Original Article

Nursing professionals' adherence to the blood stream infection prevention bundle

Adesão dos profissionais de enfermagem ao bundle de prevenção de infecção de corrente sanguínea

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ABSTRACT | OBJECTIVE: To evaluate the knowledge and behavior of nursing professionals in relation to the bundle of the prevention of primary bloodstream infection related to the central venous catheter (CVC). **MATERIAL AND METHODS**: This is a quantitative and transversal research, with a descriptive approach, carried out with nursing professionals working in the intensive care unit from a hospital in the State of Bahia. Data were collected using the instrument "Knowledge and self-reported behavior about the CVC bundle". **RESULTS:** 77 professionals, 53 nursing technicians and 24 nurses were included. The professionals indicated hand hygiene measures, connectors and dressings as important actions to prevent infection; 75.3% utilize complete attire when inserting the catheter; 63.6% possess knowledge regarding the bundle, being moderate (51.9%) and good (35.1%). Continued education was marked as a factor that facilitates the implementation of the bundle, while lack of knowledge is a factor that hinders the process. **CONCLUSION:** The professionals are aware of the reasons attributed to the occurrence of CVC infection, as well as prevention actions. Knowledge about the bundle was obtained during training at the hospital where the team works.

KEYWORDS: Central Venous Catheters. Catheter-Related Infections. Nursingcare.

RESUMO | OBJETIVO: Avaliar o conhecimento e o comportamento dos profissionais de enfermagem em relação ao *bundle* de prevenção de infecção primária da corrente sanguínea relacionada ao cateter venoso central (CVC). **MATERIAL E MÉTODOS:** Trata-se de uma pesquisa quantitativa e transversal realizada com profissionais de enfermagem atuantes em unidade de terapia intensiva de um hospital do Estado da Bahia. Os dados foram coletados com o instrumento "Conhecimento e comportamento autorrelatado sobre o *bundle* de CVC". **RESULTADOS:** Foram incluídos 77 profissionais, 53 técnicos de enfermagem e 24 enfermeiros. Os profissionais apontaram medidas de higiene das mãos, conectores e curativos como importantes para prevenir infecção; 75,3% utilizam paramentação completa na inserção do cateter; 63,6% possuem conhecimento sobre o *bundle*, sendo de nível moderado (51,9%) e bom (35,1%). A educação permanente foi apontada como fator que facilita a implementação do *bundle*, já o desconhecimento um fator que dificulta. **CONCLUSÃO:** Os profissionais têm conhecimento sobre os motivos atribuídos à ocorrência de infecção de CVC, bem como as ações de prevenção. O conhecimento sobre o *bundle* foi obtido em treinamento no hospital em que se trabalha.

PALAVRAS-CHAVE: Cateteres Venosos Centrais. Infecções Relacionadas a Cateter. Cuidados de Enfermagem.

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Introduction

Healthcare-associated infections (HAIs) are acquired during the care process within the hospital service.[1] Among them, primary bloodstream infection (PBSIs) is a serious problem that causes an increase in hospitalization days and hospital costs, in addition to increasing the mortality of these individuals.[2,3] Referred infection occurs when basic safety measures are neglected during patient care. Therefore, it is known that HAIS can be prevented through changes in the behavior of professionals.[3]

In this regard, it is understood that the quality of care is directly related to patient safety, which aims to reduce the risk of harm to patients to an acceptable minimum.[4] Focusing on care, in this aspect, is to maintain a favorable environment that provides an adequate safety culture.[2] It is a citizen's right to receive safe assistance that offers satisfaction and security.[5]

The implementation of safety bundles, developed by the Institute for Healthcare Improvement (IHI), emerges as a way to standardize care, through simple measures that generate effective and efficient results.[5-7] The bundle is a set of measures that seeks to reduce risks and prevent infections, based on scientific evidence.[4,5]

