

Nursing care for patients with short-term central venous catheter: an integrative review

Cuidados de enfermagem ao paciente com cateter venoso central de curta permanência:
revisão integrativa

Atención de enfermería a pacientes con catéter venoso central para corta duración: revisión
integradora

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ABSTRACT

Objective: to identify, through a review of the scientific literature, the care provided during nursing assistance to patients using short-term central venous catheters. **Method:** an integrative literature review was conducted, utilizing eight databases and based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The eligibility criteria included complete studies published between January 2017 and December 2021, in Portuguese, Spanish, and English. Exclusion criteria consisted of studies related to dialysis, pediatrics, neonatology, and other types of catheters. The initial search was conducted in pairs in February 2022, resulting in a sample of 48,987 studies, which were exported to the Rayyan software. **Results:** the review included 23 published studies, mostly from Brazil (30.4%) and from the year 2019 (47.8%). After analysis, five recurring themes were identified in the literature: types of dressings used, skin antiseptic solutions, connection disinfection, device permeability, and identification and documentation.

Conclusion: there is a need for studies with higher levels of evidence. The most frequently mentioned care practices involved hand hygiene, connection disinfection, skin antiseptic techniques, and dressing changes.

Descriptors: Nursing Care; Central Venous Catheterization; Evidence-Based Nursing; Hospital Care; Nursing.

RESUMO

Objetivo: identificar, na literatura científica, os cuidados realizados durante a assistência de enfermagem ao paciente em uso de cateter venoso central de curta permanência. **Método:** trata-se de uma revisão integrativa da literatura realizada em oito bases de dados e baseada nas recomendações do protocolo *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA). Os critérios de elegibilidade foram estudos completos publicados entre janeiro de 2017 e dezembro de 2021, nos idiomas português, espanhol e inglês. Critérios para exclusão consistiram em estudos relacionados à diálise, pediatria, neonatologia e outros tipos de cateteres. A busca inicial ocorreu em pares no mês de fevereiro de 2022, resultando em uma amostra de 48.987 estudos, os quais foram exportados para o software Rayyan.

Resultados: compondo a revisão, estão 23 estudos publicados, em sua maioria, no Brasil (30,4%) e no ano de 2019 (47,8%). Após a análise, foram identificados cinco temas recorrentes na literatura: coberturas utilizadas, soluções para antissepsia da pele, desinfecção de conexões, permeabilidade do dispositivo e identificações e registros. **Conclusão:** há necessidade de publicação de estudos com níveis de evidência mais elevados. Os cuidados mais citados envolviam higiene das mãos, desinfecção de conexões, antissepsia da pele e troca de curativos.

Descritores: Cuidados de Enfermagem; Cateterismo Venoso Central; Enfermagem Baseada em Evidências; Assistência Hospitalar; Enfermagem.

RESUMEN

Objetivo: identificar, a través de una revisión de la literatura científica, los cuidados proporcionados durante la asistencia de enfermería a pacientes que utilizan catéteres venosos centrales de corta duración. **Método:** revisión integradora de la literatura en ocho bases de datos y siguiendo las pautas del *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA). Los criterios de elegibilidad incluyeron estudios completos publicados entre enero de 2017 y diciembre de 2021, en portugués, español e inglés. Los criterios de exclusión consistieron en estudios relacionados con diálisis, pediatría, neonatología y otros tipos de catéteres. La búsqueda inicial se realizó en parejas en febrero de 2022, lo que resultó en una muestra de 48,987 estudios, que fueron exportados al software Rayyan. **Resultados:** la revisión incluyó 23 estudios, principalmente de Brasil (30.4%) y del año 2019 (47.8%). Después del análisis, se identificaron cinco temas recurrentes en la literatura: tipos de apósitos utilizados, soluciones antisépticas para la piel, desinfección de conexiones, permeabilidad del dispositivo e identificación y documentación. **Conclusión:** se requieren estudios con mayor nivel de evidencia. Las prácticas de cuidado más mencionadas incluyeron la higiene de las manos, la desinfección de las conexiones, las técnicas antisépticas para la piel y los cambios de apósitos.

Descriptores: Atención de Enfermería; Cateterismo Venoso Central; Enfermería Basada en la Evidencia; Atención Hospitalaria; Enfermería.

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INTRODUCTION

Patient safety represents one of the greatest challenges to achieving excellence in healthcare quality. Within this scenario, although accurate data is lacking, research indicates that millions of people worldwide are affected by adverse events during healthcare. These events, which pose challenges to ensuring quality in the healthcare field, highlight the disparity between ideal care and the actual care provided. In the face of potential unfavorable situations in healthcare, nursing practice must be conducted with the objective of promoting quality care and ensuring patient safety.¹⁻³

Outpatient and hospitalized patients often require the use of intravascular devices for various purposes. These devices play a crucial role in addressing patients' physiological needs based on their clinical conditions. Globally, approximately 60% of hospitalized patients in healthcare institutions require parenteral solutions through peripheral or central routes. The

choice of route depends on the severity of the clinical condition and the availability of materials and technological resources.⁴

The short-term central venous catheter (CVC) is a vascular device that provides direct access to the bloodstream. It is used for administering parenteral infusions, including medications, blood products, intravenous solutions, parenteral nutrition, chemotherapy, and other solutions. Additionally, the CVC enables monitoring procedures such as measuring central venous pressure, conducting diagnostic tests, and even performing hemodialysis [5-6]. This device is extensively utilized in patients requiring highly complex care. When the peripheral route is not feasible or recommended, the short-term CVC serves as an alternative, minimizing the risk of complications associated with multiple insertions of peripheral venous catheters. Its longer dwell time exceeds that of peripheral devices.⁷

Adverse events related to intravascular therapy, such as Primary Bloodstream Infections (PBSI), can be prevented through the implementation of evidence-based safe care practices. These infections arise from failures, misunderstandings, and errors during patient care, and have the potential to worsen the patient's clinical condition. Consequently, they contribute to longer hospital stays, increased costs of medications and supplies, as well as occupying beds in medium and high complexity healthcare settings.⁸⁻⁹

Patients utilizing invasive devices like short-term CVC require specific care measures to prevent the introduction of microorganisms into their venous system.¹⁰ In Brazil, a survey on the incidence of PBSI associated with short-term CVC has been conducted since 2010. It is worth noting that there has been a decline in reported cases over the past decade. However, occurrences still happen frequently.¹¹

