

**BLOOD CURRENT
INFECTION RELATED
TO CENTRAL VENOUS
CATHETER USE:
BUNDLE INTERVENTIONS**

Andressa Messias de Castro

Bianca de Santos Sousa

Giulia Almeida de Andrade

Leticia Moreira Rosa

Rebecca Maximo da Silva

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: Objective: To identify and describe the interventions that make up the *bundle* for the prevention of bloodstream infection related to the use of central venous catheters. **Method:** Integrative literature review through the steps: development of the guiding question, search for primary studies in the databases, extraction of data from studies, evaluation of selected studies, analysis and synthesis of results and presentation of the result. Respecting what was proposed to be evaluated, the guiding question was: which interventions make up the *bundle* for the prevention of bloodstream infection related to central venous catheter use? Primary articles, in Portuguese and Spanish, published in the last 10 years (2010-2020) were included. Secondary articles, that is, validation or review articles and those that did not answer the guiding question, were excluded. The search was carried out in the Latin American and Caribbean Literature on Health Sciences (LILACS) and *Scientific Electronic Library Online* (SCIELO) databases. For the search, the following descriptors were used: catheter-related infections, central venous catheterization, infection control, patient safety and patient care packages. The initial selection of studies was performed by carefully reading titles and abstracts, including those that met the established inclusion criteria. For the final selection, the articles were read in full. All the processes, from the search to the selection, were carried out by all the researchers. To assess the level of evidence of the works, the *Agency for Healthcare Research and Quality categorization* was used. **Results:** From the full reading of the selected articles, the following interventions were found as a component of the *bundle* for the prevention of bloodstream infection associated with the central venous catheter: hand hygiene (100%), use of maximum barrier for insertion (100%), skin preparation with alcoholic chlorhexidine

(40%); skin preparation with germanium chlorhexidine (40%), deinfection of hubs and connectors with alcoholic solution (40%), recording of insertion site and dressing characteristics (40%), daily assessment of the need for permanence and maintenance of the CVC (40%), avoid access through the femoral vein (20%), give preference to the subclavian vein (20%), perform percutaneous insertion (20%), change the coverage with alcoholic chlorhexidine every seven days with a transparent film or forty-eight days. eight hours segaze (20%), daily cleaning with degerming chlorhexidine (20%), maintaining an occlusive dressing after insertion (20%), changing the dressing as recommended by the institution (20%), using a sterile technique to perform the dressing and keep it dated and signed (20%) and hand hygiene in exchanges of infusion systems, medication administration, dressing change and blood collection (20%). **Conclusion:** It was observed that, although not all interventions have been described unanimously in the articles, their use contributed to reducing the incidence rates of CRBSI. Therefore, the implementation of the *bundle* in the routine of institutions allows professionals to perform care safely and effectively, in addition to reducing costs by preventing infections. Thus, knowing the interventions that can compose is the first step.

Keywords: Catheter-related infections, Central venous catheterization, Infection control, Patient safety, Patient care packages.

INTRODUCTION

Health care-related infections (HAI) represent a threat to patient safety, being considered an adverse event that often affects those who use health services worldwide, whether public or private. ⁽¹⁾

Within intensive care units (ICU), the risk of patients developing HAI is considerably

higher, especially when they are using invasive devices, such as central venous catheters (CVC).⁽¹⁾ Therefore, the use of the CVC is the main risk factor for the patient to develop bloodstream infection, accounting for 90% of the cases.^(two)

The central venous catheter is defined as the installation of a vascular access device in which the distal end is located in the inferior or superior vena cava, in order to provide safe access to the systemic circulation and thus allow the administration of vasopressor vesicant drugs and solutions. hyperosmolar for long periods.⁽³⁾

It also allows the verification and monitoring of central venous pressure and hemodynamic status, in addition to the infusion of parenteral diet and collection of blood samples for laboratory tests.⁽⁴⁾ It is usually inserted through the brachiocephalic, internal jugular, subclavian, external iliac, and common femoral veins.⁽⁵⁾

Primary bloodstream infection related to the use of CVC reflects an unfavorable complication for both the patient and the hospital, which has an increase in costs, given that the patient's stay in the inpatient unit will be longer, as well as the need for tests and drugs for the treatment of IPCS.⁽⁶⁾

The main causes of catheter-related bloodstream infection (CRBSI) are contamination of the catheter installation site by the skin microbiota, infusion of contaminated intravenous solutions, contamination of the access routes, through the hematogenous route and by the hands of the professionals who perform the installation, which shows ineffective hand hygiene prior to catheter maintenance.⁽⁴⁾

As for the risk factors that favor the development of infections resulting from blood, the presence of comorbidities, inadequate nutrition, catheter permanence time, catheter insertion site and handling by

professionals stand out.⁽⁷⁾

Always aiming at the quality of care and patient safety, infection prevention measures must be standardized to serve all clients in an equitable manner, considering the individual aspects of each one. This way, it can be said that the *bundle* consists of a series of effective and scientifically proven interventions carried out in order to organize care in order to avoid contamination of the central access and, consequently, bloodstream infections.⁽⁸⁻⁹⁾

