Characterization of infections related to health care...

CHARACTERIZATION OF INFECTIONS RELATED TO HEALTH CARE IN THE INTENSIVE CARE UNIT

ABSTRACT

Objective: to describe the characteristics of Infections Related to Health Care (IRAS) in the intensive care unit. Method: a descriptive, cross-sectional, retrospective, quantitative study, conducted through 63 records of patients hospitalized to the Intensive Care Unit (ICU) of a university hospital in Pernambuco in 2011, to spend more than 48 hours. Data collection occurred for access to records of infection control. The Research Ethics Committee, under the CAEE No. 00917112500005208, processed the data using the software STATA/SE 9.0 after project approval. Results: there was extensive use of invasive devices. The tracheal aspirate culture was the sample with the highest positivity 92.9%. The extended residence time in different cultures and positivity proved to be significant p<0.001. Conclusion: Prolonged ICU hospitalization was a risk factor for infections related to health care. Descritores: Hospital Infection; Intensive Care Unit; Length of hospitalization.

RESUMO

Objetivo: descrever as características das Infeccões Relacionadas à Assistência à Saúde (IRAS) na unidade de terapia intensiva. Método: estudo descritivo, transversal, retrospectivo e quantitativo, realizado através de 63 fichas de pacientes admitidos na Unidade de Terapia Intensiva (UTI) de um hospital universitário de Pernambuco no ano de 2011, com permanência acima de 48 horas. A coleta de dados ocorreu por acesso às fichas de controle de infecção. Os dados foram processados no Software STATA/SE 9.0, após aprovação do projeto pelo Comitê de Ética em Pesquisa, sob o CAEE nº 00917112500005208. Resultados: houve uma ampla utilização dos dispositivos invasivos. A cultura de secreção traqueal foi a amostra com maior índice de positividade 92,9%. O tempo de permanência prolongado e a positividade nas culturas diversas mostraram-se significantes p < 0,001. Conclusão: a permanência prolongada na UTI foi um fator de risco para as infeccções relacionadas à assistência à saúde. Descritores: Infecção Hospitalar; Unidade de Terapia Intensiva; Tempo De Internação.

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INTRODUCTION

The Infections Related to Health Care (IRAS), more commonly referred to as nosocomial infections are defined as infections acquired in the hospital or any other health care institution that were not present or incubating at the time of hospitalization. This term includes infections that are acquired in the hospital and manifested during the same hospitalization or after discharge. It also covers related infections outpatient procedures performed during home care and occupational infections acquired by professional’s health.1

The Intensive Care Unit (ICU) is considered the epicenter of the IRAS and the influencer link in the epidemiological chain of transmission. This fact is due to the peculiarity of the patients admitted to this unit because they use invasive devices such as central venous catheter, urinary catheter and mechanical ventilation. Furthermore, they use of immunosuppressive drugs, prolonged period of hospitalization, colonization by resistant microorganisms, antimicrobial prescription and characteristic of the ICU favoring natural selection of microorganisms environment.2-4

A study conducted in ICUs of Rio Grande do Sul showed that the presence of urinary and central venous catheter is the main factor associated with infection acquired in the ICU, increasing eight times developing infection compared to patients who did not use these devices. It was also observed that prolonged mechanical ventilation, respiratory failure, neurological dysfunction and tracheostomy were also significantly associated with infection in the ICU.5

In patients with infection, mortality is very significant - as shown by some studies. Fatality rates found in hospitals of Paraná and Rio Grande do Sul were respectively 27.9% and 45.0%.2,3 In Ribeirão Preto, this percentage was even higher, 57.5%.3

The endogenous micro flora of the patient is known to be a source of infection that may be transmitted through the professional health team, especially when not sanitize their hands after providing patient care. However, the inanimate environment that surrounds and use objects in care also harbor microorganisms that can be transmitted to him as well as for professionals and other objects. Although they do not cause diseases, contaminated objects and surfaces serve as secondary reservoirs and lead to cross-infection.6

Microbiology has helped to identify events correlating factors such as colonization and infection, environmental contamination and colonization, changes in antimicrobial susceptibility pattern, among others.3

The introduction of antibiotics provided the control and cure of infectious diseases. However, the development of such drugs has brought a new problem: the emergence of multi-resistant bacteria to antibiotics. Some factors contributing to this rise: the indiscriminate use of antibiotics, limited human resources, directly or indirectly cross-infection by resistant microorganisms and poor surveillance.7,8