Nursing professionals possess the necessary skills and responsibility to provide care during the management of short-term CVCs. They are specialized in the theoretical knowledge, procedures, practices, techniques, and clinical aspects related to this type of catheter. However, it is acknowledged that continuous updates on management practices are essential. The absence of scientific knowledge regarding proper management and failures in the care process can compromise patient safety.¹²⁻¹³

The training and ongoing education of healthcare professionals are considered fundamental and are guaranteed by the constitution.¹⁴ In 2004, the Ministry of Health (MH) introduced the National Policy for Permanent Education in Health (PNEPS in Portuguese) to enhance the organization of professional practices.¹⁵ Permanent Health Education (PHE) offers

educational strategies that prioritize on-the-job training, with the goal of promoting changes in care practices.¹⁶

Nursing practice encompasses the management of care, knowledge, resources, and actions required for nursing interventions.¹⁷ Consequently, understanding the primary concerns or challenges faced by professionals managing short-term CVCs can serve as a strategy to guide educational initiatives and enhance the quality of nursing care. It is believed that offering a theoretical-scientific foundation through educational interventions provides opportunities for updating and enhancing the knowledge and skills of the nursing team within the healthcare setting.

Within this context, the significance of providing proper care for the short-term CVC and ensuring nursing professionals have a solid theoretical and scientific foundation is evident. Standardizing techniques and care practices in managing the CVC significantly contributes to enhancing the clinical outcomes of patients utilizing this device. This study was designed and structured with the aim of recognizing the importance of generating new hypotheses to propose studies and technological products that encompass educational interventions within the healthcare service and are applied in patient care by nursing professionals.

OBJECTIVE

To identify, through a review of the scientific literature, the care provided during nursing assistance to patients using short-term central venous catheters.

METHOD

This study is an Integrative Literature Review (ILR) that was developed and carried out in accordance with the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol.¹⁸⁻²⁰ The ILR methodology involves six steps aimed at organizing and systematizing information on a specific topic, thereby facilitating a deeper understanding.²⁰ In the healthcare context, conducting an ILR enables the identification of interventions that can generate research hypotheses and be incorporated as evidence-based practices in healthcare settings.

The guiding question for this study was formulated using the PICO acronym, which includes: P - Population (nursing professionals); I - Phenomenon of interest (short-term CVC management); and Co - Context of the study (lower incidence of adverse events resulting from care) [21]. By adopting this approach, the following question was formulated: "What precautions

are taken by the nursing team during the management of short-term CVCs to reduce the incidence of adverse events?"

The search for relevant studies was conducted by accessing the following databases and portals online: Medical Literature Analysis and Retrieval System Online (MEDLINE), US National Library of Medicine National Institutes of Health (PubMed), Scientific Electronic Library Online (SciELO), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Health Sciences Literature (LILACS), Nursing Database (BDEnf), SCOPUS, and Web of Science.

The search strategy employed in this study involved a combination of controlled descriptors that were indexed in the databases, along with the use of Boolean operators AND and OR.²⁰ These descriptors were derived from medical metadata bases, such as Descriptors in Health Sciences (DeCS), Medical Subject Headings (MeSH), and Cinahl Headings (Figure 1).

Figure 1. Search strategy adopted according to the data sources used. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Database	Strategy
MEDLINE PubMed SciELO BDEnf	Catheterization, Central Venous AND Nursing Care OR Evidence-Based Nursing OR Quality of health care OR Nurse Practitioners
CINAHL	Catheterization, Central Venous AND Nursing Care OR Nursing Practice, Evidence-Based OR Quality of Health Care OR Nurse Practitioners
LILACS	(Catheterization, Central Venous) AND (Nursing Care) OR (Evidence-Based Nursing) OR (quality of health care) OR (Nurse Practitioners)
SCOPUS	(ALL (“nursing care” OR “nurse practitioners” OR “management nursing care” OR “nursing care management” OR “quality of health care” OR “evidence-based nursing” AND ALL (“catheterization, central venous” OR “central venous catheters” OR “vascular cateter” OR “catheters, vascular” OR “catheter, vascular” OR “vascular catheters” OR “vascular access device” OR “device, vascular access” OR “vascular access devices”)))
Web of Science	Catheterization, Central Venous AND Nursing Care OR (Evidence-Based Nursing) OR (quality of health care) OR (Nurse Practitioners)

Source: Prepared by the authors, 2022.