Bundle is a set of scientifically based measures that, when put into practice in a meticulous way, are able to avoid extremely harmful damage to the patient. Several measures can be taken jointly or individually, ensuring patient safety, therefore, attention must be paid to some key points related to the institution, such as: patient profile, inputs used, training, continuing education for professionals, surveillance in relation to the team responsible for the insertion, maintenance and care provided with intravenous devices.⁽¹⁰⁾

Numerous institutions include the *bundle method* in their practices, as it has been efficient in containing the percentage of infections related to CVC and effective in the quality of the offices granted. However, the low adherence of professionals is still relevant, implying in the formidable growth of the occurrence of infections.⁽¹⁰⁾

The perception of the management teams for the introduction and maintenance of the CVC regarding the *bundle* and its result in the warning of bloodstream infection, is capable of showing indications that conducts taken prudently need to be cultivated in patient care, especially those in critical situations. This would be able to review CVC placement and management procedures, implying a better quality of care and reducing the morbidity and mortality cases resulting from this infection.⁽¹⁰⁾

It is observed that the care taken during the insertion of the catheter is essential for the total safety of the patient. Some of the interventions are: applying chlorhexidine gluconate in skin preparation for antisepsis, using personal protective equipment and avoiding the femoral vein as an access route whenever possible, as it increases the risk of deep vein thrombosis. ⁽⁴⁾

Circumstances pertaining to the flora of the skin in the region of the insertion show how significant is a risk factor to be investigated, since the catheters introduced into the inner jugular veins pose a major threat to colonization when used in adults. ⁽¹¹⁾

Although the application of the *bundle* is a recent topic, which is directly correlated with patient safety, in addition to being evidenced by specialists and international entities as a perfect tool to prevent and contain blood-borne infection, it is plausible to conclude, based on the studies, the scarcity of articles that portray the use of this methodology in the investigation of ICSRC in children and, above all, in newborns. ⁽¹¹⁾

Intermediates based on evidence that are being operated on in *bundles* can be applied to any type of individual or device and, for this reason, when performed together, they produce a significant result in the attenuation of blood-borne infection rates. ⁽¹²⁾

In order for health professionals to be able to cooperate in the prudence and reduction of infection related to the use of central venous catheters, aiming to contribute to patient safety, it is essential that the multiprofessional teams that operate in the ICUs have references based on scientific and congruent conducts, with the information from the catheter-associated infection prevention *bundle*.

It is necessary to show that, for some topics of the *bundle*, most professionals have

the information, however, the correlated custom does not coincide with the exposed knowledge. This way, further investigations on the causes of the attitude of professionals who clarify the causes become necessary, purposes and eminent conditions for the non-execution of a stipulated practice when one is aware of their privileges.

Thus, it is necessary that the professionals involved in the insertion, maintenance and removal processes receive permanent education and professional training on the inherent risks associated with the use of the CVC, in order to reduce the chances of catheter contamination and, consequently, the damage to the patient's health, as well as the reduction of hospital expenses.

Therefore, it is essential that institutions employ pre-established preventive measures and intervention protocols in clinical practice, as well as that professionals apply these interventions on a daily basis. ⁽²⁾

The diagnosis of the team's perception and conduct becomes crucial for the effectiveness of an attitude and definition of more affirmative parameters related to the safety of patients hospitalized in the ICU using CVC. ⁽¹³⁾

It is known that the control of catheter-related infections is a challenge for health institutions and a need to ensure that the patient receives qualified and harm-free care. Based on the above, it is expected to answer the following question: which interventions are eligible to compose the ICSRC prevention *bundle* ?

Although numerous interventions are described in the literature, their use in different contexts must be stipulated, since there is care that is *unfeasible* in the institutional reality. These factors justify carrying out this investigation.

GOALS

Identify and describe the interventions that make up the *bundle* for the prevention of bloodstream infection related to the use of central venous catheters.

METHOD

KIND OF STUDY

It is an integrative review of the literature, which allows the approach of different types of studies and provides a comprehensive analysis of the subject addressed, in addition to the synthesis of the knowledge produced. ⁽¹⁴⁾

METHODOLOGICAL FRAMEWORK AND RESPECTIVE STEPS

For the construction of this review, the following steps were considered: development of the guiding question, search for primary studies in the databases, extraction of data from the studies, evaluation of the selected studies, analysis and synthesis of the results and presentation of the review. ⁽¹⁴⁾

Respecting what was proposed to be evaluated, the guiding question was: “which interventions make up the *bundle* for the prevention of bloodstream infections related to the use of central venous catheters?”

Primary articles, in Portuguese and Spanish, published in the last 10 years (2010 to 2020) were included. The search was carried out in the following databases: Latin American and Caribbean Literature on Health Science (LILACS) and *Scientific Electronic Library Online* (SCIELO). The choice of databases considered their scope and qualification.

For the search, the descriptors were used: catheter-related infections, central venous catheterization, infection control, patient safety and patient care packages, and all the respective synonyms were combined with each other, using the Boolean terms “AND”,

while for synonyms, the term was used boolean “OR”.

The selection of studies was initially carried out through a thorough reading of titles and abstracts, including those that meet the established inclusion criteria. For the final selection, the articles were read in full. All processes, from search to selection, were performed by all researchers. In case of doubt or discrepancy between them, a third researcher was consulted.

