DESAFIOS DO MANEJO DE INFECÇÕES SISTÊMICAS EM AMBIENTES DE ASSISTÊNCIA A SAÚDE ASSOCIADAS A PACIENTES INTERNADOS E SUBMETIDOS A PROCEDIMENTOS INVASIVOS

CHALLENGES OF MANAGING SYSTEMIC INFECTIONS IN HEALTHCARE SETTINGS ASSOCIATED WITH HOSPITALIZED PATIENTS UNDERGOING INVASIVE PROCEDURES

RETOS DE LA GESTIÓN DE LAS INFECCIONES SISTÉMICAS EN ENTORNOS SANITARIOS ASOCIADOS A PACIENTES HOSPITALIZADOS SOMETIDOS A PROCEDIMIENTOS INVASIVOS

https://doi.org/10.56238/sevened2025.021-055

Pamella Dalgobbo Duque Estrada Fagundes[1], Giuliane Ribeiro Viana[2], Nicolly da Silva Pessoa[3], Natacha Dalis Gomes da Rocha[4], Francisco Dieiemes Alves Peixoto[5], Gilson Viana da Silva[6] and Cassius de Souza[7]

RESUMO

A utilização de cateter venoso central nas unidades hospitalares tem o objetivo de auxiliar o tratamento de pacientes graves. Porém, este dispositivo pode ocasionar, na maioria das vezes, infecções relacionadas à corrente sanguínea e reações adversas à saúde. Segundo a Agência Nacional de Vigilância Sanitária (ANVISA) os cateteres venosos centrais são classificados como de curta e longa permanência. Podem ser também classificados como semi-implantáveis e totalmente implantáveis (BRASIL, 2010). O uso de práticas inadequadas na inserção e manutenção dos cateteres venosos centrais nos pacientes podem contribuir para o aumento de infecções. Realizar medidas de prevenção é um dos principais métodos para reduzir as taxas destas infecções, melhorando a qualidade de assistência à saúde, bem como direcionando protocolos para nortear a atuação dos diferentes profissionais da saúde na prevenção desses agravos. Desta forma, o presente estudo tem como objetivo propor discussões e protocolos que estabeleçam e rotinas que contribuam para o controle e diminuição nos casos de infecções associadas a procedimentos invasivos em pacientes internados nos diferentes ambientes de assistência à saúde. Para tanto, foram realizadas análises dos principais achados científicos sobre as questões levantadas através de revisão sistemática descritiva com direcionamento quantitativo e qualitativo, sem corte temporal, utilizando diferentes bases de dados, como Medline e PUBMED. Os resultados identificaram 98 artigos, 38 pré-selecionados para análise do texto completo e incluídos 36 para análise desta revisão. Tais resultados

[1]Student of the Medical Course at União Araruama de Ensino College – UNILAGOS
[2]Coordinator of Internship and Teacher and of the Dentistry Course at Faculdade União Araruama de Ensino – UNILAGOS
[3]Graduate student in Environmental Sciences in Coastal Areas - Federal Institute of Rio de Janeiro - Arraial do Cabo Campus
[4]Student of the Medical Course at União Araruama de Ensino College – UNILAGOS
[5]Post-Graduate Nurse of the emergency room of São Pedro da aldeia and the Red Room of the Emergency Care Unit of Cabo Frio, Trichologist Nurse in transplant clinic and advanced aesthetics in Cabo Frio (FB CLINIC); student of the postgraduate course in cardiology and hemodynamics, Adult and Pediatric Intensive Care, Urgency and Emergency at the Amaro educational center in São Pedro da Aldeia - RJ
[6]Dr. and Academic Director of the União Araruama de Ensino College – UNILAGOS
[7]Post-Doctorate Coordinator of Research and Extension at União Araruama de Ensino College – UNILAGOS

confirmaram a problemática levantada, evidenciando que muitos são os fatores que corroboram com o aumento de infecções sistêmicas associadas à dispositivos invasivos em ambiente de assistência à saúde. Entretanto, profissionais, podem atuar na busca por um ambiente controlado e seguro, através de ações de higiene e na criação de protocolos que visam a manutenção de ambientes seguros, reduzindo agravos e infecções associadas a procedimentos invasivos.