The movement of multidrug-resistant bacteria in ICUs is further hindering the treatment of some health care-associated infections. The main multi-resistant bacteria responsible for such complications are Staphylococcus aureus, oxacillin-resistant beta-lactamase producing Enterobacteriaceae extended spectrum (ESBL) bacteria CESP group (Citrobacter spp, Enterobacter spp, Serratia spp, and Providencia spp), Enterococcus, sturdy vancomycin, Klebsiella pneumoniae carbapenemase-producing Acinetobacter sp and, among others. For this, the epidemiological surveillance system plays a key role in detecting these organisms, as well as prevention and control.9

With this research it is aimed to describe the characteristics of Infections Related to Health Care (IRAS) in the intensive care unit.

METHOD

Article elaborated from the monograph << Characterization related to health care infections in the intensive care unit >> submitted to the Graduate Program in Nursing, Nursing Home in sport in the Intensive Care Unit of the Federal University of Pernambuco/UFPe in Recife/PE, Brazil, in 2012.

This research was designed in a descriptive, cross-sectional and retrospective study, conducted in the Commission of Infection Control (CCIH), Clinical Hospital, Federal University of Pernambuco (HC-UFPe). Database of patients from the inpatient units of the HC-UFPe were consulted and were admitted to the ICU between January 1 to December 31, 2011, and who remained hospitalized for more than 48 hours, through the records of infection control HICC/(HC-UFPe). The records of patients with less than 48 hours and coming permanence of other health care institutions were excluded. Based on the book of admission and discharge from the ICU, we obtained the number of patients admitted to the ICU in the year 2011, 374
The Ethics Committee performed access to records of infection control CCIH HC-UFPe and the results of microbiological tests after approval for Research involving humans of the Health Sciences Center, Federal University of Pernambuco (CEP/CCS/UFPe) with CAAE No. 0091711250005208. The whole research was based on the Declaration of Helsinki and the National Council of Health No. 196/96.

The gathering took place in the period of May to September 2012 to collect data, two questionnaires were used: Instrument infection control proposed by CCIH and a form of identification of origin, comorbidities and hospital microbiology. Soon after, the data were tabulated with Microsoft Office Excel 2007 and STATA Software/SE 9.0. All tests were applied with 95% confidence. The results are presented in tables and figures with their absolute and relative frequencies or mean ± deviation-standard. There was a possible association by Chi-square and Fisher’s exact test for categorical variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Yes</th>
<th>No</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>21 (37.5)</td>
<td>3 (42.9)</td>
<td>1.00 *</td>
</tr>
<tr>
<td>Negative</td>
<td>35 (62.5)</td>
<td>4 (57.1)</td>
<td></td>
</tr>
<tr>
<td>Central venous catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>18 (31.0)</td>
<td>0 (0.0)</td>
<td>0.310 *</td>
</tr>
<tr>
<td>Negative</td>
<td>40 (69.0)</td>
<td>5 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>32 (59.3)</td>
<td>2 (22.2)</td>
<td>0.068 *</td>
</tr>
<tr>
<td>Negative</td>
<td>22 (40.7)</td>
<td>7 (77.8)</td>
<td></td>
</tr>
</tbody>
</table>

* Fisher’s Exact Test

Positive nasal swabs, there were potentially pathogenic bacteria, among which prevailed Acinetobacter SP (26.3%); in the case of rectal swabs, especially species of Klebsiella pneumoniae (28.6%) and Klebsiella pneumoniae carbapenemase (21.4%); in urine cultures, there was a predominance of the fungus Candida albicans (28.6%); blood cultures, Klebsiella pneumoniae predominated (17.8%); cultures of tracheal secretions, there was Acinetobacter sp 23.9%.

Compared with a minimum of three to seven days in the unit for positive culture results, patients with greater than 30 days of hospitalization in the ICU had higher risk for bacterial colonization and infection related to health care (table 2). There was significance between the long-term stay in the area and positivity in nasal and rectal swabs as well as significant positivity in cultures of urine, blood and tracheal aspirates.
The average age observed in our study was 54 ± 19 years old, with 41.3% of patients were 60 or more. The same percentage was found in patients between 30 and 60 years old which shows a frequency of admission of young adults in the general ICU, unlike the other studies with significant predominance of the elderly population.\textsuperscript{10-11} Patients over 60 years old are more likely to physiological changes, increased incidence of comorbidities, greater disease severity, which increases the risks for the elderly develop progressive failure of organs.\textsuperscript{12-13} Thus, the elderly often require complex treatments for their clinical condition.