For data collection and analysis, we used a standardized form that addressed the following variables: title of article, authors, year of publication, country where was published, study design, level of evidence, and main results or recommendations. ⁽¹⁴⁾

To assess the level of evidence of the studies, the *Agency for Healthcare Research and Quality* (AHRQ) categorization was used, which classifies the studies into six levels, as follows: I - Evidence resulting from the meta-analysis of multiple randomized controlled clinical studies; II - Evidence obtained from individual studies with an experimental design; III - Evidence from quasi-experimental studies; IV - Evidence from descriptive (non-experimental) studies or with a qualitative approach; V - Evidence from case reports or experience and VI - Evidence based on expert opinions. ⁽¹⁵⁾

RESULTS

Initially, 69 articles were found from the descriptors in the databases, of which 37 studies were selected after reading the titles and abstracts. Of these, 10 were excluded because they were presented in both data bases. Subsequently, the 27 remaining articles were thoroughly analyzed in their entirety, excluding 22 studies for not answering the guiding question. Finally, five articles composed the sample (Figure 1).

Of the 5 studies analyzed, the oldest is

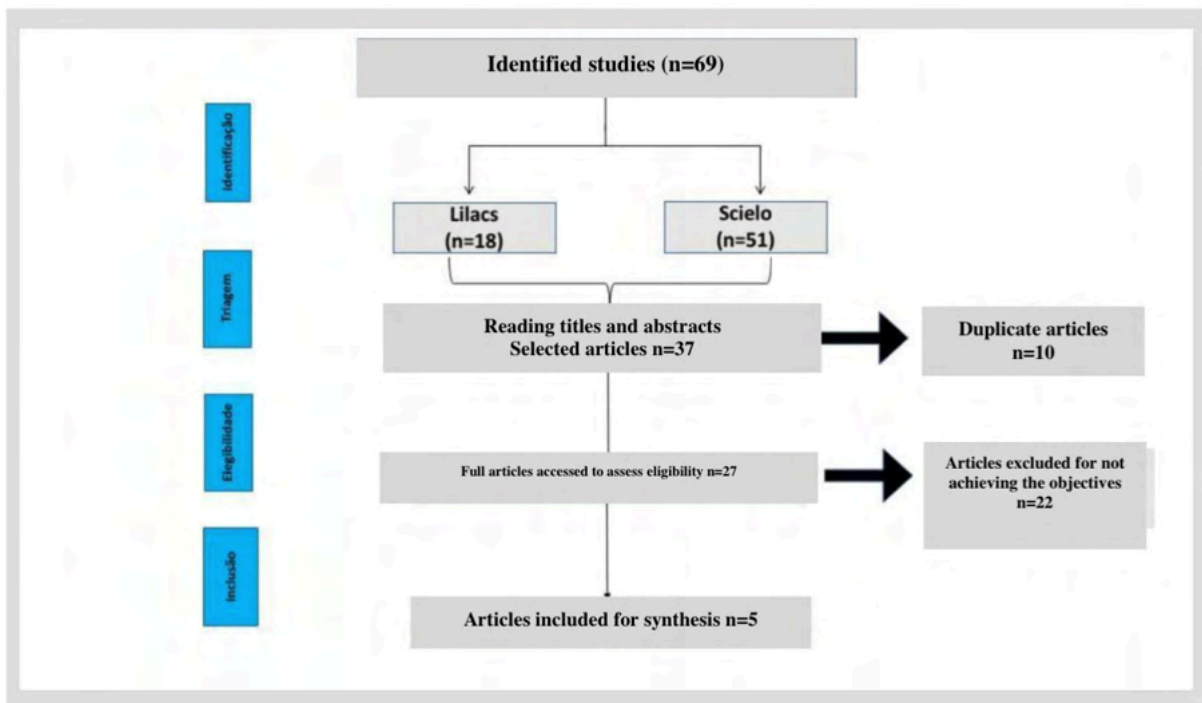


Figure 1: Flowchart of the process of selection of articles for integrative review. Bauru, SP, Brazil, 2021.

from 2012 and the most recent from 2019. All of them form descriptive studies, that is, evidence level IV, and 60% were carried out in Brazil (Chart 1).

Regarding the interventions of the ACSC prevention *bundle*, 100% referred as part of the bundle hand hygiene and use of the maximum barrier for insertion; 60% affirmed the importance of changing the dressing with alcoholic chlorhexidine every 7 days for transparent membranes and 48 hours for gauze; 40% mentioned alcoholic chlorhexidine for skin preparation, while another 40% preferred chlorhexidine degerming; 40% discussed the importance of disinfecting hubs with 70% alcohol or alcoholic chlorhexidine before and after all manipulation; 40% included the need to record the characteristics of the insertion site and dressing daily, while another 40% cited as essential to daily valuation, about the need for permanence and maintenance of the

CVC; 20% included verification of patient identification and CVC indication; 20% reaffirmed the need to save femoral access via the vein, while 20% preferred access via the subclavian vein and another 20% emphasized the preference for percutaneous insertion; 20% reported hand hygiene by the doctor and assistant with chlorhexidine, before insertion of the device, finally another 20% mentioned the occlusive dressing after insertion as part of the *bundle*; use of a sterile technique to perform the dressing, as well as keep it dated and signed, and hand hygiene when changing infusion systems, administering medications, changing dressings and collecting blood (Chart 2).