Palavras-chave: Cateter venoso central. Infecções relacionadas à assistência à saúde (IRAS). Prevenção de infecções hospitalares. Protocolos de segurança hospitalar. Dispositivos invasivos.

ABSTRACT

The use of central venous catheters in hospitals is intended to help treat critically ill patients. However, this device can often cause bloodstream infections and adverse health reactions. According to the National Health Surveillance Agency (ANVISA), central venous catheters are classified as short and long stay. They can also be classified as semi-implantable and fully implantable (BRASIL, 2010). The use of inadequate practices in the insertion and maintenance of central venous catheters in patients can contribute to an increase in infections. Carrying out preventive measures is one of the main methods for reducing the rates of these infections, improving the quality of health care, as well as directing protocols to guide the actions of different health professionals in preventing these problems. The aim of this study is to propose discussions and protocols that establish routines to help control and reduce the number of infections associated with invasive procedures in patients hospitalized in different healthcare settings. To this end, the main scientific findings on the issues raised were analyzed through a descriptive systematic review with a quantitative and qualitative approach, without a time cut-off, using different databases such as Medline and PUBMED. The results identified 98 articles, 38 of which were pre-selected for full-text analysis and 36 were included for analysis in this review. These results confirmed the problem raised, showing that there are many factors that corroborate the increase in systemic infections associated with invasive devices in the healthcare environment. However, professionals can act in the search for a controlled and safe environment, through hygiene actions and the creation of protocols aimed at maintaining safe environments, reducing injuries and infections associated with invasive procedures.

Keywords: Central venous catheter. Healthcare-related infections (HAIs). Prevention of hospital-acquired infections. Hospital safety protocols. Invasive devices.

RESUMEN

El uso de catéteres venosos centrales en las unidades hospitalarias tiene por objeto ayudar a tratar a los pacientes en estado crítico. Sin embargo, este dispositivo a menudo puede causar infecciones del torrente sanguíneo y reacciones adversas para la salud. Según la Agencia Nacional de Vigilancia Sanitaria (ANVISA), los catéteres venosos centrales se clasifican como de corta y larga estancia. También se pueden clasificar como semiimplantables y totalmente implantables (BRASIL, 2010). El uso de prácticas inadecuadas en la inserción y mantenimiento de catéteres venosos centrales en los pacientes puede contribuir al aumento de las infecciones. La realización de medidas preventivas es uno de los principales métodos para reducir las tasas de estas infecciones, mejorar la calidad de la asistencia sanitaria, así como orientar protocolos que guíen la actuación de los diferentes profesionales sanitarios en la prevención de estos problemas. El objetivo de este estudio es proponer discusiones y protocolos que establezcan rutinas para ayudar a controlar y reducir el número de infecciones asociadas a procedimientos invasivos en pacientes hospitalizados en diferentes entornos sanitarios. Para ello, se

analizaron los principales hallazgos científicos sobre las cuestiones planteadas a través de una revisión sistemática descriptiva con un enfoque cuantitativo y cualitativo, sin corte temporal, utilizando diferentes bases de datos como Medline y PUBMED. Los resultados identificaron 98 artículos, 38 de los cuales fueron preseleccionados para el análisis de texto completo y 36 de los cuales se incluyeron para su análisis en esta revisión. Estos resultados confirmaron el problema planteado, mostrando que existen muchos factores que corroboran el aumento de infecciones sistémicas asociadas a dispositivos invasivos en el ambiente sanitario. Sin embargo, los profesionales pueden actuar en la búsqueda de un ambiente controlado y seguro, a través de acciones de higiene y de la creación de protocolos dirigidos a mantener ambientes seguros, reduciendo lesiones e infecciones asociadas a procedimientos invasivos.

Palabras clave: Catéter venoso central. Infecciones relacionadas con la asistencia sanitaria (IRAS). Prevención de las infecciones hospitalarias. Protocolos de seguridad hospitalaria. Dispositivos invasivos.

