

Catheter Related Blood Stream Infections in Patients of the Intensive Care Unit

ORIGINAL

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Abstract

Objective: To identify the prevalence of bloodstream infection associated with the Catheter related Blood stream infections in patients of the Intensive Care Unit, and the characteristics of its use and handling.

Methods: Descriptive and transversal study with a sample of 88 participants. Data were collected through the observational method and the records in the medical records. The absolute and relative frequencies were used for data analysis.

Results: 73.86% of the patients had central venous access in the subclavian vein, 100% used double lumen Catheter related Blood stream infections, 0.5% chlorhexidine solution for skin antisepsis, dressing coverage is performed mostly with Sterile gauze and tape, with a daily exchange. The rate of infection related to the use of the Catheter related Blood stream infections was (6.81%). The most infused pharmacological drugs were antimicrobials (69.32%).

Conclusion: The study showed that care with central venous accesses is performed according to recommendations for prevention of bloodstream infection related to the use of these devices. The infection rate is close to the standards found in the literature.

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Keywords

Central Venous Catheterization; Hospital Infection; Intensive Care Unit; Risk Factors; Catheter-Related Infection.

Introduction

The use of central vascular access (CVA) has become indispensable for care therapy, since it allows maintaining a venous access for a long time and periodically manipulation for blood aspiration for laboratory tests and administration of medications. Technological advances contribute to maintaining vascular access for a longer time and with greater frequency of use, favoring the increase of infections related to the procedure [1].

Intrinsic and extrinsic factors are associated with bloodstream infections related to the use of Catheter related Blood stream infections (CRBSI), among these are: the insertion site, number of lumens, parenteral nutrition infusion, catheter length of stay, type of catheter and place of hospitalization [2].

Risk factors associated with bloodstream infection using Catheter related Blood stream infections may be related to preexisting diseases and clinical factors, such as admission to Intensive Care Units (ICUs), use of mechanical ventilation, and invasive hemodynamic monitoring. Also emphasized as risk factors are the type of catheter material, failure to follow the recommended technique for insertion and maintenance of the catheter, infusion of blood transfusion, more than one indication for use of the device and femoral insertion site [3].

In 2013, the National Center for Disease Control and Prevention (CDC) indicates that CRBSI in ICU ranges from 0.9 to 2.4 per 1000 catheter days, in 2014 the International Nosocomial Infection Control Consortium indicated a 4.9/1000 day catheter rate [4].

Some questions related to the adequate use of CVC in ICU patients are not clear, especially their relation with the occurrence of Health Care Associated Infections (HAIS). Based on this, the main issue that guided this study was: is the use and manipulation of CVC in accordance with what is recommended in the literature in a way that minimizes the risks related to infection related to the use of this device? Based on the exposed problem, this

study aimed to identify the prevalence of bloodstream infection in individuals with Catheter related Blood stream infections and the characteristics of its use and handling.

Methods

This is a descriptive, cross-sectional study carried out in a public hospital in a Brazilian Northeast capital, with 316 beds distributed in the neurological, medical, surgical, dermatological, gynecological, ophthalmologic, nephrological, cardiologic clinics and two ICU. The study was performed in the two ICUs with 16 beds [5].

Two thousand patients pass through the two ICUs every year. In the sample size, $K=2$ is the confidence level determined, expressed as the number of standard deviation, p_0 study parameter of 0.5, the complementary percentage, N the population size and e the maximum sampling error allowed the size of the sample. Sample was 88 patients.

Patients admitted during the period of data collection that were aged from 18 years or older and using CVC were included. The Diagnostic Criteria of the Manual of Bloodstream Infection: Guidance for the prevention of primary bloodstream infection [6], which defines bloodstream infections and the existing thematic framework, was used as a reference. Patients admitted to the ICU who were not using CVC and who were not in the stipulated age group were excluded, and those which not possible to observe the change of the dressings in the CVC insertion.

Data collection took place from January to July 2015. It was carried out using a structured form, composed of one session, 11 questions related to the CVC. In order to complete this form, a reading was performed in the medical records and direct observation of the dressing change at the insertion site of the CVC.

Since these were categorical variables, the absolute (n) and relative (%) frequencies were used

for data analysis. After the data was collected, the data was recorded in double-entry in the program Microsoft Office Excel 2010® and exported and processed using SPSS software, version 22.0 [7].

The research obeyed all the national and international ethical precepts that govern human research.

