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RESEARCH

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BLOODSTREAM INFECTIONS RELATED TO CENTRAL CATHETERS: UNDERSTANDING AND PRACTICE OF THE NURSING TEAM

Infecções de corrente sanguínea relacionada a cateteres centrais: entendimento e prática da equipe de enfermagem

Infecciones corrientes de sangre relacionadas con los catéteres centrales: entendimiento y práctica del equipo de enfermería

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ABSTRACT

Objective: To investigate the understanding and practice of the nursing team about measures to prevent central venous catheter-related bloodstream infections in an intensive care unit. **Method:** Qualitative study, conducted from November 14, 2016 to January 31, 2017, by a semi-structured interview with 24 nursing professionals working in the adult and pediatric intensive care unit of a teaching hospital. The technique of content analysis was used. **Results:** It was observed that 16 (66.6%) could not clinically define this infection, 11 (45.8%) understand their pathophysiological pathways; no professional mentioned the practice of applying the catheter insertion checklist to the medical team; 12 (50%) are unaware of national and international device maintenance guidelines. **Conclusion:** In general, there were weaknesses in the understanding of most professionals regarding the clinical concept, pathophysiological pathways and catheter insertion and maintenance measures.

DESCRIPTORS: Catheter-related infections; Nursing care; Prevention and control; Intensive care units; Knowledge.

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RESUMO

Objetivo: Investigar a compreensão e prática da equipe de enfermagem acerca das medidas de prevenção de infecções da corrente sanguínea relacionada ao cateter venoso central em unidade de terapia intensiva. **Método:** Estudo qualitativo, realizado de 14 de novembro de 2016 a 31 de janeiro de 2017, por uma entrevista semiestruturada com 24 profissionais da enfermagem atuantes na unidade de terapia intensiva adulto e pediátrica de um hospital escola. Utilizou-se a técnica de análise de conteúdo. **Resultados:** Observou-se que 16 (66,6%) não souberam definir clinicamente essa infecção, 11 (45,8%) entendem limitadamente suas vias fisiopatológicas; nenhum profissional mencionou a prática da aplicação do *check list* de inserção do cateter, junto à equipe médica; 12 (50%) desconhecem as diretrizes nacionais e internacionais de manutenção do dispositivo. **Conclusão:** Em geral, houve fragilidades na compreensão da maioria dos profissionais quanto conceito clínico, vias fisiopatológicas e medidas de inserção e manutenção do cateter.

DESCRITORES: Infecções relacionadas a cateter; Cuidados de enfermagem; Prevenção e controle; Unidades de terapia intensiva; Conhecimento.

RESUME

Objetivo: Investigar la comprensión y la práctica del personal de enfermería sobre las medidas para prevenir las infecciones del torrente sanguíneo relacionadas con el catéter venoso central en una unidad de cuidados intensivos. **Método:** Estudio cualitativo, realizado del 14 de noviembre de 2016 al 31 de enero de 2017, mediante una entrevista semiestructurada con 24 profesionales de enfermería que trabajan en la unidad de cuidados intensivos para adultos y pediátricos de un hospital universitario. Se utilizó la técnica de análisis de contenido. **Resultados:** Se observó que 16 (66,6%) no podían definir clínicamente esta infección, 11 (45,8%) entienden sus vías fisiopatológicas; ningún profesional mencionó la práctica de aplicar la lista de verificación de inserción del catéter al equipo médico; 12 (50%) desconocen las pautas de mantenimiento de dispositivos nacionales e internacionales. **Conclusión:** En general, hubo debilidades en la comprensión de la mayoría de los profesionales con respecto al concepto clínico, las vías fisiopatológicas y las medidas de inserción y mantenimiento del catéter.

DESCRIPTORES: Infecciones relacionadas con catéter; Cuidados de enfermería; Prevención y control; Unidades de cuidados intensivos; Conocimiento.