INTRODUCTION

The use of central venous catheters (CVCs) and other invasive devices are widely used in hospital units, helping in an integral way in the treatment of hospitalized patients, however, they are considered vehicles for microorganisms to invade the mucous membranes of the hosts and consequently taking advantage against the immune system, thus favoring infections associated with health. CVCs are generally used in critically ill patients who require highly complex care. They are intravascular devices that help in the administration of medications, intravenous hydration, transfusions of blood products, parenteral nutritional therapy, hemodynamic monitoring. It has a stay of many days, favoring the reduction of peripheral punctures (Santos et al., 2014).

According to the National Health Surveillance Agency (ANVISA), CVCs are classified as short- and long-term devices, and can be classified as semi-implantable and fully implantable (BRASIL, 2010). Short-term semi-implantable catheters (SCC) do not have barriers to prevent extraluminal colonization, however, long-term catheters are made up of a subcutaneous path associated with a *Dacron cuff* capable of creating pericatheter fibrosis , reducing the chance of infection, while fully implantable CVCs, because they do not have any exteriorized part, have low risks of contamination (JUNIOR *et al.*, 2010).

The use of inappropriate practices in the insertion and maintenance of central venous catheters in patients can increase the risk of nosocomial infections. Thus, preventive measures are necessary to reduce infection rates in order to improve the quality of health care (According to Rosado *et al.*, 2011).

In addition to the risks related to infections in invasive devices that act on central vessels, they can also be responsible for other aggravations and complications, such as thrombus formation, embolisms, and primary bloodstream infections (PBIs). Health-related infections (HAIs) indicate that PCIs are a major health problem after central venous catheter insertion, increasing the high mortality rate (Neves, 2010; Santos *et al.*, 2014).

The care of procedures involving vascular access is the responsibility of the entire team that provides care to the patient, with effective interdisciplinary surveillance, promoting the prevention and control of complications related to the central venous catheter. In this context, we highlight the importance of hand hygiene before and after handling the insertion ostium or in the assistance that requires the handling of the vascular venous access, so the hospital management or the infection control team are responsible for educating and supervising the team in adhering to the correct hand washing techniques, as well as intercede in cases of negligence. Anvisa (2013) points out that one of the efficient, effective and low-cost ways to avoid this infection is hand hygiene, which encompasses simple

hygiene, antiseptic hygiene, antiseptic hand rubbing with alcohol preparation (Mendonça *et al.*, 2011).

The educational processes to transmit knowledge to health professionals in order to prevent and control infections are becoming increasingly scarce and difficult, because the adherence of these professionals to biosafety is very low, since these professionals always need to be in constant learning to maintain awareness of patient care. Anvisa (2017) highlights that bloodstream infections (BSI) are related to health care, with possibilities of preventive care that exist, where 65 to 70% of cases of hospital infections could have been avoided if there were adequate interventions, using bundles of good practices and the improvement of device maintenance (Massaroli *et al.*, 2014).

One of the most effective measures to prevent the control of adverse events is hand hygiene, its intervention in care is a habit, has low cost and proven scientific evidence regarding its effectiveness. With everything worldwide, this procedure is still deficient in health care (Belela-Anacleto *et al.*, 2017).

Cases of healthcare-associated infections linked to the bloodstream increase every day in health institutions, and with this the cost of hospital admission is also prolonged. Considering the current political and economic situation in the country, it is increasingly fair to invest resources in preventive measures that reduce the time and costs of hospital admissions.

Health Care-Associated Infections (HAIs) are infectious processes acquired in the health care environment, constituting a health risk for those who need health services, such as therapeutic procedures and diagnostics. It highlights that errors in hospitalization care have drawn attention in recent decades, and that their occurrence is avoidable factors. The first initiatives regarding hospital infections in Brazil took place in 1970, with the creation of the CCIH in hospitals accredited to the National Institute of Social Security (INPS). With the death of the then president Tancredo Neves related to a surgical infection, legislation on the subject of nosocomial infection was enacted, with which some ordinances were enacted admitting that nosocomial infection is an event that poses risks to the patient (Giarola *et al.*, 2012).