DISCUSSION

All articles included in this review cited hand hygiene as part of the CVC-related infection prevention *bundle*. It is the isolated and most important measure to prevent

Title of article	Authors/year of publication and country	Design / sample / level of evidence
<i>Implementation of an insertion bundle for preventing central line- associated blood stream infections in an Intensive Care Unit in Colombia</i> ⁽¹⁶⁾	Osorio J, Álvarez D, Pacheco R, Gomez CA, Lozano CA. 2013, Colombia.	Descriptive study; 579 patients; level of evidence IV.
<i>Evolution of practices for the prevention and control of blood stream infection in government hospital</i> ⁽¹⁷⁾	Jardim JM, Lacerda RA, Soares NJ, Nunes BK. 2013, Brazil.	Descriptive study; 5877 procedures evaluated; level of evidence IV.
<i>Insertion of central vascular catheter: adherence to infection prevention bundle</i> ⁽⁶⁾	Llapa-Rodríguez EO, Oliveira JKA, Melo FC, Silva GG, Mattos MCT, Macieira Junior VP. 2019, Brazil.	Descriptive study; 1342 actions observed; level of evidence IV.
<i>Central venous catheter -related infection after the implementation of preventive bundle in intensive care unit (UCI) of Hospital de Clinicals de Porto Alegre</i> ⁽¹⁸⁾	Dallé J, Kuplich NM, Santos RP, Silveira DT. 2012, Brazil.	Descriptive study; 594 procedures analyzed; level of evidence IV.
<i>Impact of two bundles on central catheter-related blood stream infection in critically ill patients</i> ⁽¹⁹⁾	Fortunati CFP. 2017, Chile.	Descriptive study; 390 patients; level of evidence IV.

Table 1- When-synthesis of the characteristics of the studies included in the literature review according to the article title, year, country, design, sample and level of evidence. Bauru, SP, Brazil, 2021.

Title of article	outcome	interventions
<i>Implementation of an insertion bundle for preventing central line - associated blood stream infections in an Intensive Care Unit in Colombia</i> ⁽¹⁶⁾	The use of these measures during patient care was able to reduce infection rates.	Hand hygiene; 2% chlorhexidine; maximum sterile barrier and avoid femoral access
<i>Evolution of practices for the prevention and control of bloodstream infection in government hospital</i> ⁽¹⁷⁾	Adherence to the practices of the bloodstream infection prevention bundle through continuing education and procedural assessment systems reduced the rates of ACSC	Percutaneous insertion; complete surgical attire; skin preparation with alcoholic antiseptic; occlusive dressing after insertion; Daily record of appointment and length of stay; dressing change record; disinfection of hubs and connectors with alcoholic solution before handling and handwashing exchange of infusion systems, medication administration, change dressings collecting blood
<i>Insertion of central vascular catheter: adherence to infection prevention bundle</i> ⁽⁶⁾	Bundle application proved to be effective in preventing primary bloodstream infection	Check patient identification and CVC indication; hand hygiene by the doctor and assistant; use of sterile gloves, cap and mask; use of sterile technique to perform bandage and datesign
<i>Central venous catheter-related infection after the implementation of preventive bundle in intensive care unit (ICU) of Hospital de Clinicals de Porto Alegre</i> ⁽¹⁸⁾	The implementation of the infection prevention bundle resulted in a reduction in the rate of CVC-related infection when compared to the same period in the previous year	Hand hygiene by the physician and assistant with degerming chlorhexidine; antiseptis of the insertion site with alcoholic chlorhexidine; use of maximum barrier; preference for the subclavian vein; hand hygiene to handle the CVC; disinfection of hubs and connections with 70% alcohol before handling; changing coverage with chlorhexidine alcoholic every 7 days for transparent membrane and 48 hours with gauze and recording of site characteristics insertion.
<i>Impact of two bundles on central catheter- related bloodstream infection in critically ill patients</i> ⁽¹⁹⁾	Implementing insertion and maintenance bundles simultaneously had a positive impact on reducing bloodstream infections in critically ill patients	Hand hygiene by the doctor and assistant; skin preparation with 2% chlorhexidine soap; use of maximum barriers; daily assessment of the need for catheter maintenance; review of the insertion location CVC and dressing check with daily cleaning with chlorhexidine 2%

Table 2-When-synthesis of the characteristics of the studies included in the literature review according to the title of the article, outcome and interventions. Bauru, SP, Brazil, 2021.

infections, being scientifically proven, in addition to having low cost. Its use is necessary, since the main microorganisms causing infection come from the hands of professionals involved in health care and although there is knowledge of how important this measure is, adherence to the procedure remains flawed throughout world.⁽²⁰⁾

The World Health Organization recommends that hand hygiene be carried out in all health units, regardless of available resources. In addition, it establishes the 5 ideal moments to perform hygiene, namely: Before contact with the patient; Before performing aseptic procedures; After risk and/or

exposure to bodily fluids; After contact with the patient; After contact with areas close to the patient and whenever hands are visibly dirty.⁽²¹⁾

Hand hygiene, at the appropriate times and with the correct technique, promotes a rapid reduction of infections related to health care, in addition to reducing the financial costs of institutions and the chances of complications to the patient's health, as well as the risk of death as a result of this adverse event.⁽²¹⁾