INTRODUCTION

Healthcare-associated infections (HAIs) are globally a frequent public health problem in hospital care[1]. They are considered prevalent adverse events that promote impacts on morbidity and mortality, increase in hospital stay and increase in hospital costs.[1]

These infections are a serious patient safety problem[2], especially in Intensive Care Units (ICUs), due to the numerous invasive procedures inherent to the treatment and rehabilitation of critically ill patients.[3] Among the main sites of HAIs, they stand out for order of occurrence, respiratory tract, urinary tract, bloodstream and surgical site.[4]

Approximately 60% of bloodstream infections are associated with the use of central vascular catheters (CVCs)[5], therefore, it is important the use of bundles for insertion and maintenance of these devices.[6] A previous study has found that there is low adherence by healthcare professionals regarding the use of bundles for insertion and maintenance of CVC, which results in errors associated with the handling of CVC, inappropriate skin antisepsis for insertion of CVC, absence of disinfection of the lateral injector for the administration of the medication and inadequate hand washing.[7]

It is known that the care of patients using CVC is multiprofessional, and it is pertinent to emphasize the importance of nursing in the prevention and control of these infections, considering that the nursing team performs continuous assistance in the hospital environment. Therefore, for prevention it becomes relevant that these professionals have knowledge of the evidence-based interventions contained in the bundles for insertion and maintenance of CVCs, which are recommended by national and international agencies.[8]

A previous study has already observed that nursing professionals, despite having knowledge related to the maintenance of CVCs, may not perform priority care in their care practice, such as changing the dressing at the appropriate time, disinfecting ampoules and the catheter hub before administering medications, among other factors.[9]

In this perspective, the following question was proposed: do nurses and nursing technicians have knowledge about clinical definition, pathophysiology and preventive measures for ICSR-CVC? This study contributes to raise the need to improve nursing care for patients using CVC, as well as to highlight the importance of nurses assisting the patient, through evidence-based measures, in order to resolve the occurrence of adverse events and, thus, promote patient safety and quality of care.

The aim of this study was to investigate the understanding and practice of the nursing team regarding preventive measures and control of bloodstream infections related to the central venous catheter in the ICU.

METHOD

This is a descriptive research, with a qualitative approach, carried out in a teaching hospital in the municipality of Campina Grande - Paraíba, in the Adult and Pediatric ICUs.

The study participants were 24 professionals (7 nurses and 17 nursing technicians). The inclusion criteria were: being a professional with higher education or a nursing technician; work on the adult or pediatric ICU facilities of the hospital; provide direct assistance to the patient and have worked in the sector for more than 6 months.

The delimitation of the number of participants was done using the data saturation criteria, which occurred when the subjective data became repetitive, since the interaction between the researched object and the researcher no longer offered elements to deepen the study's theorization.[10]

The data were obtained through a semi-structured interview subsidized by an instrument that in its initial part contained variables of characterization of the participants: age, sex, time of service in the ICU, time of training, level of education and local of education. The second part consisted of an interview script with subjective questions that met the objectives of this study. The interviews were recorded using a tablet (BV - Quad) and a cell phone (CCE), with an average

duration of 30 minutes per interview, afterwards, the empirical material was transcribed in full. It is worth mentioning that two interviewees refused to carry out the recorded interview, choosing to write the answers as they were spoken.[11]

Data analysis was carried out using the thematic content analysis technique, proposed by Laurence Bardin, which provides for three fundamental phases: i) pre-analysis – considered to be an organization phase where it involves a first reading, that is, the first contact with the document and the choice of material used, as well as the development of indicators, which were subsequently submitted to analysis; ii) exploration of the material – step in which the registration units are selected, the selection of counting rules, classification and aggregation – rubrics or classes that bring together a group; iii) content analysis process – treatment of results and interpretation.[12]

To guarantee the participants' privacy, nurses and nursing technicians were identified by the letter P and numbered according to the interview number, for example: P1, P2, P3, P4, P5 ... P24.

The research complied with the ethical precepts of Resolution 466/201213, as well as resolution 564/2017, which reformulates the Code of Ethics for Nursing Professionals, and data collection was only carried out after approval by the Ethics and Research Committee (CEP), having been approved with protocol number 1.749.814 and Certificate of Presentation for Ethical Appreciation (CAAE) 59490416.6.0000.5182.

RESULTS E DISCUSSION

The participants were mostly women, 22 (91.6%), aged 30-40, 16 (66.7%), nursing technicians, 17 (70.8%), graduated between 13 and 19 years, 12 (50%).