In the first decades of the twentieth century, health professionals did not have an eye on the risks of hospital infection that patients could acquire during hospitalization. With large episodes of patients submitted to nosocomial infection by antibiotic-resistant pathogens, it favored the organization of committees to carry out hospital infection control. In addition, the definition of hospital infection occurs during hospitalization or even after discharge. It is associated with procedures, treatments, and surgeries that are performed

during hospitalization. He highlights that all professionals must have constant vigilance to prevent hospital infections from happening in the actions that users will be subjected to. However, he emphasizes that in Brazil, nosocomial infections have been a major public health problem, as the increase in hospitalization costs, interdicted beds and the high rate of deaths, resulted in the intercession of the Ministry of Health (MS) to promote preventive measures in the control of hospital infection (Giarola *et al.*, 2012; Dutra *et al.*, 2015).

According to the control of hospital infection, it began in the mid-70s around the twentieth century, advised by the Ministry of Social Security (MPAS), with the support of professionals who investigated and took care of the occurrences of infections in the country, and created the first Commissions for the Control and Prevention of Hospital Infection (CCIH) (Oliveira *et al.*, 2016).

Pathophysiology acts as two main mechanisms, extraluminal colonization, which occurs when skin microbiota aided by capillaries penetrate through the skin at the time of catheter insertion or days after insertion, and intraluminal colonization, which occurs with the displacement of bacteria into the bloodstream caused by infections already installed in the body or infusions of contaminated solutions. Pathophysiology occurs when microbiota are installed at the time of catheter insertion into the skin with the help of capillaries, and intraluminal microbiota as the displacement of bacteria into the bloodstream from another area of the body, or by contaminated infusions (Oliveira *et al.*, 2016).

Bloodstream infection related to central venous catheters occurs due to contamination of the catheter at the time of insertion by the skin flora, by infusions of contaminated solutions, by connectors and by the hands of the teams. The pathophysiology of catheter infection is complicated and several risk factors may be associated. Pathogens gain access to intravascular devices by two routes: extraluminal and intraluminal, in extraluminal there is adherence of the local microbiota to the percutaneous tract, or in contamination of the devices at the time of manipulation, and intraluminal is associated with infusions of contaminated medications, connectors manipulated by care teams, and microorganisms carried by the bloodstream from another source of infection (Brachine *et al.*, 2012 and Corrêa *et al.*, 2012))

Catheters that are inserted percutaneously favor the risk of infection at the time of puncture, as the migration of microorganisms from the resident skin microbiota through the surface of the catheter to the bloodstream can occur, when this happens, it is called extraluminal infection. Intraluminal bloodstream infections are affected by bacteria and fungi that gain the bloodstream. It highlights that the risk of infection does not occur in catheters that are implanted in the subcutaneous route (Shah *et al.*, 2013).

Studies indicate that primary bloodstream infection (PBI) occurs more than 48 hours after the insertion of the central venous catheter, without another infectious condition being identified, additionally, the primary bloodstream infection associated with the catheter in patients who are undergoing treatment and use the central catheter for a time longer than two calendar days, where the first day of catheter placement is considered D1 and that at the time of infection the device was in use or had been removed previously (Brasil, 2010; Danski *et al.*, 2017). Diagnosing bloodstream infections in patients with long-term catheters becomes a great challenge, since it is always accompanied by fever and chills, common signs and symptoms as for different pathologies. Rupp and Karnatak in 2018 stated that catheter-related infections could be associated with sites where erythema occurs, hardening and extension through the tunnel pathway, causing inflammation along the subcutaneous tunnel of the insertion outlet (Zerati *et al.*, 2017).

Current scientific conceptions state that healthcare-associated infections are a local or systemic condition that results in an adverse reaction to the presence of a pathogen or its toxin and without certainty that the infection was present or latent at the time of the patient's admission to a hospital or outpatient unit. It is usually detected as early as 48 hours after admission and that primary bloodstream infections are severe systemic, with occurrences of bacteremia or sepsis, without a primary focus detected. Secondary blood culture occurs with a positive blood culture result, signs suggestive of sepsis, and the presence of infections at another catheter insertion site (Crivelaro, et. al., (2018).