Most patients admitted to an intensive care unit (ICU) require the insertion of a central venous catheter (CVC), as it is a critical environment in which patients need vasoactive drugs, parenteral nutrition, renal replacement therapy, among others.[8-9] However, such device can cause infection from implantation to removal, as it is a frequent manipulation apparatus by health professionals.[1,5]

The issue of patient safety is common in high-, middle-, and low-income countries, as shown by the safety net report carried out in 2010 in the United States, which covered 2,473 hospitals, showing that about 11,000 cases of PBSIs are laboratory-confirmed, with estimated rates of up to 3.5%.[9-10] Considering that it is a frequent problem, researches that lead to reflection and adoption of good practices in catheter manipulation contribute to prevent or reduce the occurrence of infections.

This study is necessary due to the importance of the subject in the prevention of a serious and preventable adverse event and, with that, to contribute to a safe and effective assistance. Given the above, this work aims to evaluate the knowledge and behavior of nursing professionals in relation to the bundle of prevention of primary bloodstream infection related to the Central Venous Catheter.

Material and methods

This is a quantitative and cross-sectional research, with a descriptive approach, performed in the surgical and general intensive care unit II of a hospital in the State of Bahia. The unit was chosen for being a place where the bundle application had already been implemented.

The sample selection was intentional and for convenience in a population of 25 nurses and 62 nursing technicians from the surgical and general ICU II. Professional nurses and nursing technicians who had been working in the sector for at least six months were included in the survey. Nursing professionals who were on vacation or leave were excluded, as well as those who refused to participate in the research.

The study was approved in May/2021 by the Research Ethics Committee of *Hospital Geral Roberto Santos*, under Protocol Nº 4,725,987. The researchers followed the regulatory guidelines and standards set forth in Resolution Nº 466/12 of the National Health Council on research involving human beings.

A readapted questionnaire based on the work of Costa[11] was used, consisting of objective questions, subdivided into four categories, which were related to the sociodemographic conditions of nursing professionals, knowledge about central venous catheter, knowledge about the BSIs bundle, and behavior regarding the bundle insertion and maintenance.

The interview was conducted face-to-face within the working hours of these professionals, with questions being asked by the interviewer to the interviewee. The allotted time was approximately 10 minutes. Data were analyzed using the Statistical Package for the Social Sciences 24.0 software (SPSS 24.0, SPSS Inc., Chicago, Illinois, USA). Data in this study is presented in absolute and relative frequencies, average and standard deviation.

Results

Of the 87 professionals working in the ICU, 77 were included in the study. Out of these, 64 (83.1%) are women with average age of 41.16±8.75. Regarding the professional performance unit, 41 (53.2%) work in the Surgical ICU and 36 (46.8%) in the general ICU II; the workload of 12/36 hours on duty was predominant, 75 (97.4%).

Regarding the professional category, 53 (68.8%) are nursing technicians and 24 (31.2%) are nurses. Training time averaged 11.9±7.76 years. As for working time at the institution, the average was 6.14±4.83, and 5.09±3.24 at the unit.

Table 1 presents data on the reasons that may result in catheter infection, during the insertion or assistance of this procedure by the health team.

Table 1. Distribution of reasons attributed to the occurrence of catheter infection, during insertion or assistance in the procedure by the nursing team. Salvador, 2021. (n = 77)

Presented reasons	n	%
Absence or error in hand hygiene technique	44	57,1
Patient skin antisepsis technique error	40	51,9
Lack of sterile glove, cap, mask, sterile gown and sterile field	31	40,3
High frequency of catheter inserted in the femoral region	25	32,5
Use of PVPI only for skin degermation	9	11,7
Not waiting the necessary time after degerming and applying alcohol	26	33,8
Increased catheter permanence time in the patient	39	50,6
Keeping the conventional dressing wet for a long time	37	48,1
Multiple punctures	35	45,5
All the presented reasons	33	42,9

Values expressed in absolute (n) and relative (%) frequency.
Source: The authors (2023).

