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# Nosocomial Infections, Their Complications and the Relevance of Combating Them

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**Abstract:** This article provides an overview of the main characteristics of nosocomial infections. It provides a general discussion on how important healthcare is for the spread of infections, as well as on methods of their prevention and management. This exercise discusses methods for the assessment, management and prevention of nosocomial infections. It highlights how important the medical team is in evaluating, managing and improving the care of patients with this disease. Hospital-acquired infections are a serious health problem in developing countries. The rising incidence rate leads to longer hospital stays, higher psychological burdens, higher treatment costs and higher antibiotic resistance. VI is most often associated with gram-negative bacteria in the intestine. In addition, the most frequent VIS were in the intensive care unit. Postoperative infections were the most common type of infection. The results showed that there is a significant correlation between average age and different hospital wards. In addition, it was found that there is a significant correlation between gender and the hospital ward. All hospital staff should receive regular noise reduction training, especially in wards where invasive treatments are used.

**Keywords:** Urinary catheter, central venous catheter, Acinetobacter, Clostridioides difficile, E. Coli.

**Introduction.** The term "nosocomial" or "nosocomial infections" in medical practice, which appear in a patient who is under medical supervision in a hospital or other medical institution. These infections were absent at the time of hospitalization, people become infected while receiving medical care, after hospitalization, and in this case, infection can occur when a pathogen — an organism that can cause the disease — spreads to a susceptible host. In addition, it is worth noting that these include occupational infections among medical personnel who, when using invasive devices such as catheters and ventilators used in modern healthcare, are associated with these infections [1, 2, 3]. The etiology of NI is based on the source or type of infection and the responsible pathogen, which It can be bacterial, viral, or fungal and they contribute to significant morbidity, mortality, and financial burden for patients, families, and health systems. Because these infections occur during hospital stays, they result in long hospital stays, disability, and economic burdens, and even during this time. Thus, nosocomial infections (NI) occur in patients under medical supervision and even after the patient is discharged. These infections are found worldwide in both developed and developing countries, which account for up to 7% in developed and up to 10% in developing countries. In 2015, the prevalence of care-related infections was lower than in 2011, and for further progress in preventing *C. difficile* and pneumonia infections, approaches to preventing these infections should be expanded. The appearance of multidrug—resistant organisms is another complication of NI, which is observed in 3.2% of all hospitalized patients in the United States, 6.5% in the European Union/The

European Economic Area and probably much higher around the world. Due to the lack of surveillance systems for NI, the number of NI worldwide is unknown. Nevertheless, infection prevention and control programs are making great efforts to create infection surveillance and control strategies [4, 5, 6, 7].

Nosocomial infections are increasing due to improper and excessive use of broad-spectrum antibiotics, especially in medical institutions. This is becoming a serious health problem, and also leads to economic and industrial losses in society. By measuring and comparing infection rates in medical institutions and adhering to the best medical practices, hospital-acquired infections can be controlled. The Centers for Disease Control and Prevention conducts surveillance of hospital-acquired infections and conducts investigations of major outbreaks. Hospitals can use this surveillance to develop infection control strategies. Certain organizational and practical measures are carried out annually to reduce NI, but the problem remains relevant from a medical point of view. So far, both patients and medical workers are at risk of infection. Over the past five years, the incidence of purulent septic infections of newborns and women in the postpartum period, postoperative purulent septic complications and post-injection complications have had an unstable downward trend. Hospital-acquired infections have also decreased. Thus, purulent septic infections of newborns and women after childbirth, as well as postoperative infections, form the basis of the structure of nosocomial infections [8, 9, 10, 11]. Thus, today, although the number of cases of nosocomial infections has decreased, the problem of eliminating severe and serious complications resulting from them remains relevant. This, in turn, will require the development of optimal measures to eliminate the possibility of complications from these infections.

**The purpose of the analysis presented** in this manuscript is to conduct a brief analysis of the literature on nosocomial infection, taking into account its complications and relevance.