Studies indicate that the routes of choice for catheter implantation are the internal and external jugular, subclavian and femoral routes, however, they emphasize that these accesses are momentary and are subject to major complications such as hematoma, stenosis and incidents at the time of catheter insertion that lead the patient to present pneumothorax and hemothorax, in addition to primary bloodstream infections (Tardivo et. al., 2008).

Another important relationship is that the subclavian and jugular veins are sites with the highest infection rate because they are close to the airways, where when a patient with a neurological condition or tracheostomy is using a CVC, he will have more risks of contracting BSI, because the secretions of the respiratory tract can come into contact with the dressings (Andrade et. al., 2010).

Essential nursing care is necessary before handling the device, such as: sanitizing the connections with 70% alcohol; remain with unused connections closed with the protective cap, taking due care never to leave them open; make use of the aseptic technique in the preparation of solutions; administer medications immediately after

preparation or refrigerate as recommended by the manufacturer; give priority to closed infusion systems; perform antisepsis with 70% alcohol whenever opening bottles of serum and medications; pay attention to turbidity, cuts, perforations, sealing, loss of vacuum and expiration date; remain with the infusion mechanism always closed. In addition, medication should be ininfused in their proper places, such as: lateral device for injectable solutions, taps and extensions, always performing prior antisepsis of the connections with 70% alcohol; replace simple equipment, burettes, extensions, tapers and other devices every 72 hours and whenever blood reflux occurs. For cases of intermittent infusions, such as antimicrobials, blood and blood products, immediately change the infusion mechanism within 24 hours and replace the total parenteral nutrition (TPN) infusion system also every 24 hours. Semi-implantable catheters also require strict nursing care, such as: after the administration of medication or blood, the catheter should be cleaned with saline solution (0.9%), and heparin can also be used in the catheter lumen as prescribed by the doctor. For implantable catheters, avoid infusion or withdrawal of blood avoiding damage to the equipment, proceed with the use of sterile gloves and perform skin antisepsis with PVPI before introducing the needle into the device, replace the needle (Huber® needle) every 2 days and for special needles, similar to the scalp, every 7 days (Pedrolo et. al., 2013).

Nursing care should adopt measures for catheter maintenance, such as: washing hands before and after manipulating the catheters; protect the catheter during bathing with waterproof material to avoid getting wet; When bathing, use sponges soaked with chlorhexidine or polyurethane cover with hydrophilic gel containing 2% chlorhexidine gluconate; use gauze or semipermeable transparent sterile dressing to occlude the catheter insertion site; replace the dressing in the presence of dirt and containing no visible dirt, change the gauze every 2 days and the transparent dressing every 7 days or as specified by the manufacturer (Barros et. al., 2016).

Patient safety has also been systematically monitored and patronized by Anvisa and other inspection agencies. There are many regulations, such as the guidelines established by the National Patient Safety Program (PNSP) in 2013, the World Health Organization (WHO) Recommendations for patient safety, one of the main axes defined for the PNSP, which consists of the "Citizen Involvement in their Safety", considering patients, family members and companions as partners in efforts to prevent failures and damage in health services in the country (BRASIL, 2017).

Care must be accompanied by both the patient and family members and companions so that they are aware of their rights and duties as users of health services, understanding the risks associated with care; choosing the properly specialized health professional;

providing correct information about their health; and once the treatment is accepted, following the instructions of the professionals and participating in the decisions of care and therapies. Also, notifying Anvisa of adverse events (AEs) (incidents that result in damage to health) that may have occurred during their care/treatment in health services (Gonçalves et. al., 2012).

The professional responsible for the care should ask the patient/family member/companion for the name and check the information contained in the patient's bracelet with the prescribed care, or with the labeling of the material that will be used. The greatest challenge for patient safety specialists who seek to reduce events in health institutions has been the assimilation, on the part of managers, that the cause of errors and adverse events is multifactorial and that health professionals are susceptible to committing adverse events when technical and organizational processes are complex and poorly planned (CAPUCHO et. al., 2013). The correct identification of the patient establishes an effective process and thus reduces the occurrence of failures, mistakes and errors in treatments during hospital procedures. Thus, the identification of patients must be achieved at their admission to the service and carried out by means of a bracelet that is placed on the patient's wrist. This bracelet will remain with the patient throughout the time he or she is being submitted to care (BRASIL, 2017).