Another care reported in 40% of the articles mentioned the preparation of the skin with chlorhexidine-alcoholic chlorhexidine-alcoholic to prepare the skin before inserting the CVC as part of the *bundle*. *Its use is strongly recommended as the anti septic of choice*, because when compared to povidone-iodine solution, it showed a 50% reduction in the incidence of colonization and a decrease in infection rates.^(4,22)

In fact, proper skin preparation is an essential measure to prevent infections and the use of chlorhexidine has excellent antimicrobial activity, capable of reducing the microbial load of the site, in addition to having an extensive residual effect, which reduces the spread of microorganisms in the skin towards

the site. insertion of the catheter.⁽²³⁾

Another intervention referred to the disinfection of *hubs* and connectors with alcoholic solution before manipulation. This measure is of paramount importance in preventing central catheter contagion, since the contamination present on the external face of the *hub* and connector will be conducted into the lumen, where it is not susceptible to disinfection, that is, it becomes an important source of infection.⁽²²⁾

Therefore, disinfection must be performed with alcohol rubbing for 15 to 30 seconds, before and after administering medications, fluids, or diets to reduce the spread of microorganisms.⁽²³⁾ This measure has become so indispensable to infection prevention that it is part of the *Association for Professionals in Infection Control and Epidemiology* campaign called "*ScrubdeHub*", whose purpose is to reduce infections through measures of education, awareness and encouragement to the professionals to disinfect the *hub* correctly before handling them.⁽¹⁰⁾

The daily record of the insertion site and dressing characteristics was another care that made up the *bundle*, since the presence of phlogistic signs such as hyperthermia, hyperemia, pain, edema and/or the presence of secretion may be suggestive of infection, which must be evaluated, as well as considering a new puncture in a different site.^(10,24)

The bandage must be kept intact, and must be changed whenever it is damp, dirty or loose. In addition, it can be used as a transparent membrane covering, which can remain intact for up to 7 days and allows the assessment of the conditions of the insertion site.⁽¹⁰⁾

The bandage with gauze and tape must be changed every 48 hours or sooner if necessary, being related to a greater probability of developing a local reaction, often in areas of the skin in contact with the tape.⁽²⁴⁾

The use of chlorhexidine degerming to

prepare the skin before passing the CVC also made up the bundle, and its use is related to good hand hygiene by the professionals responsible for the procedure, physician and assistant. It is also aimed at the patient during antisepsis, cleaning and/or bathing. ^(18,19)

Initially, it is necessary for health professionals to perform antisepsis with chlorhexidine degerming in the region of the hands and forearms in order to promote the elimination of the transient microbiota of the skin and the reduction of the resident microbiota. ^(25,26)

The patient is cleaned of the skin from the insertion site in progress to the periphery in a circular way, and it is necessary to let the two types of antiseptic solutions (degerming and alcoholic) dry on the skin of the patient before starting a new procedure. ⁽⁴⁾

The period of dressing change with alcoholic chlorhexidine using the transparent membrane or gauze was also mentioned. Changing the dressing for the CVC varies according to the model manipulated, thus, if the transparent membrane is placed, it is valid for seven days and, when using gauze and tape, up to forty-eight hours, or in a shorter period if both dressings present detachment of the edges that compromises their integrity or accumulation of exudate in the region of the catheter. ^(6,27)

The dressing is a way to preserve the CVC insertion site from colonization by bacteria and/or microorganisms. Nowadays, there are several dressings on the market, and the degaze and tape and the transparent membrane are the most used. These dressings differ in terms of durability, ease of juxtaposition, ability to develop a skin reaction and also to prevent infections. In the two dressing models presented, the CVC insertion region is previously cleaned with 0.5% alcoholic chlorhexidine, as well as inspection and palpation of the catheter exit ostium and

cleaning of the connections with 70% alcohol. ⁽⁶⁾

The daily cleaning of the catheter insertion with chlorhexidine degerming was another measure included in the *bundle*, seeing that this solution acts as a microbicide, that is, at low concentrations, it has a bacteriostatic effect, causing the modification of the osmotic stability of the bacterial cell, and in high concentrations it acts as a bactericide, promoting the precipitation of cytoplasmic materials. ⁽²⁸⁾

Chlorhexidine degerming can also be indicated in daily baths, in patients older than 2 months, according to the microbiological presentation of the institution. In acute and/or long-term care hospital units, chlorhexidine baths may also be seen as a prophylactic measure. ⁽²⁵⁾

The subclavian vein as the site for CVC insertion was indicated as the first choice, while the femoral vein was mentioned as the last option. The recommendations of the CDC *Guidelines* and ANVISA emphasize the need to avoid as much as possible the routine use of the femoral vein in adult patients to reduce the risk of CRBSI. An important risk factor that needs to be evaluated, as the catheter inserted into the internal jugular vein has a high risk of colonization and the use of a femoral catheter in adults also has a high risk of colonization, as well as thrombosis and hematoma.