When questioned about the reasons for catheter infection during patient maintenance, professionals pointed to manipulation of the catheter without prior hand hygiene, lack of cleaning the hub or connectors with 70% alcohol and dirty, loose or damp dressings as main responsible for the infection (Table 2).

Table 2. Frequency of reasons attributed to the occurrence of catheter infection during patient maintenance. Salvador, 2021

Presented reasons	n	%
Catheter manipulation without prior hand hygiene	23	29,9
No cleaning of the hub or connectors with 70% alcohol	25	32,5
No change of equipment	19	24,7
Absence of date on hub or connectors	18	23,4
Wetting the central access dressing while bathing	12	15,6
Excessive manipulation of the catheter	12	15,6
Leaving the catheter in the patient unnecessarily	21	27,3
Absence of date in iv access	18	23,4
Assist or change the dressing without wearing a cap and mask	16	20,8
Dirty, loose, or wet dressing	23	29,9
No daily reassessment	17	22,1
All the presented reasons	52	67,5

Values expressed in absolute (n) and relative (%) frequency.
Source: The authors (2023).

With regard to the inputs needed to perform a conventional dressing, in addition to procedure gloves, sterile gloves, alcoholic chlorhexidine and sterile gauze, participants opted for micropore tape 48 (62.3%), followed by non-sterile transparent film 24 (31 .2%) and adhesive tape 5 (6.5%).

Regarding the knowledge about the bundle, 49 (63%) of the participants reported having acquired it in training at the hospital; 15 (19.5%) in lectures, courses and classes; 10 (13%) through books, magazines and the Internet. In addition, 51 (66.2%) of the professionals received some training on prevention of central venous catheter-related infection. Said training took place more than 1 year ago for 47 (61.1%) of them.

Related to the level of knowledge about the bundle, 40 (51.9%) reported having moderate knowledge, 27 (35.1%) knowing it well, 8 (10.3%) little knowledge and 2 (2.6%) no knowledge at all. Table 3 expresses the factors that can facilitate and hinder the implementation of the bundle. It is noted that continued education is the main facilitator, while unfamiliarity with the instrument is the main factor that makes it difficult.

Table 3. Factors that interfere with *bundle* implementation. Salvador, 2021

	Todos		**Enfermeiro**		**Técnico de Enfermagem**	
Fatores que facilitam	n	%	n	%	n	%
Conhecimento sobre o *bundle*	67	85,7	21	31,8	45	67,2
Boa adesão da equipe	68	88,3	20	29,4	48	46,8
Educação permanente	73	94,8	22	30,1	51	69,9
Fatores que dificultam						
Desconhecimento do instrumento	67	87	19	28,4	48	71,6
Não incentivo da equipe	63	81,8	19	30,2	44	69,8
Carga horaria excessiva	27	35,1	6	22,2	21	77,8
Resistência da equipe	63	81,8	21	33,3	42	66,7

Values expressed in absolute (n) and relative (%) frequency.
Source: The authors (2023).

With regard to infection prevention actions, all participants entirely agree on hand hygiene before inserting and handling the catheter, cleaning the hub or connectors with 70% alcohol before handling the device, dating iv accesses and removing the catheter when it is no longer needed (Table 4). In relation to disagreeing with prevention actions, it was found that 9 (11.7%) of the professionals indicated avoiding the femoral vein, 4 (5.2%) avoided excessive manipulation of the catheter, and 1 (1.3%) avoided changing iv access (every 96 hours).