Regarding the understanding of the clinical concept of CVC-related bloodstream infection, it was found that eight (33.3%) professionals conceptualized this type of HAI as an infection associated with the presence of CVC, there was no clinical definition or laboratory criteria, as noted in the speeches below:

> *Infection of bloodstream related to central catheter are all infections that have the venous catheter as the gateway.* (P1)

> *Then, with the puncture of the central venous catheter, it occurs as an entrance door.* (P22)

> *Most catheter infection happens when contamination by microorganisms occurs, either during insertion due to lack of technique or in the handling of this catheter as well.* (P10)

> *It is an infection caused by manipulation of the catheter or even by puncture in a non-aseptic manner.* (P11)

ICSR-CVC is characterized as Primary Bloodstream Infection (PBI) – severe systemic infections, with no identifiable primary focus and are associated with CVC, when it is present in the diagnosis of the infection, directly related to health care.[13-14] Clinically, episodes of fever, tremors, oliguria, hypotension or not, related to infection can be observed elsewhere. In addition, laboratory criteria, such as positive blood culture, have greater reliability for diagnosis and epidemiological surveillance.[15]

Thus, the nursing professionals in this investigation, for the most part, are unaware of the clinical definitions, as they associated the infection only with the use of CVC. As a result of the lack of knowledge of clinical guidelines, difficulties may occur in identifying cases of this condition, generating delayed diagnosis and accentuating the clinical condition for sepsis.

On the other hand, some nursing professionals, four (16.7%), understand that the ICSR-CVC is associated with complications such as sepsis, according to the speeches below:

> *It is an infection that progresses very quickly to sepsis.* (P14)

> *Which can lead to a generalized infection.* (P19)

Sepsis can be a serious consequence of a PBI, and it is worth noting that there is no presence of an existing primary focus. Sepsis is considered a secondary bloodstream infection (SBI) and is defined when the pathogen is identified in the blood culture as an agent of an infection elsewhere. The primary focus of SBI are considered: urinary tract infection, pneumonia, endocarditis, myocarditis, among others.[16]

In this study, it was also observed that most of the nursing team, 11 (45.8%), limitedly understand the pathophysiological pathways/forms of ICSR-CVC, as shown in the following excerpts:

> *They come with the medication, the syringe, in this case, will be the means, and that medication, if there is not appropriate cleaning, will take the bacteria from the external environment to the internal environment.* (P2)

> *Handling. This is the case with the use of sterile material, handling without gloves, through the skin, in the part that the incisions take place; and any type of contaminated liquid that can be injected.* (P5)

In these speeches, the professionals highlighted the intraluminal penetration pathway, which is associated with CVC manipulation. Intraluminal genesis develops after a period of two weeks, mainly in long-term catheters, which are sources of colonization of bacteria for the occurrence of this type of HAI. This pathway for microorganisms to penetrate can occur when health professionals have contact with the central access with contaminated hands without having properly sanitized them; when handling medications without proper disinfection of administration sites, such as side injectors and catheter access hubs.[17]

In this study, no professional mentioned the existence of the extralumial and the hematogenic pathways.

The extralumial pathway occurs due to contamination of the tip of the device during insertion of the catheter, or through the entry of pathogens from the skin into the bloodstream after forming biofilms on the outside of the CVC, during the first two weeks of colonization. The hematogenous route is a less common means of penetrating microorganisms into the bloodstream, and can occur through another existing infectious focus.[18]

On the other hand, six (25%) professionals recognize that both the insertion and manipulation of the CVC are responsible for the penetration of microorganisms into the bloodstream, as it is possible to observe through the following statements:

> *The question of the moment of insertion. The second is the issue of handling this catheter, if the protocol is broken you can make an internal contamination of this catheter or the site.* (P1)

> *[...] Through the insertion site or directly via the catheter.* (P20)

Regarding professional practice in caring for patients using CVCs, it was observed that all participants stated that their assistance is exclusively in handling and maintaining the catheter, no professional mentioned the practice of applying the CVC insertion check list, with the medical team, as seen in the following excerpts:

> *Wash hands. Wear sterile gloves when taking medications. It has to be sterile.* (P12)

> *Care is of the dressing in the catheter, actions in the installation of medications. Cleaning the catheter inlets and aspirations to find out if it is well located.* (P13)

Among the most widespread strategies for preventing these infections are the CVC insertion bundles, which are characterized as a package of evidence-based interventional resources, which applied together have beneficial results for patient safety. There are five main measures in the axis package - hand hygiene; maximum barrier precautions; skin antisepsis with chlorhexidine; selection of the catheter site and avoid the use of the femoral vein.[19]

To apply the insertion bundle, it is necessary to apply an insertion check-list, preferably by the nurse team. This instrument should include the following items: hand hygiene, maximum protective barriers, use of chlorhexidine, an ideal place for catheter placement, as well as maintaining a stocked cart for the moment of insertion, in addition, it is important to observe the time and the access status.[20]