**Nosocomial infections.** According to the data obtained, the most common bacterial infections are K. *pneumoniae, Acinetobacter, S. aureus, P. aeruginosa, Enterobacter types, coagulase-negative staphylococcus, E. coli* and *enterococci*. Up to 60% of multidrug-resistant bacteria were common, with more than 50% being E. coli, and up to 34% of *K producers*. *pneumoniae ESBL* or *AmpC BL* The increase in the incidence of *Acinetobacter* in our intensive care units compared to intensive care units in Europe and North America indicates differences in practice and means that small changes in practice, such as sterilization of outpatient bags and respiratory circuits, can reduce the incidence of this infection [12-16]. There is a need to increase funding for health care, as well as tighten policies on infection prevention products such as hand washing and infection prevention products. Differences in infection rates in intensive care units across the country should be assessed and infection management strategies and up to 10% *Acinetobacter XDR* should be evaluated. The antibiotics with the highest sensitivity to most types of bacteria are imipenem and amikacin. The risk of developing NI is associated with the use of artificial ventilation and severe traumatic brain injury. Carbapenems should not be used to treat a serious bacterial infection involving multidrug-resistant TB, and they should be avoided in cases where narrow-spectrum antibiotics would be more effective. Antibioticograms are needed in the intensive care unit to assess local sensitivity, to select specific antibiotic therapy, and to monitor resistance trends in the hospital. In order to stop the spread of multidrug-resistant bacteria and the development of antibiotic resistance, it is necessary to develop effective policies in the field of rational use of antibiotics, antimicrobial surveillance and infection control [17, 18, 19].

**Assessment of risk factors for nosocomial infections in patients with severe diseases.** Nosocomial infections are classified by type and causative agent into four parts: infections at the site of surgery, urinary tract infections, bloodstream infections and respiratory pneumonia. Artificial ventilation, gastrointestinal infections caused by *Clostridioides difficile*, inadequate equipment, contamination in the patient's hospital environment, failure to follow standard precautions when contacting patients by medical professionals, failure to observe proper hand hygiene when handling patients, improper disinfection of hospital wards and improper use of

equipment such as catheters are the causes of nosocomial pneumonia. According to various studies, most of the human organs affected by complications of NI are the lungs, skin, bones, eyes, throat, ear and nose. In addition, the central nervous system, circulatory system, gastrointestinal tract, skin and soft tissues, respiratory and cardiovascular systems are the main systems of the human body that are affected by NI. According to the results of studies conducted in many countries, including the United States, the frequency and prevalence of pneumonia, irritable bowel syndrome, gastrointestinal diseases, impotence and joint diseases [12, 13, 14, 16].

Various studies have shown that the lungs, skin, bones, eyes, throat, ear and nose are the majority of human organs affected by complications of NI. In addition, the central nervous system, circulatory system, gastrointestinal tract, skin and soft tissues, respiratory and cardiovascular systems are the main systems of the human body that are affected by NI. According to the results of studies conducted in developed countries, the frequency and prevalence of gastrointestinal diseases and the above pathologies amounted, respectively, to 22%, 22%, 18%, 13% and 10%, respectively. The level of infectious diseases in the intensive care unit is low. Through a final logistic regression analysis, risk factors were identified, including diabetes mellitus, length of hospital stay, steroid use, urinary catheter and central venous catheter. The newly established intensive care unit of the University Hospital uses this data to predict future infections and antimicrobial resistance profile [17, 18, 19].

**Complications of nosocomial infections.** Patients under medical supervision may receive hospital-acquired infections or healthcare-related infections. Since the establishment of hospitals, infections acquired in hospitals have existed from the very beginning and continue to be a big public health problem even nowadays, when antibiotics have become more common. They currently cause high morbidity and mortality, prolonged hospitalization, increased use of antibiotics and increased costs. The extinction of multidrug-resistant pathogens has been caused by excessive and inappropriate use and application of antibiotics. Due to limited treatment options, it is difficult to combat multidrug resistance, which causes serious, life-threatening hospital-acquired infections and is apparently biologically compatible with the environment. The multidrug resistance of Gram-negative and gram-positive bacteria worldwide has jeopardized the fight against bacterial pathogens. Antibiotic resistance will obviously become alarming and will become a serious problem in the coming years if it does not find a timely and effective solution. In this review article, we will look at the main pathogens of nosocomial multidrug-resistant infections, which pose the greatest danger worldwide. These pathogens include *Staphylococcus aureus, Enterococcus faecium, Klebsiella pneumoniae, Acinetobacter baumannii* and *Pseudomonas aeruginosa* [14-18].