Results

Table 1 shows that all Catheter related Blood stream infections were of the Double Lumen type. The dressing at the CVC insertion is cleaned with 0.9% saline, occluded with sterile gauze and fixed with micropore or adhesive tape, and changed daily, with no routine of exchange in the two Intensive Care Units. 0.5% alcoholic chlorhexidine is the solution used to perform skin antisepsis during stroke puncture, and was used in all punctures evaluated.

The insertion sites of the Catheter related Blood stream infections were subclavian (73.86%), internal jugular (18.19%) and femoral (7.95%). Of the 88 CVCs, 60 (68.18%) had received antibiotics. The incidence of stroke-related infection was 6.8%, of which the majority were bloodstream infection. Of the accesses with infection in only 4 there was bacterial growth. The isolated microorganisms were: Escherichia coli, Staphylococcus epidermidis and Staphylococcus aureus.

Discussion

The results of this research indicate that the majority of patients who use this intravascular system present age equal to or greater than 60 years. There is a worldwide trend towards an aging population. In Brazil, the proportion of people aged 60 years has been increasing considerably. As a consequence, the average age of ICU patients has increased in recent years and will increase further with the aging of the general population [8].

Table 1. Characterization of the use and handling of the Catheter related Blood stream infections and the presence of bloodstream infection in patients hospitalized in the Intensive Care Units of a public and teaching hospital. Teresina, PI, Brasil, 2016.

Variables	N	%
Insertion site		
Right subclavian	49	55.68
Left subclavian	16	18.18
Right Jugular	15	17.04
Left Jugular	01	1.13
Right femoral	06	6.84
Left femoral	01	1.13
Catheter Type		
Double lumen	88	100
Antiseptic solution		
0.5% alcoholic chlorhexidine	88	100
Dressing		
Gauze + Micropore / Plaster	88	100
Dressing change frequency		
Daily	88	100
Infused Solution		
Antibiotic	61	69.32
Hemoderivatives	18	20.46
Other Solutions	09	10.22
Type of CVC infection		
Absence of infection	82	93.19
Infection at the insertion site	02	2.27
Bloodstream infection	04	4.54
Total of infections	06	6.81
Hemoculture		
No blood culture	84	95.46
Carried out blood culture	04	4.54
With Bacterial growth (n = 04)	03	3.4
No Bacterial Growth (n = 04)	01	1.13
Total	88	100

Fonte: Direct research.

The coverage of the insertion site of the CVC used was the sterile gauze fixed with micropore/plaster, changed daily. Performing the dressing on the exit ostium, in which the integrity of the skin is interrupted, assists in the prevention of infectious complications [9]. The Centers for Disease Control and Prevention (CDC) recommends that the dressing on the CVC insertion should be with both sterile gauze and plaster and transparent film, and no statistically significant difference in the incidence of catheter-related infection is found in the studies [10]. The dressing with sterile gauze and tape should be changed every 24 hours, and the transparent film every 7 days [2].

In skin antiseptis, 0.5% alcoholic chlorhexidine is preferred. Its action at low concentrations is bacteriostatic, but at high concentrations it has a rapid bactericidal action [9]. Studies indicate the superiority of chlorhexidine for degermation in relation to polyvinyl pyrrolidone iodine (PVP-I) and Alcohol 70% for the reduction of the risk of infection related to the insertion site [11].

The most frequent site of insertion was the subclavian, with the right subclavian being the most chosen site. According to the CDC, the preferred site of insertion with respect to infectious complications is in fact the subclavian [12]. The jugular is related to a greater number of cases of infection than the subclavian and the femoral access is associated with a higher incidence of infection in relation to the other two sites, since the place of this access presents a greater density of bacterial flora [13].

CVC-related infections may occur at the catheter insertion site, with no systemic repercussions, and primary infections of the bloodstream are those with a positive blood culture or clinical signs of sepsis, with no signs of infection elsewhere [14].

Of the 4 blood cultures performed, in 3 there was growth of the bacteria: *Escherichia coli*, *Staphylococcus epidermidis* and *Staphylococcus aureus*. Infection involves the significant presence of

microorganisms in the endoluminal portion or the external surface of the catheter, where the most present causal agent is *Staphylococcus aureus* [1]. The infection can originate from the cutaneous flora, during and insertion, by migration along the catheter, which can be colonized by microorganisms of the skin, mainly coagulase-negative staphylococci, such as *Staphylococcus epidermidis* [15].

Of the solutions infused through the CVC, the antimicrobial was administered in the majority of the catheters, being a minority associated with complications. Of the blood cultures with bacterial growth, all were from patients who had received blood products.