Nursing plays a fundamental role in infection control, due to its direct contact with the patient, always being directly and indirectly on the front line in infection control processes in the hospital environment. In addition, nurses play an important role in promoting care and disease prevention. We observed that there is still a great challenge for nursing professionals to prevent infections, where a multidisciplinary team has a responsibility to keep this patient's life intact, thus predicting adverse reactions related to health care and promoting the reduction of their stay and hospital costs.

BSI is one of the most important complications of central venous catheters and with prevention means already established worldwide, which deserves to be studied for a broader analysis. Therefore, this study presents its relevance when it proposes to investigate the best evidence available in the literature, relating the interventions that nurses can perform to reduce and prevent catheter-related infections, aiming at the advancement of nursing practices in the care of these patients and encouraging the academic environment to have a view of integrality of care and precepts for life.

The study has as its central problem the different and constant bloodstream infections related to the central venous catheter and seeks to direct measures and protocols that guide the nurse's performance in the prevention of this health problem. To

this end, analyses of the main scientific findings were carried out on the main issues raised and from this analysis to propose discussions and protocols that establish procedures and routines that can contribute to the control and reduction of cases of infections associated with invasive procedures in patients hospitalized in different health care environments, in addition to establishing a systematic tool to demonstrate the importance of the nurse in the prevention of deep venous catheter infection.

METHODOLOGY

The present study used an exploratory research, through a literature review with a qualitative approach, through works such as scientific articles, books, manuals.

We used works published in the Latin American and Caribbean Health Sciences Literature Databases (LILACS), in the Nursing Database (BDENF) accessed through the Virtual Health Library (VHL) Portal, and in the American Medical Literature Analysis and Retrieval System Online (MEDLINE) database, accessed through the U.S. National Library of Medicine (Pubmed).

The search of the scientific literature in an electronic database was carried out using the descriptors: nurses, catheter-related infections, prevention and patient safety, using the Boolean operator AND. The descriptors mentioned above are found in the Health Sciences Descriptors (DecS).

Texts in Portuguese and English with a publication period from January 2014 to January 2019 were considered as inclusion criteria; abstract and full text; and as exclusion criteria: studies with percutaneous access.

For data collection, a semi-structured script was prepared by the authors of the research, namely: identification data of the article, institution where the study was conducted, methodological characteristics, sample, results and conclusions. (Appendix)

Data collection was carried out between February and March 2019 after the project was approved by the course coordination.

After identifying the works, their abstracts were analyzed and, subsequently, the works in full to verify whether they meet the objectives of the study.

The search strategies were elaborated from the databases and descriptors used in Chart 1.

Chart 1: Database search strategies – 2014 – 2019

Bases of Descriptor	Bdenf	Lilacs	Medline	Total
(nurses AND catheter-related infections)	8	5	46	59
(nurses AND prevention)	660	867	8742	10.269
(nurses AND patient safety)	202	281	1037	1520

(catheter-related infections AND prevention)	36	74	2000	2110
(catheter-related infections AND patient safety)	10	10	87	107
(prevention AND patient safety)	180	444	8305	8929
Total	1.906	1.681	20.217	23.804