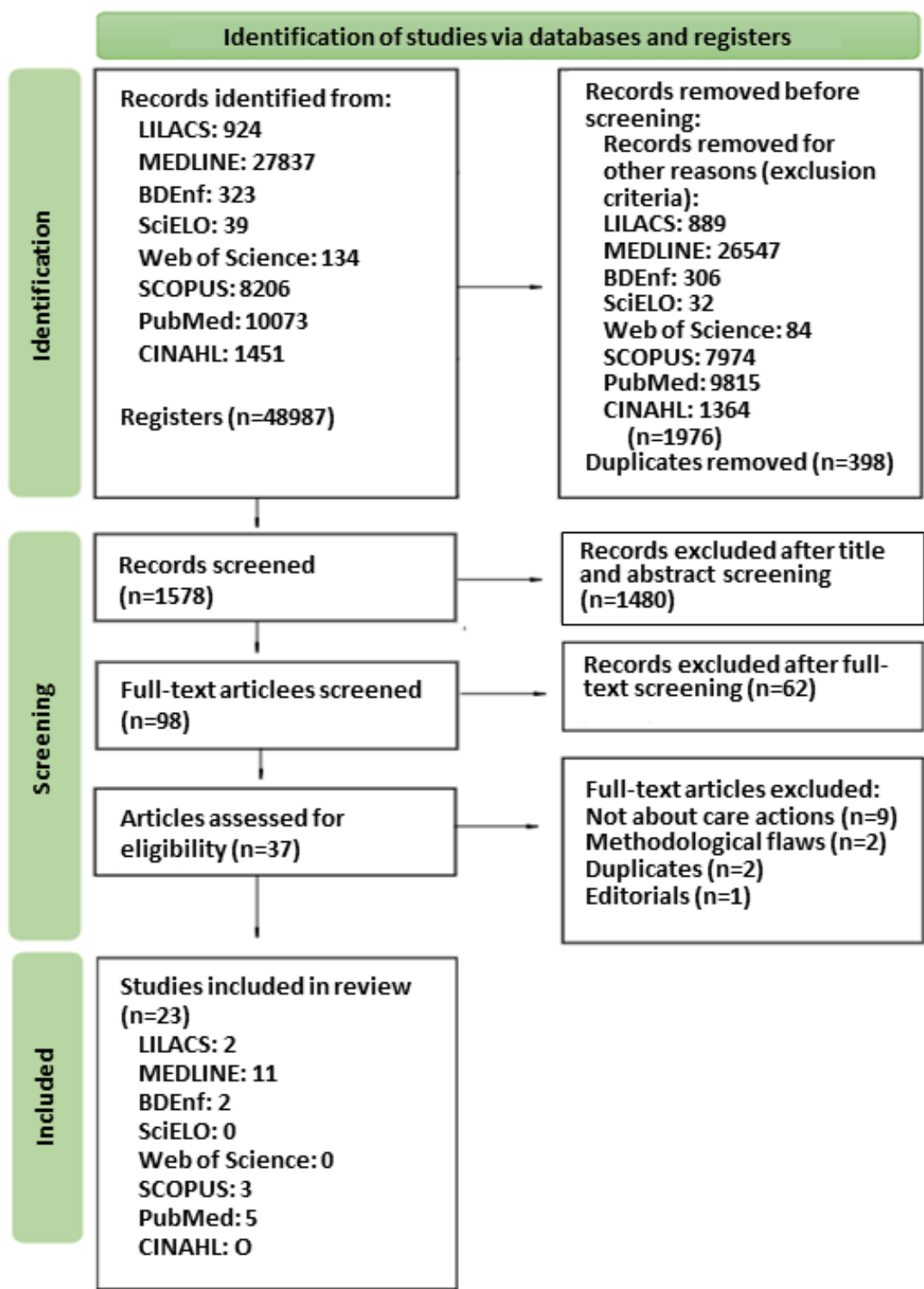
The search strategies were tailored to accommodate the specificities of each database, ensuring that their unique characteristics were respected. Access to the databases was

facilitated through the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) using remote access to the Federated Academic Community (CAFe).

The following eligibility criteria were applied to select relevant studies: full-text studies, published within the period between January 1, 2017, and December 31, 2021, and available in Portuguese, Spanish, or English. Studies related to dialysis, pediatrics, neonatology, and other types of catheters were excluded, along with editorials, term papers, dissertations, theses, integrative and bibliographic reviews, and simple and expanded abstracts. Additionally, studies with serious methodological flaws identified by the reviewers during the critical analysis were also excluded.

In February 2022, the search for indexed studies was conducted, yielding a total of 48,987 articles. These results were subsequently imported into the Rayyan® software, a tool utilized for storage, sample selection, identification of duplicates, and blinding of researchers. After eliminating duplicate records, the inclusion or exclusion of studies was determined through a double-blind process based on the examination of titles and abstracts. In cases where disagreement arose, a third researcher was involved to resolve the discrepancy. Subsequently, the selected articles underwent a thorough reading following the same methodological procedure. As a result, a final corpus of 23 scientific articles was identified, which effectively addressed the research question. The selection of studies adhered to the PRISMA guidelines, as depicted in Figure 2.

Figure 2. Adaptation of the PRISMA study selection flowchart.¹⁸ Porto Alegre, Rio Grande do Sul, Brazil, 2022.



Source: Prepared by the authors, 2022.

The Evidence Level (EL) was determined using the classification proposed by Melnyk and Fineout-Overholt's evaluation instrument. This instrument assesses the methodological guidelines employed in the study to gauge the quality of evidence. The instrument assigns seven scores for measuring the level of evidence, denoted by the following metrics: EL I: Evidence derived from a systematic review or meta-analysis of multiple randomized clinical trials; EL II: Evidence obtained from at least one well-designed randomized controlled clinical trial; EL III: Evidence derived from well-designed clinical trials without randomization; EL IV: Evidence from well-designed cohort and case-control studies; EL V: Evidence from a

systematic review of descriptive and qualitative studies; EL VI: Evidence derived from a single descriptive or qualitative study; and EL VII: Evidence based on the opinion of authorities and/or reports from expert committees.²³

For the critical analysis of the results, the findings were categorized and grouped based on the similarity of the results presented. Descriptive and qualitative statistics were employed to analyze the scientific evidence obtained from the sample. Since this study was an integrative literature review and did not involve research on human subjects, it was not submitted to appreciation by any Research Ethics Committee. However, the study respected the copyright of the selected studies included in the review.

RESULTS

The search and selection process resulted in the inclusion of 23 articles for the integrative literature review. Among the selected studies, 11 articles (47.8%) were published in 2019,^{13,24-33} 2 articles (8.7%) were published in 2017,⁴⁰⁻⁴¹ and 1 article each (4.3%) was published in 2020,⁴²⁻⁴³ and 2021,⁴⁴⁻⁴⁵ respectively. The analysis corpus consists of 7 national publications (30.4%) and 16 international publications (69.6%), providing a comprehensive global perspective on the topic. Among the international studies, 5 (31.4%) were conducted in China,^{26-27,31-33} 2 (12.6%) in the United States,^{28,44} 2 (12.6%) in Jordan,^{34,38} and 1 (6.2%) each in Turkey,²⁴ Switzerland,⁴⁵ the United Kingdom,¹³ Lebanon,³⁰ Japan,²⁹ India,⁴¹ and Chile⁴⁰.

At the conclusion of the systematic search, the articles were found in different languages. Specifically, 15 articles (65.2%) were in English, 7 articles (30.5%) were in Portuguese, and 1 article (4.3%) was in Spanish. In terms of the databases and portals utilized, MEDLINE accounted for the majority with 11 articles (47.9%), followed by PubMed with 5 articles (21.7%), SCOPUS with 3 articles (13%), and BDEnf and LILACS with 2 articles each (8.7%).

