibiotic against *P. aeruginoza* turned ceftazidime. In *E. coli* strains high sensitivity level, exceeding 80% of the tested was to cefuroxime, cefepime, meropenem, gentamicin, ampicillin / sulbactam. *K. pneumoniae* strains were effective netilmicin and pefloxacin.
Gram (+) bacteria *S. aureus* and *S. epidermidis* are sensitive to fusidic acid, vancomycin and cefazolin.

CNS Infections
All cases of nosocomial infections caused by CNS Gram (-) bacteria: *Ent. aerogenes* (33.3%), *K. pneumoniae* (16.7%), *A. baumannii* (16.7%) and Gram (+) bacteria: *S. epidermidis* (16.7%), *S. haemolyticus* (16.7%).
It should be noted that if the strains: *Ent. aerogenes K. pneumoniae* and sensitive to aminoglycoside drugs, among *A. baumannii* drugs was not effective.
Gram (+) bacteria: *S. epidermidis* and *S. hemolyticus* were susceptible to vancomycin, and oxacillin.

CONCLUSION:
The problem of rational development of treatment algorithms for each hospital department remains quite relevant. Without local microbiological monitoring the effectiveness of treatment and HAI forecasting involves considerable difficulties.
The study of patterns of spread of pathogens epidemiologically important species in space and time is both theoretical and practical importance because it allows you to predict the intensity and nature of patient infection. Status HAI resistance of pathogens to antibiotics is an important parameter for the rational empirical and then the causal treatment and prevention foundation PII in critically ill patients.
The results of this work were used in practical health care system in the formation of the rules of appointment of antibacterial drugs at the level of general hospital. The aim of the further work of the authors is to analyze the effectiveness of established rules.
Given the increase in the proportion of multiresistant to antibiotics microorganisms in the hospital, there is a need for additional funds to combat IHS as which can act bacteriophages. Adequacy of bacteriophages preparations etiological agents of the structure can be achieved through constant adaptation of bacteriophages to circulating strains of pathogens among patients.

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