According to the data, nosocomial infections were rare. Nosocomial infection could have been prevented by factors such as intravenous administration, artificial ventilation, length of hospital stay, urinary tract catheterization and lack of antibiotics. Thus, we advise medical professionals to pay special attention to infection prevention and control of these factors, which significantly affect the level of nosocomial infections. This article examines current trends in epidemiology, diagnosis and treatment of HAP/VAP. Infectious disease doctors believe that each of these elements can affect how they currently treat this disease. The spread of multidrug-resistant organisms may increase the risk of ineffective empirical treatment. But new rapid microbiological methods allow clinicians to quickly learn about potential pathogens and the spectrum of their antimicrobial resistance, which allows them to modify or modify ineffective or redundant treatments, especially when multiplex molecular tests are used together with antimicrobial control programs. Logically, if the availability of new antimicrobials is of paramount importance, these drugs should be used with caution to protect them from the rapid development of resistance. In addition, one should strive to avoid modifiable factors associated with HAP/VAP, such as interventions (e.g. intubation or reintubation instead of NIPPV, excessive sedation, surgery) and medical conditions (e.g. dysphagia, pain, immobilization, neurological problems). Finally, multidisciplinary staff, including infectious disease specialists, microbiologists, infectious disease specialists, and infection prevention and control specialists,

can be crucial for setting goals, developing implementation programs, supporting staff training, and evaluating hospital unit commitment. In addition, a network between hospitals should be established to establish common goals and standardize clinical practice [19-26].

VAD support was associated with an increased incidence of infectious complications. Four factors largely associated with the occurrence of infection anywhere included blood transfusion, repeated bleeding surgery, duration of mechanical ventilation, and stay in the intensive care unit. Despite several limitations, our study provides relevant results, as there are currently insufficient studies examining hospital-acquired infections during VA-ECMO in CICUs. We found that preventive measures should be taken to reduce the level of hospital-acquired infection, as well as to develop management strategies that will help optimize the use of antimicrobials. Prospective and multicenter studies are needed to reduce infection-related morbidity and mortality [27, 28, 29].

Due to weakness, prolonged hospital stay and weakened immunity, patients with previous colonization and concomitant diseases are more susceptible to nosocomial infections. Hospital transfers, age, high body mass index and the use of stationary devices increase the susceptibility of patients to hospital-acquired infections. Patients moving inside the hospital are exposed to other infectious patients, staff, and the hospital environment, which increases the risk of infection. In addition, it has been shown that the number of staff per patient correlates with a higher risk of infection. Nosocomial infections can be caused by repeated hospitalization, concomitant disease or active cancer, prior administration of antibiotics and the spread of opportunistic organisms. While obesity and age are closely linked to cardiovascular diseases, internal devices such as urinary catheters increase the risk of sepsis. *C. difficile* and *E. coli* were the most common pathogens of nosocomial infections. In order to control microorganisms acquired during the periods before and after admission, it is necessary to take into account the time spent before admission. Additional research is needed to identify risk factors for hospital-acquired infections and drug-resistant pathogens targeting a broader group of patients. This will make it possible to better prevent and fight infection. In the conditions in which we live, HAC is very common, which leads to an increase in the length of hospital stay and direct medical expenses. As a result, effective prevention methods are needed [25-32].

**Discussion.** Adverse events resulting from the provision of medical care are commonly referred to as healthcare infection. The more efficient functioning of the health services sector depends on reducing the risk of the spread of pathogenic microorganisms in the hospital environment. Health care systems in all Territories face significant financial costs for hospitals related to health care. The local epidemiological situation is responsible for the spread of drug resistance strains in hospitals. The insufficient number of diagnostic tests prescribed by both general practitioners and inpatient doctors is one of the reasons. The European Union and the amount recommended by WHO. Bacteria of clinical significance have developed drug resistance as a result of enhanced and inadequate antibacterial therapy. The current epidemiological situation requires constant monitoring of NI and a widely understood optimization of the policy of antibiotic therapy in hospitals [22-27].

Nosocomial infections are still not controlled by antibiotics. Since nosocomial infections lead to economic losses and production losses, the fight against these organisms is extremely necessary. Infection control methods can prevent the spread of these infections among healthcare workers. Drug-resistant microorganisms, which are difficult to treat, arise as a result of improper and frequent use of antibiotics. In order to compare and control infection rates, hospitals should develop infection control programs. According to the *C. difficile* guidelines, a well-managed epidemic monitoring strategy is required. The dissemination of best practices among hospitals is urgently needed to stop the spread of infections within hospitals [28-31].

**Conclusions.** The frequency of suspected or confirmed nosocomial infections in all patients admitted to the intensive care unit at the hospital in patients who received antibiotics during this period, were confirmed or suspected of NI. Pneumonia, followed by skin and soft tissue

infections, as well as urinary tract infections, accounted for the vast majority of infections. Gram-negative bacteria made up the majority of the registered cultures.

Piperacillin/tazobactam and vancomycin were the most common antibiotics used to treat these hospital-acquired infections. We recommend that all medical staff in intensive care units strive to develop more effective strategies to minimize the incidence of nosocomial infections. This can be achieved by observing hand hygiene, environmental hygiene, surveillance culture, antibiotic management programs, and following patient safety guidelines and culture.

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