Among the journals included in the review, three journals published two articles each: American Journal of Infection Control, Journal of Hospital Infection, and Journal of Vascular Access. The remaining journals published only one article each: Australian Critical Care, BMC Infectious Diseases, BMJ Quality & Safety, British Journal of Nursing, Indian Journal of Critical Care Medicine, International Journal of Nursing Practice, Journal of Infection and Chemotherapy, Journal of Infusion Nursing, Journal of Nursing Care Quality, Journal of Perianesthesia Nursing, Medicine, Revista da Escola de Enfermagem da USP, Revista de Enfermagem UFPE Online, Revista de Epidemiologia e Controle de Infecção, Revista Latino-

Americana de Enfermagem, Revista Referência, Saudi Medical Journal, and Texto & Contexto Enfermagem.

The sample of articles included in the review had diverse levels of evidence. Five articles (21.7%) were classified as EL I, one article (4.3%) as EL II, one article (4.3%) as EL III, six articles (26.2%) as EL IV, three articles (13%) as EL V, six articles (26.2%) as EL VI, and one article (4.3%) as EL VII. No standardization was identified regarding the quality of evidence in relation to the country or year of publication. The sample included articles from various levels of evidence, with 13 articles (56.5%) evaluated as I, II, III, and IV, and 10 articles (43.5%) as V, VI, and VII. The studies were organized according to their level of evidence and the mentioned nursing care, as shown in Figure 3.

Figure 3. Characterization of the sample of selected studies. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Article	Journal, Year of publication	Evidence level	Summary of recommendations
The case for using a disinfecting cap for needlefree connectors ¹³	British Journal of Nursing, 2019	EL I	The evidence indicates that the use of passive disinfectant caps is good practice to protect the lumens of CVCs.
Examination of nursing drug administration practices via central venous catheter: An observational study ²⁴	Journal of Vascular Access, 2019	EL VI	Hand hygiene, disinfection of the three-way stopcock using cotton soaked in alcohol, allowing the alcohol to dry, and flushing the lumen with a compatible fluid.
Bundle para a prevenção de infecção de corrente sanguínea ²⁵	Revista de Enfermagem UFPE On line, 2019	EL IV	Hand hygiene, skin antisepsis with chlorhexidine gluconate, use of gloves when handling the catheter; friction of catheter connections with antiseptic solution; dressing the CVC insertion site with alcoholic chlorhexidine and sterile gauze or transparent semipermeable film; maintenance of the equipment and connector exchange routine, identifying them; and daily assessment of maintenance needs.
A hospital-wide reduction in central line–associated bloodstream infections through systematic quality improvement initiative and	American Journal of Infection Control, 2019	EL IV	Developing kits for proper insertion of the CVC; establishing and training a fixed team to carry out the insertion; reinforcing the importance of hand hygiene; and developing an educational program focused on the insertion,

multidisciplinary team work ²⁶			care and maintenance of the CVC.
Chlorhexidine disinfectant can reduce the risk of central venous catheter infection compared with povidone: a meta-analysis ²⁷	American Journal of Infection Control, 2019	EL I	Use of alcoholic chlorhexidine during CVC dressing.
A Collaborative Approach to Reducing Central Line-Associated Bloodstream Infections ²⁸	Journal of Nursing Care Quality, 2019	EL VII	Proper dressing performance (dressing labeling, proper placement, and dressings being occlusive with no visible blood under the dressing).
Maintenance antisepsis in reducing the rate of late-onset central venous catheter-related bloodstream infection: A comparison of 0.05% and 1% chlorhexidine ²⁹	Journal of Infection and Chemotherapy , 2019	EL IV	Substitution of 0.05% chlorhexidine antiseptic with 1% chlorhexidine.
Achieving a Zero Central Line-Associated Bloodstream Infection Rate in 4 Critical Care Units in Lebanon ³⁰	Journal of Infusion Nursing, 2019	EL IV	Eliminating the use of multiple three-way stopcocks, replacing them with needleless connector devices on all ports, evaluating the site of the central venous access device for signs of infection or thrombophlebitis, avoiding the use of gauze dressings except in specific conditions, as they can retain moisture and promote infection, and utilizing a 2% chlorhexidine solution for antiseptic purposes.
Chlorhexidine-impregnated dressing for the prophylaxis of central venous catheter-related complications: a systematic review and meta-analysis ³¹	BMC Infectious Diseases, 2019	EL I	Dressing impregnated with chlorhexidine in the prophylaxis of complications related to CVC.
Comparative efficacy of 13 antimicrobial dressings and different securement devices in reducing catheter-related bloodstream infections: A Bayesian et work meta-analysis ³²	Medicine, 2019	EL I	The meta-analysis showed that the transparent dressing may be the best way to prevent short-term CVC-associated bloodstream infections.

Chlorhexidine gluconate transparent dressing does not decrease central line-associated bloodstream infection in critically ill patients: A randomized controlled trial ³³	International Journal of Nursing Practice, 2019	EL II	Using transparent gluconate dressing instead of the standard gauze and tape dressing.
Impact of two bundles on central catheter-related bloodstream infection in critically ill patients ³⁴	Revista Latino-Americana de Enfermagem, 2017	EL IV	Daily assessment of the need for CVC maintenance, review of the CVC insertion site and dressing verification and daily cleaning with 2% chlorhexidine.
A methodological study to develop a standard operational protocol for nurses on central line catheter care of patients in selected intensive care units ³⁵	Indian Journal of Critical Care Medicine, 2017	EL V	Dressing: Using a face mask, sterile gloves, stabilizing the catheter during cover removal, careful dressing removal, hand hygiene, daily dressing assessment, proper disposal, correct identification; Daily care: disinfection of connections before and after use, checking the fixation and permeability; Changing connections: changing the equipment every 72 hours, changing the dressing every 7 days, changing the multipurpose adapter every 72 hours; Hand hygiene: performing it before each contact with the CVC, before putting on gloves and after removing gloves.
Nurses' compliance with central line associated blood stream infection prevention guidelines ³⁶	Saudi Medical Journal, 2018	EL VI	Actions taken based on Centers for Disease Control and Prevention Centerline-associated bloodstream infection prevention guidelines: daily assessment of catheter insertion site; evaluation of the dressing date; keeping the dressings clean and dry; hand hygiene; use of sterile gloves; connections disinfection; washing with 0.9% SF; equipment replacement; keeping non-used lines blocked with caps; and using as few lumens as possible.
Desafio da higienização das mãos para a implementação dos <i>bundles</i> de cateter venoso central ³⁷	Revista de Epidemiologia e Controle de Infecção, 2018	EL VI	Hand hygiene when handling the device.