Another important result of this research was that the professionals had superficial information, both about the service they perform, as well as in academic training, with regard to measures aimed at maintaining and handling the catheter, without deepening the national and international guidelines. In addition, nursing should not have its work process limited only to the handling and maintenance of the CVC, but the guidelines recommend that nurses should participate indirectly in the insertion of the catheter, for example, by applying a check-list, evaluating and observing if there was no disruption of aseptic techniques by the doctor[23]. Studies corroborate by pointing out that a combined medical and nursing approach reduces the average infection rate.[21]

Another component of preventing ICS is the device maintenance bundles, which recommend the use of dressing, gauze, transparent or sterile semi-permeable film to cover the insertion site. Nursing must perform antisepsis of the insertion site with chlorhexidine 0.5% to 2%; promote the change of coverage every 48 hours, or, when the dressing is dirty, loose or damp and for those transparent semi-permeable coverings every 7 days[18], as well as perform the dressing change registration; the entire team must adhere to hand hygiene in situations such as: changing the infusion system, administering medications and collecting blood.[10]

Statements that were not consistent with scientific evidence were also observed, with regard to the permanence time of the CVC semipermeable dressing. As noted in the statements below:

> *It is the dressing change every 72 hours. Here in the ICU, we do not use this period. We do it daily.* (P16)

> *To do the dressing daily.* (P22)

In view of this, there is a weakness in the understanding of the scientific evidence related to the time for replacing the transparent dressing. It was possible to notice the absence of protocols in the sector studied for the maintenance of this type of device. Studies point out the importance of implementing protocols and guidelines for care in the insertion and maintenance of central catheters, since scientific evidence contributes to patient safety during clinical practice.[22] This lack of knowledge about such CVC maintenance measures confirms another worrying finding in this study, in which half of the interviewees, 12 (50%), report not knowing the other CVC maintenance guidelines designated by ANVISA or the Centers for Disease Control and Prevention (CDC), as shown below:

> *I don't know techniques. I never really had this curiosity to read about the techniques that ANVISA [...] just like that, I have no knowledge of these techniques.* (P2)

> *Honestly, literally, I don't fully know these recommendations from ANVISA, or the CDC.* (P7)

The speeches show that half of the professionals participating in this study are unaware of the insertion and maintenance measures recommended by the guidelines of ANVISA and CDC, and, often, this care is empirical, due to the experience and routine of the sector. Thus, it is essential

to implement activities of continuing and permanent education in health, such as updating practice, improving the quality of care and promoting patient safety.[23]

A previous study found that educational interventions directly impact ICSR-CVC rates, as some can change the professional's behavior. For example, the use of educational posters at the bedside; videos related to clinical definitions, pathophysiology of ICSR-CVC and device maintenance; periodically disseminating results of ICSR-CVC rates to the multiprofessional team; encouraging the adherence to preventive measures through awards when professionals reach goals established by the hospital infection control commission, among others, are educational interventions that contribute to the prevention and control of these infections.[24]

CONCLUSION

In general, there were weaknesses in the understanding of nursing professionals regarding the clinical concept, the pathophysiological pathways and measures to prevent ICSR-CVC during insertion and maintenance of CVC. Most did not know how to define it clinically, which may have an impact on the identification of cases of this type of infection. In addition, some professionals did not have the understanding that the moment of insertion of the CVC is also an important route of entry of microorganisms into the bloodstream. Most of them attributed the occurrence of ICSR-CVC only to the bad practices in handling the CVC.

In this study, it was also observed that nurses are not involved in applying the CVC insertion check-list, which is recommended by the international guidelines for the prevention of these HAIs. Most of these professionals have their practice focused on manipulating the CVC. In addition, they practice assistance based on the experience and routine of the institution, and, they say they are largely unaware of the evidence-based guidelines for insertion and maintenance of the CVC in accordance with the CDC and ANVISA guidelines.

Thus, courses in permanent health education and the implementation and dissemination of protocols for good conduct towards patients using CVC are suggested, in a more incisive and dynamic way.

This study has some limitations, as it was not possible to verify the conformity of the speeches with the practice of these professionals. Therefore, further studies that also observe the adhesion of professionals to bundles are suggested. In addition, patient care using CVC includes the multiprofessional team, and in the present study, we interviewed only the nursing team, not including other team members. It is hoped that the results of this research may contribute to the need to develop guidelines, protocols, educational interventions and clinical standards in the ICU environment, which aim at evidence-based practice, aiming to reduce the rates of ICSR-CVC, in the studied context or in similar scenarios, in order to promote the quality of care and safety to the patient submitted to the use of CVC.

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