Table 4. Frequencies of agreement with actions to prevent CVC-related infection. Salvador, 2021

	Parcially		**Entirely**	
	n	**%**	**n**	**%**
Hand hygiene before inserting the catheter			77	100
Use of maximum barrier	2	2,6	75	97,4
Daily check of device permanence	1	1,3	76	98,7
Avoid femoral vein as insertion site	14	18,2	54	70,1
Hand hygiene before manipulating the catheter			77	100
Cleaning the hub or connectors with 70% alcohol			77	100
Change of iv access (every 96 hours)	2	2,6	74	96,1
Avoid excessive manipulation of the catheter	3	3,9	70	90,9
Dating iv access			77	100
Remove the catheter when no longer needed			77	100

Values expressed in absolute (n) and relative (%) frequency.
Source: The authors (2023).

When evaluating the behavior of professionals regarding the insertion and maintenance bundle, it is noted that 75.3% of professionals wore complete attire when inserting the catheter. Still in this regard, the majority of respondents (68.9%) state that always, almost always or sometimes the sterile technique was broken during the procedure.

About the maintenance of the bundle, it is highlighted that the need for the catheter to remain is always or almost always verified by both categories. The same was observed in relation to the following items: cleaning the hub or connectors with 70% alcohol, prior hand hygiene before handling the catheter, change of iv access, prior hand hygiene for dressing change, use of cap and mask during dressing change as shown in (Table 5).

Table 5. Frequency of behaviors regarding the CVC insertion and maintenance bundle. Salvador, 2021

	Always	Almost Always	Sometimes	Never
Insertion bundle				
Complete attire	75,3	19,5	5,2	
Hand hygiene	92,2	5,2	2,6	
Antiseptic drying on the skin	33,8	48,1	11,7	6,5
Breakage of sterile technique	18,2	20,8	29,9	31,2
Maintenance bundle				
Verification of the need for permanence	62,3	23,4		14,3
Cleaning the hub or connectors with 70% alcohol	15,6	51,9	6,5	26
Hand hygiene before handling	45,5	37,7	2,6	14,3
Practice in changing iv access	62,3	32,5		5,2
Hand hygiene for dressing change	58,4	32,5		7,8
Use of cap and mask during dressing change	61	23,4	2,6	13

Values expressed in relative (%) frequency.
Source: The authors (2023).

Discussion

The results from the present study reveal that nursing professionals are aware of HAIs and that errors in antisepsis are directly related to infections. It is known that most hospital infections occur due to mistakes in the procedures and are transmitted through the hands of employees, through materials or through contact with other infected patients. Therefore, hand hygiene is one of the most important recommendations for the prevention of BSIs.[3,10,12-14]

In 2005, the first global challenge proposed by the Pan American Health Organization of the World Health Organization was launched, which was aimed at infections related to health care, and addressed the importance of hand hygiene as a simple and effective measure in the prevention of infections.[15-16]

Hand hygiene is considered by Agência Nacional de Vigilância Sanitária (ANVISA) as a simple, economical and effective measure to combat nosocomial infection. Thus, the professionals involved must understand the importance of these measures in order to be able to control and reduce mortality in services through this variable.[12-17]

Despite knowledge about the subject, a study carried out in 2017 pointed that 98.3% of respondents acknowledged the importance of hand hygiene in the prophylaxis of nosocomial infection, 83.3% claimed to master the technique; however, only 53.4% described it correctly. That is, regardless of the awareness, adherence is still low.[13]

This also corroborates the present study, since one of the reasons attributed to the occurrence of central venous catheter infection during the insertion or assistance of this procedure by the health team most frequently pointed out by the participants were the absence or error in the hand hygiene technique, error in the antisepsis technique on the skin of the patient, and the increased time the catheter remains in the patient.

A 2016 study states that inappropriate practices are responsible for causing infections in addition to prolonging the length of stay of patients in hospitals. The same study also proves that health professionals, despite claiming to have theoretical knowledge about the hand hygiene technique, showed poor performance when listing the sequence of the correct technique.[8,15]

The results also showed that in relation to infection prevention actions, all participants entirely agree on hand hygiene before inserting and handling the catheter, cleaning the hub or connectors with 70% alcohol before handling the device, dating iv accesses and removing the catheter when no longer needed.