Chlorhexidine-impregnated gel dressing compared with transparent polyurethane dressing in the prevention of catheter-related infections in critically ill adult patients: A pilot randomised controlled trial ³⁸	Australian Critical Care, 2018	EL I	Use of dressing impregnated with chlorhexidine versus polyurethane dressing.
Implementation of Tailored Interventions in a Statewide Programme to Reduce Central Line-associated Blood Stream Infections ³⁹	Journal of Hospital Infection, 2018	EL IV	Alcohol for hand hygiene; provision of catheter insertion kits; provision of alcohol swabs for disinfection of connections; training of healthcare professionals; strengthening leadership within the ICU; and providing feedback to the workers.
Teaching module for improving oncology nurses' knowledge and self-confidence about central line catheters caring, complications, and application: A pretest-posttest quasi-experimental design ⁴⁰	Journal of Vascular Nursing, 2018	EL VI	Frequency of dressing changes for CVC, antiseptics, insertion sites, lumen flushing, medication and fluid administrations, insertion site and use of aseptic technique.
Medical and nursing team self-reported knowledge on bloodstream infection prevention measures ⁴¹	Texto & Contexto Enfermagem, 2018	EL VI	Use of gloves, application of antiseptic solution during dressing changes (germicidal chlorhexidine), hand hygiene, sterile dressing (sterile gauze or transparent film), dressing change according to unit protocol, and disinfection of the hub before medication administration.
Prática clínica dos enfermeiros na prevenção da infecção associada ao cateter venoso central ⁴²	Revista Referência, 2020	EL V	Administration of blood products and lipid solutions, no wearing of hand jewelry, guidelines for changing or replacing the systems, hand hygiene, proper method of system flushing, and use of gloves.
Central Venous Catheter bundle: professional knowledge and behavior in adult Intensive Care Units ⁴³	Revista da Escola de Enfermagem da USP, 2020	EL VI	Actions based on bloodstream infection prevention bundles, including: hand hygiene, use of chlorhexidine followed by alcohol-based antiseptic, dating hubs or connectors, using proper attire for catheter insertion, allowing

			antiseptic to dry before catheter insertion, and disinfecting hubs or connectors with 70% alcohol.
Central Line Care and Management: Adopting Evidence-Based Nursing Interventions ⁴⁴	Journal of Perianesthesia Nursing, 2021	EL V	Hand hygiene, maximum sterile barrier precautions, chlorhexidine use, catheter site selection, and daily evaluation of the need for the device.
Implementation of daily chlorhexidine bathing in intensive care units for reduction of central line-associated bloodstream infections ⁴⁵	Journal of Hospital Infection, 2021	EL III	Daily bathing with chlorhexidine.

Source: Prepared by the authors, 2022.

DISCUSSION

The prevention of infections is supported by multiple studies included in this review, emphasizing the significance of proper hand hygiene throughout all stages of managing short-term CVCs to reduce infection rates associated with their use.^{24-26,34,37,39,41,43} This preventive measure aligns with the guidelines provided by the Infusion Nurses Society (INS).⁴⁶ A Brazilian study investigating the clinical practices of nursing professionals in device care highlighted the importance of removing adornments and maintaining nail hygiene as crucial steps in the hand hygiene process.⁴²

In another prospective study conducted in an ICU of a hospital in Switzerland, the incidence of PBSI was examined before and after the implementation of daily baths with chlorhexidine, which were adopted as a preventive measure for patients with short-term CVCs. The study revealed a significant reduction in PBSI cases, with the incidence rate decreasing from 2.45 per 1000 catheter days to 1.00 per 1000 catheter days, representing a reduction of approximately 60%. It is worth noting that patients who had experienced recurrent PBSI during the analysis period did not have any new episodes following the implementation of the intervention.⁴⁵ However, there are conflicting findings in the literature, as some studies did not observe a significant difference in the prevention of PBSI with the implementation of chlorhexidine baths.^{10,47}

Regarding the connections, it is recommended to disinfect them with alcohol-based solutions during manipulation, such as during administrations or collections performed on short-term CVCs,^{24-25,34,37,39,41,43} For this manipulation, swabs^{37,43} or cotton balls²⁴ soaked in 70%

alcohol solution can be used. The INS establishes that mechanical disinfection of the connections should be performed for a period of 5 to 15 seconds using 70% alcohol solution or, if contraindicated, alcohol-based chlorhexidine.⁴⁶

As for the use of three-way connector mechanisms, known as "taps or hubs," they should be installed only when the patient has a clinical need, such as the prescription of multiple infusions.³⁰ The replacement of these connectors is recommended every 72 hours of use or when they become dirty.⁴¹ It is important to emphasize the non-reuse of occlusives after each disconnection from the short-term CVC.^{25,30,43} Consistent with this scenario, the INS recommends immediate disposal of the occlusive in use, its replacement with a new one, and emphasizes the importance of following the manufacturer's standards for the maximum time of use of the three-way connector mechanism, provided it does not exceed 96 hours.⁴⁶

Nursing care related to dressing changes recommends that they be performed in a sterile manner.^{25,30-31,33-34,41,44} Regarding the coverage of short-term CVCs, the use of transparent film is indicated,^{25,32-33,36,39} followed by a sterile gauze dressing.^{25,39}

A study conducted in China in 2019 evaluated the rate of PBSI in patients using transparent dressings impregnated with chlorhexidine compared to patients using standard coverings. The study did not reveal a significant difference in the incidence between the two groups.³³ This result is consistent with a study conducted in Brazil in 2018 that compared the use of transparent dressings impregnated with chlorhexidine to semi-permeable transparent dressings and found no statistical difference in reducing the incidence of PBSI between the two coverings.³⁶

It is important to highlight that the performed dressings should be properly identified and dated to verify their validity according to the patient's medical records.^{28,34,41} The transparent film dressing is changed every seven days or when it becomes loose or dirty. The INS recommends changing it before the recommended date if the skin shows signs of irritation. No data or information regarding the change of dressings with sterile gauze were found in the sample of studies in this review. However, the INS suggests changing the dressing every 48 hours if it remains intact or immediately in case of dirt, moisture, or detachment.⁴⁶