In the period studied, the average length of ICU stay was 21 ± 20 days, ranging from the minimum of three days to maximum 106 days of hospitalization. Study conducted in ICUs in Paraná State presents similar data in what was found in our study, with mean length of 23 days.\textsuperscript{11} It is encouraged that the length of stay in the ICU is short, as evidenced by a study conducted in Turkey with 4.1 days.\textsuperscript{14} However, in studies conducted in ICUs of public and charitable hospitals, this percentage is high because of difficulties of access for seriously ill patients to ICU beds.\textsuperscript{15} Thus, prolonged ICU stay directly implies the increased hospital costs.\textsuperscript{7}

Another aspect evaluated is referred to invasive procedures, central venous catheter having a high incidence (92.1%) in the sample, as well as the urinary catheter (88.9%) and mechanical ventilation (85.7%). These devices are widely used in ICUs and are responsible for much of the care-associated infections to health being caused by multidrug-resistant organisms.\textsuperscript{15-16}

The outcome of hospitalization and death occurred in 47.6% of cases analyzed. Statistical ICU mortality is quite varied, but the frequency differs from some studies found where death ranged from 25.4% to 26.7%.\textsuperscript{17,18} Klebsiella pneumoniae was also among the microbial agents involved in the process of colonization.\textsuperscript{7} The Acientobacter sp isolated on nasal swab is found colonizing the oropharynx of healthy people and are able to proliferate during hospitalization. It survives on moist surfaces, including respiratory therapy equipment.\textsuperscript{19}

Urinary infections are often associated with the use of indwelling catheters, their use has been widely discussed because it is an invasive device that provides the urinary tract infection (ITU).\textsuperscript{20} The introduction of this type of probe in sterile urinary tract facilitates penetration of microorganisms of the device in the urethra and causes a decrease of intrinsic defense mechanisms of the host as urination and voiding.

The microorganisms invade and multiply in the urinary tract by ascending, blood and lymphatic, being influenced by the causative agent, the size of their inoculum and the defense mechanism of the host, which is sometimes compromised by the use of invasive device.\textsuperscript{20} However, in patients who use indwelling catheters, the penetration of microorganisms in the urinary tract occurs through contamination during insertion, ascending via periurethral (extraluminal between the probe light and space of the urethra) and contamination of the drainage system (intraluminal).\textsuperscript{20}

The risk of ITU due to the use of urinary catheter is directly proportional to the staying time.\textsuperscript{21} It was not possible to observe the registration of staying time of indwelling catheters in the record searched, constituting a limitation of this study. Therefore, it is recommended to record clearly and objectively the time of insertion of the probe, as well as withdrawal. However, in this study there was no significant difference between
the use of indwelling catheters and urinary tract infection. A similar finding was found in another publication, in which there was no significant association between any of the variables studied with bacteriuria after vesical poll.22

The diagnosis of ITU is not hampered by asymptomatic infections. Clinical diagnosis and laboratory tests (urinalysis and urine culture) are essential to increase the diagnostic accuracy when identifying the cause of the infection, the etiologic agent and the sensitivity/bacterial resistance profile. To classify a positive urine culture, it is necessary to standardize the collection of urine to be performed aseptically through midstream. From there, we can characterize urinary infection bacterial growth of at least 105 Colony Forming Units (CFU) per milliliter (100,000 CFU/ml).23-24

Etiologic agents most isolated of 14/49 positive urine cultures analyzed were fungi Candida albicans (28.6%). The gender Candida comprises the normal micro flora of man and it is isolated in healthy mucous membranes of the oral cavity, vagina, gastrointestinal tract and rectum, and can be found widespread in the environment.23-24

Transformation of yeast commensal infectious agent occurs in hospital settings, the result of very progress of medicine: emergence of a large number of invasive procedures, breaking the barrier of natural protection and intensive use of broad-spectrum antibiotics. All with an eye to the ability to sustain the lives of patients. Weak people, untreated diabetic or immunocompromised patients are susceptible to opportunistic microorganisms during the ICU stay.24

Central venous catheters are devices routinely used for the treatment and care of critically ill patients. However, their use predisposes patients to develop local or systemic infections, whose incidence depends on the type of catheter, frequency of handling and the factors related to the intrinsic characteristics of the patient.25