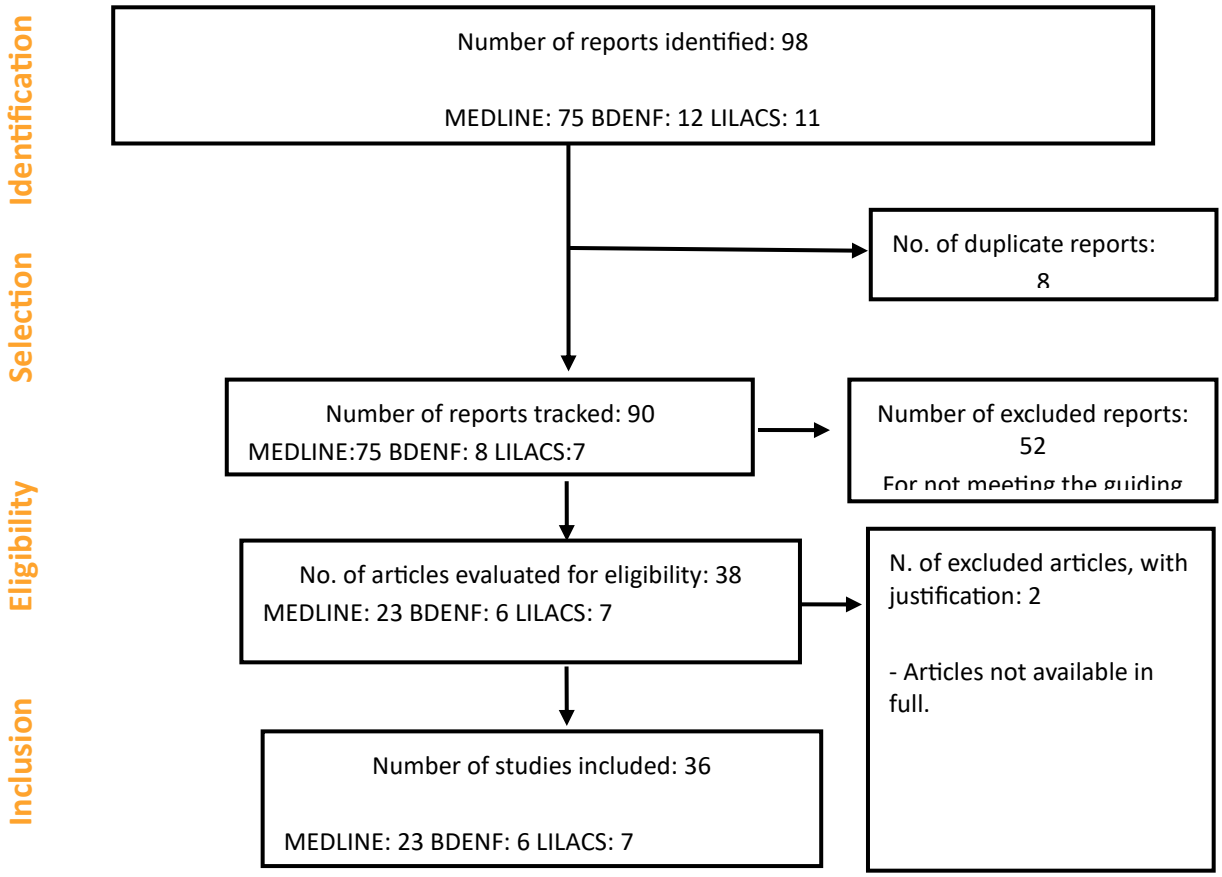
Source: The authors

Works with abstracts, full texts and available for analysis were included. Exclusion criteria were peripheral venous catheters, urinary tract infection control, randomized controlled trial, hemodialysis catheters, neonatology, and cancer patients.

RESULTS

The results of this research strategy are represented in figure 1.

Figure 1: Flowchart



Source: Prepared by the authors.

A total of 98 articles were identified, 38 of which were pre-selected for full-text analysis and 36 were included for analysis of this review. In the MEDLINE database, the number of works found with relevance on the theme was 23, in BDENF 6 and in LILACS 7. Chart 2 describes the titles of the articles included in this review, with the authors, the year of publication, journal, area, type of publication, and title.