The use of 2% Chlorhexidine solution for skin antisepsis during dressing changes is recommended by several studies.^{25,27,30,39-40,43-44} In a study conducted in Japan over a two-year period, the prevalence of PBSI was compared between patients undergoing skin antisepsis with 0.05% chlorhexidine and 1% chlorhexidine. It was observed that the use of 1%

chlorhexidine reduced the risk of PBSI from 3.64/1,000 catheter-days to 1.77/1,000 catheter-days, representing a reduction of approximately 48%. However, this study also highlighted an increase in complaints of sensitivity at the site of antisepsis, indicating the possibility of an adverse event associated with the use of 1% chlorhexidine.²⁹

A meta-analysis conducted in China compared the use of chlorhexidine-based solutions with iodopovidone-based solutions for skin antisepsis and found a 36% reduction in device contamination when alcoholic chlorhexidine was used.²⁷

The daily assessment of the insertion site of short-term CVC by nursing professionals, especially nurses, is necessary to reassess the continuation of device use and identify possible signs of inflammation.^{25,34,40-41,44} Studies emphasize the importance of flushing the lumens of the CVC to prevent device occlusion.^{24,34,38} Flushing should be performed with 0.9% saline solution³⁴ or a compatible fluid.²⁴ The infusion sets used for continuous infusions in the CVC should be dated at the beginning of use and replaced every 72 hours or according to medication specifications.³⁴

It is worth noting that the implementation of bundles of measures has been shown to be effective in reducing PBSI associated with short-term CVCs.^{35,40,43} In a study that implemented a bundle for device insertion and maintenance, a 54.5% reduction in CVC infection rate was observed.⁴⁰ Another study showed a 57% reduction.²⁸ However, it was revealed that it is crucial to update and enhance professionals' knowledge regarding the guidelines proposed by the bundles of measures.⁴³ The INS emphasizes the importance of providing feedback to the team after education and implementation of the measures.

Limitations encountered include the limited number of updated studies on the topic and the risk of biases present in primary studies. There is a need for the development of studies with robust methodological designs, considering that the sample composition includes articles classified as levels IV, V, VI, or VII.

CONCLUSION

The care provided to patients with short-term CVC should be supported by scientific evidence aiming to prevent and reduce adverse events. It is emphasized that hospital complications related to intravenous devices should be minimized, ensuring a hospital stay free from adverse events for the patient.

Among the nursing care provided to patients with short-term CVC, the following actions for the prevention of PBSI were highlighted in this review: hand hygiene, disinfection of connections, skin antisepsis, dressings, daily device assessment, and the use of bundles.

The relevance of technical-scientific knowledge and continuous education for the proper management of CVC is considered. It is suggested that nurses invest in sources of updates and professional improvement. Professional updating is considered mandatory; however, ways should be devised to facilitate access to information and raise awareness among the nursing team for their participation in institutional educational activities.

CONTRIBUTIONS

The authors contributed equally to the design of the research project, data collection, analysis, and discussion, as well as to the writing and critical review of the manuscript's content with intellectual contribution and approval of the final version of the study.

CONFLICT OF INTERESTS

Nothing to declare.

REFERENCES

1. Diz ABM, Lucas PRMB. Hospital patient safety at the emergency department - a systematic review. *Ciênc saúde coletiva* [Internet]. 2022 [cited 2022 Jul 12];27(5):1803-12. DOI: <https://doi.org/10.1590/1413-81232022275.22742021>
2. Spadojevic ASS, Gomes AQF, Teixeira CP, Mello CMB, Carvalho DGO, Ribeiro JCA, et al. Plano Estadual de Segurança do Paciente. [Internet]. Rio de Janeiro: Secretaria de Estado de Saúde do Rio de Janeiro. Subsecretaria de Vigilância e Atenção Primária à Saúde. 2021 [cited 2022 Set 03] Available from: <https://www.saude.rj.gov.br/comum/code/MostrarArquivo.php?C=NDM3Mzc%2C>
3. Moreno J, Silva A, Santos I, Maia P. Erro e eventos adversos na unidade de cuidados intensivos. In: Pinho J, coord. *Enfermagem em cuidados intensivos*. Lisboa: Lidel; 2020. p. 33-41
4. Instituto Brasileiro de Segurança do Paciente (BR). Terapia infusional: como as práticas de segurança do paciente evitam erros e infecções [Internet]. São Paulo: IBSP; 2017 [cited 2022 Jul 28]. Available from: <https://segurancadopaciente.com.br/seguranca-e-gestao/terapia-infusional-como-as-praticas-de-seguranca-do-paciente-evitam-erros-e-infeccoes/#:~:text=Além%20da%20identificação%20do%20paciente,relacionada%20à%20assistência%20a%20saúde>
5. Tirado-Reyes RJ, Silva-Maytorena R. Nivel de conocimiento y cuidado enfermero del paciente con catéter central en Culiacán, Sinaloa, México. *Rev Enferm Inst Mex Seguro Soc*. [Internet]. 2020 [cited 2022 Jul 28];28(1):25-36. Available from: http://revistaenfermeria.imss.gob.mx/editorial/index.php/revista_enfermeria/article/view/1110/1054
6. Brasher C, Malbezin S. Central venous catheters in small infants. *Anesthesiology*. [Internet]. 2018 [cited 2022 Jul 28];128(1):4-5. DOI: <https://doi.org/10.1097/ALN.0000000000001961>