An American study revealed that the choice of some physicians for the femoral or internal jugular access is directly linked to the complications associated with access via the subclavian route, since it presents risks such as the arterial puncture, pneumothorax and/or hemothorax, even though it is the best site to be used. chosen because it is the route that shows the lowest risk of colonization and infection, when compared to the efemoral internal jugular. ^(11,18)

In addition to the insertion site, the articles point to the need to prioritize percutaneous catheter insertion. In fact, the use of the short-term central venous catheter and one of the components was the percutaneous insertion, they performed tests on the insertion and were able to conclude that it had a high rate of satisfactory adherence, although the insertion of the short-term CVC, performed by medical professionals in the surgical center, showed overall null compliance (0.0%) due to non-compliance of all sets of components. ⁽¹⁷⁾

Hand hygiene by the physician and assistant with chlorhexidine degerming agent before CVC insertion was cited as one of the interventions that make up the *bundle*: hand hygiene by the physician and assistant with chlorhexidine degerming agent prior to CVC insertion, as it is capable of perform antisepsis, promotes residual effect and the gecomomicrobicide, essential characteristics in the prevention of infection. ⁽²⁹⁾

Daily assessment of the need for permanence and maintenance of the CVC, as well as hand hygiene before and after contact with the catheter, assess the insertion site at least once a day through visual inspection and palpation over the intact dressing. Also, it is essential to change the dressing whenever it is damp, loose or dirty or every seven days if it is a transparent membrane and forty-eight hours if it is gauze, with alcoholic chlorhexidine or a degerming agent, maintaining the catheter permeability through flushing before and after the infusion of any fluid. The most common covering is the transparent film, as it allows continuous observation through direct visualization of the catheter and the insertion site, helping to detect phlogistic signs. ⁽³⁰⁾

The use of maximum barrier for catheter insertion was pointed out as part of the CVC-related infection prevention *bundle*, showing that the implementation of all available precautionary barriers during catheter

insertion reduces the incidence of infections. ⁽³¹⁾

The use of a maximum barrier means using all individual equipment after hand hygiene, such as a mask, cap, glasses, sterile glove, sterile apron and sterile field, by the physician responsible for the insertion and by the assistant, avoiding breaches of aseptic technique and contamination of the procedure. ⁽³¹⁾

Also, the importance of correct identification of the patient prior to insertion was emphasized, since, as an invasive device, the unnecessary application to the cart poses health risks. For this, identification must be carried out with at least two different identifiers, with the full name and date of birth and, if available, use a standardized wristband. ⁽³²⁾

Among the indications to use it, there are the replacement of large volumes, prolonged parenteral nutrition, blood transfusion, infusion of vesicant solutions and irritants such as chemotherapy, peripheral venous network of difficult access and patients with unfavorable clinics. ⁽³³⁾

Another intervention was related to the performance of the occlusive dressing immediately after insertion of the catheter, with a sterile technique, containing the date and signature of the person responsible for the procedure. Such action aims to prevent contamination of the newly punctured site and, consequently, to avoid a source of bloodstream infection, in addition, occluding the catheter as soon as it is performed prevents it from dislodging. ⁽²⁴⁾

The sterile technique consists of correct hand antisepsis, use of a mask, cap and sterile gloves. The insertion site must be cleaned from the center to the periphery, that is, first the antisepsis of the orifice where the catheter is inserted and then the peri-catheter region must be performed, using gauze soaked in

alcoholic chlorhexidine, changing them. with every move. After complete drying, fix it with an occlusive dressing, put the date on which it was performed and the name of the person responsible. ⁽²⁴⁾

Finally, it is important to mention that the fact that this study only included national databases may somehow restrict the articles published internationally. Thus, it is recommended in other investigations of this type, that international databases be included.

However, the contributions of this investigation are evident, when identifying and describing the main interventions that make up the BSCSI prevention bundle in the national scenario, in particular because this is the first step towards its implementation in clinical practice.

CONCLUSION

It was observed that, although not all interventions were described unanimously in the articles, their use contributed to the reduction of incidence rates of catheter-related bloodstream infection. Therefore, the implementation of the *bundle* in the routine of institutions allows professionals to perform care safely and effectively, in addition to reducing costs by preventing infections.

This way, knowing the intentions that can compose this *bundle* is the first step towards implementing quality health care that is free from harm to the patient, as well as making the practice of professionals efficient and safe in the processes of insertion and maintenance of the CVC.