The absence of records such as: date of insertion, exchange and time of use of Catheter related Blood stream infections, illegibility in the medical records, as well as the problem of their integrity, made it difficult to collect data that would be relevant to the present study.

This study has some limitations. The main one is related to the method, which does not allow a follow-up of the subjects. It is recommended the implantation of the electronic medical record and that other studies should be carried out in the area of nursing in the unit researched in order to prevent and monitor CVC-related infections, as well as their incidence and the most frequent risk factors.

Conclusion

The prevalence of registered infection is close to the standards found in the literature. In patients admitted to the Intensive Care Unit the most frequent place of insertion of the CVC is the subclavian and the less frequently the femoral. The catheter used is double lumen, the solution used for skin antiseptis before insertion of the catheter is 0.5% chlorhexidine, the dressing is done with sterile gauze and micropore/plaster and changed daily. The solutions most infused by the catheter are antimicrobials. All

patients with positive blood culture had received blood products from the Catheter related Blood stream infections.

References

1. Andrade MR, Silva HG, Oliveira BGRB, Cruz ICF. Risk of infection in central venous catheter: review study to nursing care. Online Braz J Nurs. 2010. Disponível em: <http://www.objnursing.uff.br/index.php/nursing/article/view/3109>. Acesso dia 30 de Maio de 2015
2. Jardim JM, Lacerda RA, Soares NJD, Nunes BK. Avaliação das práticas de prevenção e controle de infecção da corrente sanguínea em um hospital governamental. Rev. Esc. Enferm. USP. 2013; 47(1): 38-44.
3. Duarte ED, Pimenta AM, Silva BCN. Fatores associados á infecção periférica em Unidade de Terapia Neonatal. Revista Esc enfermagem USP 2013; 47(3): 547-54
4. Salama MF, Jamal W, Mousa HAL, Rotimi V. Implementation of central venous catheter bundle in an intensive care unit in Kuwait: Effect on central line-associated bloodstream infections. *Journal of Infection and Public Health*. 2016; 9(1): 34-41.
5. Cadastro Nacional De Estabelecimentos De Saúde (CNES). Estabelecimento de saúde. Disponível em: http://cnes.datasus.gov.br/Exibe_Ficha_Estabelecimento.asp?VCo_Unidade=2211002726971. Acesso dia 30 de Maio de 2015.
6. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Infecção de Corrente Sanguínea: Orientações para prevenção de infecção primária de corrente sanguínea. Unidade de Investigação e Prevenção das Infecções e dos Efeitos Adversos, UIPEA; 2010
7. Medronho, R. et al. Epidemiologia. 2ª Ed. São Paulo: Atheneu, 2009.
8. Feijo CAR, Bezerra ISAM, Peixoto Junior AAM. Morbimortalidade do idoso internado na Unidade de Terapia Intensiva de Hospital Universitário de Fortaleza. Rev. bras. ter. intensiva. 2006. 18(3): 263-267
9. Boumendil A, Maury E, Reinhard I, Luquel L, Offenstadt, Guidet B. Prognosis of patients aged 80 years and over admitted in medical intensive care unit. Intensive Care Med, 2004. 30(4):647-54
10. Silveira RCCP, Galvão CM. O cuidado de enfermagem e o cateter de Hickman: a busca de evidências. Acta paul. Enferm, São Paulo 2005; 18(3): 276-84
11. Rosado V, Romanelli RMC, Camargos PAM. Fatores de risco e medidas preventivas das infecções associadas a cateter venoso central. Jornal de Pediatria, 2011. 87(6):469-477.
12. Centers for disease control and prevention (CDC). Guidelines for prevention of intravascular device-related infections. MMWR. 2011; 51: 1-29.
13. Siqueira GLG, Hueb W, Contreira R, Nogueira MA, Cancio DM, Caffaro RA. Infecção de corrente sanguínea relacionada a cateter venoso central (ICSRC) em enfermarias: estudo prospectivo comparativo entre veia subclávia e veia jugular interna. J Vasc Bras. 2011; 10(3):211-6.
14. Brasil, Agência Nacional de Vigilância Sanitária. Série Segurança do Paciente e Qualidade em Serviço de Saúde, Critérios Diagnósticos de Infecção Relacionada à Assistência à Saúde. ANVISA- 2013 P. 43-8.
15. Moreira RCR, Batista JC, Abrão . Complicações dos cateteres venosos centrais de longa permanência : análise de 500 implantes consecutivos. Rev Col Bras Cir 1998; 25(6): 403-8.

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