7. Araújo FL, Manzo BF, Costa ACL, Corrêa AR, Marcatto JO, Simão DAS. Adherence to central venous catheter insertion bundle in neonatal and pediatric units. *Rev Esc Enferm USP*. [Internet]. 2017 [cited 2022 Jul 28];51:e03269. DOI: <https://doi.org/10.1590/S1980-220X2017009603269>
8. Moreira AS, Silva DM, Carvalho MKSL, Santos MB, Marques ES, Santos M, Rocha IMSA, Santos IV. Iatrogenes in nursing and hospital infection: how to prevent and ensure patient safety?. *Bras J Hea Rev*. [Internet]. 2020 [cited 2022 Jul 28];3(3):6141-56. DOI: <https://doi.org/10.34119/bjhrv3NIII-169>
9. Huerta LE, Nelson GE, Stewart TG, Rice TW. Factors associated with recurrence and mortality in central line-associated bloodstream infections: a retrospective cohort study. *Crit Care*. [Internet]. 2018 [cited 2022 Jul 28];22(1):266. DOI: <https://doi.org/10.1186/s13054-018-2206-7>
10. Matos TS, Galvão BHA, Martins DL, Maia FSB, Paiva FAS, Carvalho ALMC. Perfil microbiológico e sensibilidade antimicrobiana das infecções relacionadas à assistência à saúde das UTIs do hospital Lauro Wanderley - UFPB em 2018. In: Fajardo PA, org. O fortalecimento intensivo das ciências biológicas e suas interfaces. São Paulo: Atena; 2021. p.145-52.
11. Agência Nacional de Vigilância Sanitária (BR). Programa nacional de prevenção e controle de infecções relacionadas à assistência à saúde (PNPCIRAS) 2021 a 2025. [Internet]. Brasília (DF): ANVISA; 2021 [cited 2022 Set 03]. Available from: https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/publicacoes/pnpciras_2021_2025.pdf
12. Lin WP, Chang YC, Wu UI, Hung MC, Chuang PY, Wang JT et al. Multimodal Interventions for bundle implementation to decrease central line-associated bloodstream infections in adult intensive care units in a teaching hospital in Taiwan, 2009-2013. *J Microbiol Immunol Infect*. [Internet]. 2018 [cited Jul 28];51(5):644-51. DOI: <http://dx.doi.org/10.1016/j.jmii.2017.08.008>
13. Barton A. The case for using a disinfecting cap for needlefree connectors. *Br J Nurs*. [Internet]. 2020 [cited 2022 Jul 05];28(14):22-7. DOI: <https://doi.org/10.12968/bjon.2019.28.14.S22>
14. Presidência da República (BR). Lei nº 8.080, de 19 de setembro de 1990. Dispõe sobre as condições para a promoção, proteção e recuperação da saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências [Internet]. Brasília (DF): Diário Oficial União; 1990; [cited 2022 Ago 14]. Available from: http://www.planalto.gov.br/ccivil_03/leis/l8080.htm
15. Ministério da Saúde (BR). Secretaria de Gestão do Trabalho e da Educação na Saúde. Departamento de Gestão da Educação em Saúde. Política Nacional de Educação Permanente em Saúde [Internet]. Brasília (DF): 2009; [cited 2022 Ago 14]. Available from: <http://portal.saude.gov.br/portal/arquivos/pdf/volume9.pdf>
16. Ogata MN, Silva JAM, Peduzzi M, Costa MV, Fortuna CM, Feliciano AB. Interfaces between permanent education and interprofessional education in health. *Rev Esc Enferm USP*. [Internet]. 2021 [cited 2022 Jul 28];55:e03733. DOI: <https://doi.org/10.1590/S1980-220X2020018903733>
17. Silva TO, Vieira LM, Lemos TS, Sant'Anna FP, Sanches RS, Martinez MR. Gestão Hospitalar e gerenciamento em enfermagem à luz da filosofia Lean Healthcare. *Cogitare enferm*. [Internet]. 2019 [cited 2022 Jul 28];24:e60003. DOI: <https://doi.org/10.5380/ce.v24i0.60003>
18. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. [Internet]. 2021 [cited 2022 Jul 05];372(71). DOI: <https://doi.org/10.1136/bmj.n71>
19. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. [Internet]. 2018 [cited 2022 Jul 28];169(7):467-73. DOI: <https://doi.org/10.7326/M18-0850>

20. Mendes KDS, Silveira RCCP, Galvão CM. Use of the bibliographic reference manager in the selection of primary studies in integrative reviews. *Texto Contexto Enferm.* [Internet]. 2019 [cited 2022 Jul 12];28:e20170204. DOI: <https://doi.org/10.1590/1980-265X-TCE-2017-0208>
21. The Joanna Briggs Institute. JBI Manual for Evidence Synthesis [Internet]. JBI; 2020. [cited 2022 Jul 22]. Available from: <https://jbi-global-wiki.refined.site/space/MANUAL>
22. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan – a web and mobile app for systematic reviews. *Syst Rev.* [Internet]. 2016 [cited 2022 Jul 12];5(210):1-10. DOI: <https://doi.org/10.1186/s13643-016-0384-4>
23. Melnyk BM, Fineout-Overhold E. Evidence-Based practice in nursing & healthcare: a guide to best practice. 4. ed. Philadelphia: Wolters Kluwer; 2018.
24. Arslan GG, Özden D, Alan N, Yilmaz I, Ayik C, Göktuna G. Examination of nursing drug administration practices via central venous catheter: an observational study. *J Vasc Access.* [Internet]. 2019 [cited 2022 Jul 12];21(4):426-33. DOI: <https://doi.org/10.1177/1129729819880979>
25. Fernandes MS, Fernandes MS, Nogueira HKL, Pontes FS, Góes ACF, Oliveira DF. Bundle para a prevenção de infecção de corrente sanguínea. *Revista de Enfermagem UFPE On line.* [Internet]. 2019 [cited 2022 Jul 12];13(1):1-8. DOI: <https://doi.org/10.5205/1981-8963-v13i1a237743p1-8-2019>
26. Han J, Wan J, Cheng Y, Li D, Deng M, Wang X, et al. A hospital-wide reduction in central line-associated bloodstream infections through systematic quality improvement initiative and multidisciplinary teamwork. *Am J Infect Control.* [Internet]. 2019 [cited 2022 Jul 12];47(11):1358-64. DOI: <https://doi.org/10.1016/j.ajic.2019.05.008>
27. Shi Y, Yang N, Zhang L, Zhang M, Pei HH, Wang H. Chlorhexidine disinfectant can reduce the risk of central venous catheter infection compared with povidone: a meta-analysis. *Am J Infect Control.* [Internet]. 2019 [cited 2022 Jul 18];47(10):1255-62. DOI: <https://doi.org/10.1016/j.ajic.2019.02.024>
28. Layne DM, Anderson T. A collaborative approach to reducing central line-associated bloodstream infections. *J Nurs Care Qual.* [Internet]. 2019 [cited 2022 Jul 12];34(4):285-6. DOI: <https://doi.org/10.1097/NCQ.0000000000000419>
29. Kikuchi M, Sato T, Okada S, Abe N, Sato A, Suzuki Y. Maintenance antisepsis in reducing the rate of late-onset central venous catheter-related bloodstream infection: a comparison of 0.05% and 1% chlorhexidine. *J Infect Chemother.* [Internet]. 2020 [cited 2022 Jul 12];26(2):188-93. DOI: <https://doi.org/10.1016/j.jiac.2019.08.007>
30. Jamous S, Kouatly I, Zaatari R, Badr LK. Achieving a zero central line-associated bloodstream infection rate in 4 critical care units in Lebanon. *J Infus Nurs.* [Internet]. 2019 [cited 2022 Jul 12];42(2):249-53. DOI: <https://doi.org/10.1097/NAN.0000000000000335>
31. Wei L, Li Y, Li X, Bian L, Wen Z, Li M. Chlorhexidine-impregnated dressing for the prophylaxis of central venous catheter-related complications: a systematic review and meta-analysis. *BMC Infect Dis.* [Internet]. 2019 [cited 2022 Jul 12];19(1):429. DOI: <http://dx.doi.org/10.1186/s12879-019-4029-9>
32. Dang FP, Li HJ, Tian JH. Comparative efficacy of 13 antimicrobial dressings and different securement devices in reducing catheter-related bloodstream infections: a bayesian network meta-analysis. *Medicine.* [Internet]. 2019 [cited 2022 Jul 12];98(14):e14940. DOI: <http://dx.doi.org/10.1097/MD.00000000000014940>
33. Yu K, Lu M, Meng Y, Zhao Y, Li Z. Chlorhexidine gluconate transparent dressing does not decrease central line-associated bloodstream infection in critically ill patients: a randomized controlled trial. *Int J Nurs Pract.* [Internet]. 2019 [cited 2022 Jul 19];25(6):e12776. DOI: <https://doi.org/10.1111/ijn.12776>
34. Aloush SM, Alsaraireh FA. Nurses' compliance with central line associated blood stream infection prevention guidelines. *Saudi Med J.* [Internet]. 2018 [cited 2022 Jul 19];39(3):273-9. DOI: <https://doi.org/10.15537/smj.2018.3.21497>