REFERENCES

1. Silva MPC, Bragato AGC, Zago LB, Nicolussi AC, Contim D, Amaral JB. *Bundle* para manuseio do cateter central de inserção periférica em neonatos. *Acta.paul.enferm.* [Internet]. 2019 [citado 2021 mar 25]; 32(3):261-266. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-21002019000300261&lng=pt.
2. Silva A G, Oliveira A C. Conhecimento autor referido das equipes médica e de enfermagem quanto às medidas de prevenção de infecção da corrente sanguínea. *Texto contexto – enferm.* [Internet]. 2018 [citado 2021 mar 23]; 27(3):e3480017. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_isoref&pid=S0104-07072018000300327&lng=pt&tlng=pt
3. Almeida TM, Gallasch CH, Gomes HF, Fonseca BO, Pires AS, Peres EM. Prevenção de infecções relacionadas ao cateter venoso central não implantado de curta permanência. *Rev.enfermUERJ.* [Internet]. 2018 [citado 2021 mar 23]; 26:e31771. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0104-3552018000100503&lng=pt
4. Brachine JDP, Peterlini MAS, Pedreira MLG. *Método bundle em la reducción de infecciones relacionadas a cateteres centrales: una revisión integrativa.* *Rev.GaúchaEnferm.* [Internet]. 2012 [citado 2021 mar 24]; 33(4):200-210. Disponível em: https://www.scielo.br/scielo.php?pid=S1983-14472012000400025&script=sci_abstract&tlng=es
5. Oliveira FT, Ferreira MMF, Araújo STC, Bessa ATT, Moraes ACB, Stripp MAC. *Positive Deviance* como estratégia na prevenção e controle das infecções de corrente sanguínea na terapia intensiva. *Rev. Esc Enferm USP.* [Internet]. 2016 [citado 2021 mar 24]; 2017; 51:e03212.
6. Llapa-Rodríguez E O, Oliveira J LA, Melo F C, Silva GG, Mattos MCT, Jr V P M. *Inserción de cateter venoso central: adhesión abundante de prevención de infección.* *Rev. Bras. Enferm.* [Internet]. 2019 [citado 2021 mar 23]; 72(3):774-779. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0034-71672019000400774&lng=pt&nrm=iso&tlng=pt
7. Schwanke AM, Danski MTR, Pontes L, Kusma SZ, Lind J. Cateter venoso central para hemodiálise: incidência de infecção e fatores de risco. *Rev. Bras. Enferm.* [Internet]. 2018 [citado 2021 mar 25]; 71(3):1115-1121. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0034-71672018000501115&lng=pt&nrm=iso&tlng=pt
8. Curan GRE, Rosseto EG. Medidas para redução de infecção associada a cateter central em recém-nascidos: revisão integrativa. *Texto contexto – enferm.* [Internet]. 2017 [citado 2021 mar 24]; 26(1):e5130015. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S01040707201700100502&lng=en

9. La Torre FP, Baldanzi G, Troster EJ. Fatores de risco para infecções da corrente sanguínea relacionadas a cateter em unidades de terapia intensiva pediátrica. *Rev. bras. ter. intensiva*. [Internet]. 2018 [citado 2021 mar 25]; 30(4): 436-442. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-507X201800040043
10. Silva AG, Oliveira AC. Impacto da implementação dos *bundles* na redução das infecções da corrente sanguínea: uma revisão integrativa. *Texto contexto-enferm*. [Internet]. 2018 [citado 2021 mar 25]; 27(1):e3540016. Disponível em: <https://www.scielo.br/pdf/tce/v27n1/0104-0707-tce-27-01-e3540016.pdf>
11. Oliveira FT, Stipp MAC, Silva LD, Frederico M, Duarte SCM. Comportamento da equipe multiprofissional frente ao *bundle* do cateter venoso central na terapia intensiva. *Esc. Anna Nery*. [Internet]. 2016 [citado 2021 mar 25]; 20(1) 55-62. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-81452016000100055
12. Lucas TCS, Sá PLC, Santos LP, Leite CA, Caldeira ALP, Oliveira AC. Desafios de higienização das mãos para implementação dos *bundles* de cateter venoso central. *Rev. epidemiol. controle infecç*. [Internet] 2018 [citado 2021 mar 25]; 8(3): 2016-223. Disponível em: <https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1009953>
13. Costa CAB, Araújo FL, Costa ACL, Corrêa AR, Kusahara DM, Manzo BF. *Bundle* de cateter venoso central: conhecimento e comportamento de profissionais em unidades de terapia intensiva adulta. *Rev. esc. enferm*. [Internet]. 2020 [citado 2021 25 mar]; 54: e03629. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S0080-62342020000100472
14. Whittemore R, Knafk K. *The integrative review: updated methodology*. *J Adv Nurs* [Internet]. 2005 [cited 2018 Jan 20]; 52(5):546-53. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.9393&rep=rep1&type=pdf>
15. *Oxford Centre for Evidence-based Medicine: levels of evidence* [Internet]. 2009 [cited 2021 Mar 20]. Available from: <http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009>
16. Osorio J, Álvarez D, Pacheco R, Gómez CA, Lozano A. *Implementation of an insertion bundle for preventing central line-associated bloodstream infections in an Intensive Care Unit in Colombia*. *Rev. Chilena Infectol*. [Internet]. 2013. [cited 2021 out 15]; 30(5): 465-473. Available from: <https://scielo.conicyt.cl/pdf/rci/v30n5/art01>
17. Jardim JM, Lacerda RA, Soares NJD, Nunes BK. *Evaluation of practices for the prevention and control of blood stream infection in a government hospital*. *Rev. esc. Enferm. USP*. [Internet]. 2013. [cited 2021 out 15]; 47(1):38-45. Available from: <https://www.scielo.br/j/reusp/a/Cfvp7TjvzHy9wmdXJZQ6wWc/?lang=en>
18. Dallé J, Kuplich NM, Santos RP, Silveira DT. Infecção relacionada a cateter venoso central após a implementação de um conjunto de medidas preventivas (*bundle*) em centro de terapia intensiva. *Rev. HCPA*. [Internet]. 2012 [citado 2021 out 4]; 31(1):10-17. Disponível em: <https://www.lume.ufrgs.br/bitstream/handle/10183/157902/000835245.pdf?sequence=1&isAllowed=y>
19. Fortunatti CFP. Impacto de dois *bundles* na infecção relacionada a cateter central em pacientes críticos. *Rev. Latino-Am. Enfermagem*. [Internet]. 2017 [citado 2021 out 4]; 25:e2951. Disponível em: <https://www.scielo.br/j/rlae/a/7kNyXyq57MZDVJY6Qhf9d9n/?lang=pt&format=pdf>
20. Balelana Cleto ASC, Peterlini MAS, Pedreira MLG. Higienização das mãos como prática do cuidar: reflexão acerca da responsabilidade acerca da responsabilidade profissional. *Rev. Bras. Enferm*. [Internet]. 2017 [citado 2021 set 18]; 70(2):461-4. Disponível em: <https://www.scielo.br/j/reben/a/mfwspZTRBs3f9SjvLxHtHwg/abstract/?lang=pt#:~:text=RESUMO,RESUMO,relacionadas%20C3%A0%20assist%C3%A2ncia%20C3%A0%20sa%C3%A0>
21. BA de Souza LM, Ramos MF, Becker ES, Meirelles LCS, Monteiro SAO. Adesão dos profissionais de terapia intensiva aos cinco momentos de higienização das mãos. *Rev. Gaúcha. Enferm*. [Internet]. 2015 [citado 2021 set 18]; 36(4):21-28. Disponível em: <https://www.scielo.br/j/rgenf/a/9vXgJdqhXHX3KQfD6gQfyB/?lang=pt>
22. Oliveira FJG, Caetano JÁ, Silva VM, Almeida PC, Rodrigues AB, Siqueira JF. Uso de indicadores clínicos na avaliação das práticas de prevenção e controle de infecção de corrente sanguínea. *Rev. Texto & Contexto Enferm*. [Internet]. 2015 [citado 2021 set 21]; 24(4): 1018-1026. Disponível em: <https://www.redalyc.org/pdf/714/71443247013.pdf>
23. Junior FSM, Aquino RL, Junior NFPL. Infecção da corrente sanguínea relacionada ao cateter venoso central. *Rev. Enferm. UFPE online*. [Internet]. 2019 [citado 2021 set 21]; 2019;13:e242380. Disponível em: [file:///D:/Usuarios/Usuario/Downloads/242380-154952-1-PB%20\(1\).pdf](file:///D:/Usuarios/Usuario/Downloads/242380-154952-1-PB%20(1).pdf)