To characterize a central catheter-related infection, a clinical picture suggestive of the involvement of vascular access with the possible source is required. The catheter contamination can occur upon insertion through the skin colonization of the contaminated infusion solution used to maintain patency of the catheter, the connections between the catheter and infusion lines by endogenous catheter colonization by through the blood of another infectious focus distance, with contaminated transducers used for hemodynamic monitoring of the patient and the contaminated hands of health professionals.25 If it was the presence of central venous catheter and blood cultures positive correlated significance, it was not observed meaning between them, a fact similar to what occurred in another national study. 26

Identification of some bacterial pathogens in blood cultures can be considered as an indicator of the spread of an infectious process and has been recognized as important diagnostic episodes of bloodstream infections resource tool because exams are subject to change blood culture contamination in the collect moment.27-28

Some studies have shown that catheter-related blood cultures, there was a predominance of gram-positive bacteria such as Staphylococcus epidermidis, Staphylococcus aureus and coagulase negative Staphylococcus and gram-negative bacteria such as Pseudomonas agents aeruginosa.26,28 Therefore, there is divergence in prevalence of microorganisms found in gram-negative Klebsiella pneumoniae (17.8%). Study in Minas Gerais presents data similar to our results, a fact that deserves attention because Klebsiella pneumoniae has great clinical relevance because of the high prevalence of resistance to antimicrobial agents, mainly by the presence of the enzyme extended-spectrum beta-lactamase (ESBL).28

The endotracheal tube required for mechanical ventilation misrepresents the cough reflex, promotes the accumulation of tracheobronchial secretions and mucus, providing a direct channel for pathogenic microorganisms reach the lower respiratory tract, which increases the risk of acquiring a pneumonia.29 The ICU inpatients when they have inadequate oral hygiene, have greater biofilm formation, which constitutes a suitable reservoir of microorganisms that can cause an infectious process in the periodontal tissues and even lead to distant infections.29

The ventilator-associated pneumonia is an infection of the lung parenchyma caused by different etiological agents. Infection results from an imbalance between immune mechanisms and the pathogen and may constitute a significant cause of morbidity and mortality, especially in elderly and/or immunocompromised individuals.29

The tracheal aspirate culture is the sample with the highest positivity (92.9%), being higher than what is revealed in national studies, which showed positivity around 51.5%. Thus, in our study, some microorganisms were isolated in cultures of
Organisms are tário than 30 days in ICU – al venous catheters and 98 t.

Though the need for monitoring with the use of invasive procedures, and that exposure to the accumulation of biofilm, are important causative agents of infections in ICU patients and usually associated with infections of the lower respiratory tract, for surviving on moist surfaces, including respiratory therapy equipment.\textsuperscript{19,29}

The length of ICU stay between seven and 30 days significantly increases the chance of developing an infection. In another study, all patients who stayed more than 30 days in ICU acquired infection, corroborating our study, where greater than 30 days length of stay was significantly associated (p <0.001) between loitering and colonization and/or assistance related to the infection health.\textsuperscript{3} This demonstrates that hospitalization knowingly exposes patients to other risk factors, whether as a result of their severity or the need for monitoring with the use of invasive procedures, and that exposure to the environment increases chance of getting a cross-infection.

**CONCLUSION**

Most admissions involved females in economically active age diagnosed with kidney failure and high use of devices favoring colonization, as evidenced by the large percentage of positivity in cultures of tracheal secretions by multi resistant microorganisms, especially the gram-negative Acinetobacter sp. The death was reported in 47.6\% of patients. There was no statistically significant association between the use of urinary catheter and urinary infection as well as the use of central venous catheters and bloodstream infection. With regard to length of stay in the unit, this was extended with a significant association in the positivity of different cultures.

Data from this study reinforce the need for early and accurate investigation of multi resistant microorganisms involved in the IRAS because the high costs that these infections cause the budgets of public hospitals and the increase in mortality.

The control of IRAS is a difficult task, involving so great multidisciplinary effort. Lower rates of infection may contribute to the reduction of economic problems of public hospitals, reduce the length of stay of patients, increased turnover of beds, and provide greater availability of vacancies in the ICU.

During the research, we observed the need to know the length of stay of invasive devices for adding these variables in future studies. The lack of electronic system to file the records of CCIH difficult to identify and organization, and to facilitate loss.

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