35. Lucas TC, Sá PLC, Santos LP, Leite CA, Caldeira ALP, Oliveira AC. Desafio da higienização das mãos para a implementação dos bundles de cateter venoso central. *Rev. epidemiol. controle infec.* [Internet]. 2018 [cited 2022 Jul 19];8(3):216-23. DOI: <https://doi.org/10.17058/reci.v8i3.11283>
36. Margatho AS, Ciol MA, Hoffman JM, Reis PED, Furuya RK, Lima DAFS, et al. Chlorhexidine-impregnated gel dressing compared with transparent polyurethane dressing in the prevention of catheter-related infections in critically ill adult patients: a pilot randomised controlled trial. *Aust Crit Care.* [Internet]. 2018 [cited 2022 Jul 19];32(6):471-8. DOI: <https://doi.org/10.1016/j.aucc.2018.11.001>
37. Assis DB, Madalosso G, Padoveze MC, Lobo RD, Oliveira MS, Boszczowski I, et al. Implementation of tailored interventions in a statewide programme to reduce central line-associated blood stream infections. *J Hosp Infect.* [Internet]. 2018 [cited 2022 Jul 19];100(3):163-8. DOI: <https://doi.org/10.1016/j.jhin.2018.04.020>
38. Sharour LA, Subih M, Yehia D, Suleiman K, Salameh AB, Kaladeh MA. Teaching module for improving oncology nurses' knowledge and self-confidence about central line catheters caring, complications, and application: A pretest-posttest quasi-experimental design. [Internet]. 2018 [cited 2022 Jul 19];36(4):203-7. DOI: <https://doi.org/10.1016/j.jvn.2018.07.005>
39. Silva AG, Oliveira AC. Medical and nursing team self-reported knowledge on bloodstream infection prevention measures. *Texto Contexto Enferm.* [Internet]. 2018 [cited 2022 Jul 21];27(3):e3480017. DOI: <https://doi.org/10.1590/0104-070720180003480017>
40. Fortunatti CFP. Impact of two bundles on central catheter-related bloodstream infection in critically ill patients. *Rev. Latino-Am. Enferm.* [Internet]. 2017 [cited 2022 Jul 21];25:e2951. DOI: <http://dx.doi.org/10.1590/1518-8345.2190.2951>
41. Devi R, Ghai S, Singh NV, Puri GD. A methodological study to develop a standard operational protocol for nurses on central line catheter care of patients in selected intensive care units. *Indian J Crit Care Med.* [Internet]. 2017 [cited 2022 Jul 21];21(8). DOI: https://doi.org/10.4103/ijccm.IJCCM_261_16
42. Pires VAL, Martins MDS, Correia TIG. Prática clínica dos enfermeiros na prevenção da infecção associada ao cateter venoso central. *Revista Referência.* [Internet]. 2020 [cited 2022 Jul 29];5(7):e20163. DOI: <https://doi.org/10.12707/RV20163>
43. Costa CAB, Araújo FL, Costa ACL, Corrêa LR, Kusahara DM, Manzo BF. Central venous catheter bundle: professional knowledge and behavior in adult intensive care units. *Rev Esc Enferm USP.* [Internet]. 2020 [cited 2022 Jul 29];54:e03629. DOI: <https://doi.org/10.1590/s1980-220x2019011203629%20>
44. Jarding EK, Makic MBF. Central line care and management: adopting evidence-based nursing interventions. *J Perianesth Nurs.* [Internet]. 2021 [cited 2022 Jul 29];36(4):328-33. DOI: <https://doi.org/10.1016/j.jopan.2020.10.010>
45. Scheier T, Saleschus D, Dunic M, Fröhlich MR, Schüpbach R, Falk C, et al. Implementation of daily chlorhexidine bathing in intensive care units for reduction of central line-associated bloodstream infections. *J Hosp Infect.* [Internet]. 2021 [cited 2022 Jul 29];110:26-32. DOI: <http://dx.doi.org/10.1016/j.jhin.2021.01.007>
46. Infusion Nurses Society. Infusion therapy standards of practice. 8. ed. Norwood: Wolters Kluwer; 2021.
47. Santos SS, Batista TEQ, Carneiro ICRS, Corvelo TCO. Eficácia da aplicação do banho de clorexidina na prevenção de infecção da corrente sanguínea relacionada ao uso de cateter vascular central em pacientes de unidade de terapia intensiva de um hospital brasileiro. *Enferm Bras.* [Internet]. 2019 [cited 2022 Jul 29];18(4):501-9. DOI: <https://doi.org/10.33233/eb.v18i4.2572>

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