24. Pedrolo E, Danski MTR, Mingorance P, Lazzari LSM, Johann DA. Ensaio clínico controlado sobre o curativo de cateter venoso central. *Acta paul. enferm.* [Internet]. 2011 [citado 2021 set 23]; 24(2):278-83. Disponível em: <https://www.scielo.br/j/ape/a/YCzZgnQs35DyLrvdB4KH6K/?lang=pt#> Brasil. Secretaria de Estado de Saúde do Rio de Janeiro. Protocolo de prevenção de infecção de corrente sanguínea associada a cateteres centrais. Rio de Janeiro: Secretaria Estadual de Saúde, 2015
25. Brasil. Agência Nacional de Vigilância Sanitária. Segurança do paciente em serviços de saúde: higienização das mãos. Brasília: Anvisa, 2009.
26. Pedrolo E, Danski MTR, Vayego SA. Curativo de clorexidina e gaze e fita para cateter venoso central: ensaio clínico randomizado. *Rev. Latino-Am. Enfermagem.* [Internet]. 2014 [citado 2021 out 4]; 22(5):764-71. Disponível em: <https://www.scielo.br/j/rlae/a/kh9HnSNjTbCBzsB8GQ6Bxbn/?lang=pt&format=pdf>
27. Oliveira AC, Sarmiento CG. O que usar no preparo cirúrgico da pele: povidona-iodo ou clorexidina? *Rev. SOBECC.* [Internet]. 2018 [citado 2021 out 4]; 23(4):155-159. Disponível em: <https://revista.sobecc.org.br/sobecc/article/view/391>
28. Dotto PP, Zucuni CP, Antes GB, Fernandes M, Favarin AG, Christ R, Santos BZ et al. Eficácia de dois métodos de degermação das mãos. *Rev. cir. traumatol. buco-maxilo-fac.* [Internet]. 2015. [citado 2021 out 5]; 15(3):7-14. Disponível em: <http://revodontobvsalud.org/pdf/rctbmf/v15n3/a02v15n3.pdf>
29. Rosado V, Romanello RMC, Camargos PAM. Fatores de risco e medidas preventivas das infecções associadas a cateteres venosos centrais. *J. Pediatr.* [Internet]. 2011. [citado 2021 out 5]; 87(6):469-477. Disponível em: <https://www.scielo.br/j/jped/a/fP8PYHv6gnjFb3R9RsyMqTv/?lang=pt#>
30. Carranza AG, Pizarro VC, Cárdenas GQ, Badilla MJM, Quirós AA. Cateter venoso central e suas complicações. *Med. Leg. Costa Rica.* [Internet]. 2020. [citado 2021 out 5]; 37(1): 74-86. Disponível em: https://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S1409-00152020000100074&lang=pt
31. Brasil. Conselho Regional de Enfermagem do Estado de São Paulo. 10 passos para a segurança do paciente. São Paulo: COREN-SP, 2010.
32. Gomes AVO, Nascimento MAL. O processo do cateterismo venoso central em Unidade de Terapia Intensiva Neonatal e Pediátrica. *Rev. esc. enferm. USP.* [Internet]. 2013. [citado 2021 out 6]; 47(1):794-800. Disponível em: <https://www.scielo.br/j/reeusp/a/LPV9HwVCvWgFr4yYGJmytPj/?lang=pt#ModalArticles>