Most respondents agree that flaws in the skin antisepsis technique are a risk factor for infection. It is important to remember that preparing the skin with an alcoholic solution of chlorhexidine gluconate > 0.5% is considered a high level of evidence according to ANVISA.[17] As well as not performing routine femoral vein puncture, as insertion in this site is associated with a higher risk of developing BSIs.[18] This contradicts the study, as only 32% of respondents believe that the access located in the femoral vein may present a risk factor.

Not cleaning the hub or connectors with 70% alcohol, keeping the dressing dirty, loose or damp, and having the catheter in the patient unnecessarily are seen as the main causes of infection during maintenance. Corroborating with a study from 2017, in which the majority of respondents stated that the occurrence of infection during catheter manipulation is due to letting the device remain in the patient and over-handling it.[11]

The bundle is a tool created in the United States in 2001, but it was in 2012 that the IHI implemented the method as a set of measures with the function of optimizing and organizing health care. At Los Angeles Hospital in 2012, a study was conducted to determine whether the institute's implementation of the IHI coreline package would reduce the incidence of catheter-related BSIs. Its result was truly positive, as it presents significant numbers regarding the reduction of infection rates with the use of the bundle, reduction of the death rate, length of stay and costs with intensive care.[6,7]

It was evidenced that most participants obtained knowledge about the bundle in training at the hospital. Regarding the level of self-reported knowledge about the CVC-related infection prevention bundle, most professionals report having moderate to good knowledge. This is worrying data, as local managers need to intensify actions with permanent education within the services.

In this aspect, it is observed that in recent years, several studies have shown a reduction in the incidence of PBSIs related to the use of vascular access after the implementation of PBSIs prevention bundles, associated with continued education and awareness of the teams.[16,19] The safety culture aims to reduce risks in the work environment, which is why it has been reported as a critical element in reducing hospital-acquired infections, both in technical and behavioral aspects.[20]

Continued education consists of the constant qualification of employees in their work environment, and is the main tool to prevent BSIs, through continuous training for professionals combined with good practices for insertion and maintenance of the catheter, epidemiological surveillance of infections related to healthcare and evaluation of results.[18,21,22] In the present study, it is clear that permanent education was identified as the main facilitator, while the lack of knowledge of the instrument is the main obstacle in the implementation of the bundle in the health unit.

Currently, there is still a difficulty for health professionals to follow the recommendations of established protocols, as well as to evaluate the conduct of each professional so that everyone can follow the same recommendations.[18]

In order to interpret the results of this study, it is necessary to consider limitations inherent to the chosen method. One of the limitations refers to the use of a research instrument that has not yet been validated; in addition, it is necessary to consider that the way of collecting information is through an interview in which the report of the professional was considered without confirmation of the presented information. Furthermore, it is a study with a considerably small sample and its results may not reflect the reality of other units.

Conclusions

It is possible to conclude by the results of this study that nursing professionals are aware of the reasons attributed to the occurrence of central venous catheter infection, as well as prevention actions.

In addition, it is also possible to conclude that the knowledge, in a moderate and good degree, about the bundle was obtained in training at the hospital where they work.

However, it is necessary to intensify educational measures through continued education on the importance of hand hygiene during catheter manipulation, since it was one of the vulnerabilities found in this research.

It is suggested that further studies be carried out on the subject, in order to identify which microorganisms are most common within catheter-related infections, as well as the positive points of continued education programs within health services.

Author contributions

Lima KMS participated in the conception and design of the research, in the collection, analysis and interpretation of data, in the writing of the manuscript and in the critical review of the manuscript. Souza CS participated in the conception and design of the research, statistical analysis and critical review of the manuscript. Santos IRA participated in the conception and design of the research and critical review. Rocha HMN participated in the conception and design of the research, writing and critical review of the manuscript.

Conflict of interests

No financial, legal, or political conflicts involving third parties (government, companies, and private foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to, grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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