IDENTIFICATION OF SCIENTIFIC PRODUCTION

Chart 1 – Scientific Production in the BDENF, LILACS and MEDLINE databases

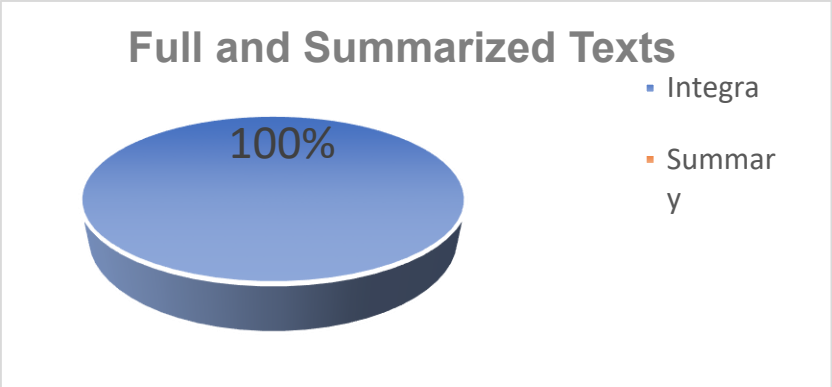
Author	Year	Periodic	Base	Area	Type of work	Title of the work
Stocco JGD	2014	A Turnkey Institutional Repository Application - DuraSpace	BDENF	Nursing	Thesis	Effectiveness of second-generation catheters impregnated with chlorhexidine and silver sulfadiazine in the prevention of bloodstream infection in hospitalized patients.
Silva AGD et al.	2017	Rev. Nursing Focus	BDENF	Nursing	Article	Adherence to measures to prevent central venous catheter-related bloodstream infection.
Dantas GD et al.	2017	Online UFPE Nursing Rev.	BDENF	Nursing	Article	Adherence of the nursing team to measures to prevent bloodstream infections.
Barbosa CV et al.	2017	Online UFPE Nursing Rev.	BDENF	Nursing	Article	Knowledge of the nursing team about venous catheter care.
Silva AGD	2017	Federal University of Minas Gerais	BDENF	Nursing	Dissertation	Competencies of the multiprofessional team for measures to prevent central venous catheter-related bloodstream infection.
Costa CAB	2017	Fluminense Federal University	BDENF	Nursing	Dissertation	This study aims to analyze the knowledge and behavior of health professionals in the adult intensive care unit of a large hospital.
Calil K	2014	Fluminense Federal University	LILACS	Nursing	Dissertation	Construction of a bundle for catheter handling.
Oliveira FTD et al.	2016	Rev. Nursing Ana Nery	LILACS	Nursing	Article	Behavior of the multiprofessional team in the face of the bundle of the central venous catheter in intensive care.
Gomes MLS et al	2017	Nursing Rev. UERJ	LILACS	Rusting	Article	Evaluation of short-term central dressing practices.
Oliveira FTD et al.	2017	Rev. USP School of Nursing	LILACS	Nursing	Article	Positive deviance as a strategy in the prevention and control of bloodstream infections in intensive care.
Silva AGD et al.	2018	Rev. Text & Context Nursing	LILACS	Nursing	Article	Self-reported knowledge of the medical and nursing teams regarding measures to prevent bloodstream infection.
Almeida TMD et al.	2018	Nursing Rev. UERJ	LILACS	Nursing	Article	Prevention of infections associated with short-term non-implanted central venous catheter.

Oliveira JAD et al.	2018	Latin American Nursing Rev.	LILACS	Nursing	Article	Patient safety in nursing care during medication administration.
Zingg W et al.	2014	Journal PLoS One	MEDLINE	Nursing	Article	Multidisciplinary multimodal intervention program throughout the hospital to reduce bloodstream infection associated with central venous catheter.
Dumyati G et al.	2014	American Jounal of Infection Control	MEDLINE	Epidemiology	Article	Sustained reduction of central line-associated bloodstream infections outside the intensive care unit with a multimodal intervention focusing on central line maintenance.
Borg MA et al.	2014	Journal of Hospital Infection	MEDLINE	Epidemiology	Article	Prevention of meticillin-resistant Staphylococcus aureus bloodstream infections in European hospitals: moving beyond policies.
Langton H	2014	Journal of Perioperative Practice	MEDLINE	Medicine	Article	The management of central venous catheters and infection control: is it time to change our approach?
Lemaster CH et al	2014	Journal Annals of Emergency Medicine	MEDLINE	Medicine	Article	Implementing the central venous catheter infection prevention bundle in the emergency department: experiences among early adopters.
Perez GMJ et al.	2014	Journal of Vascular Access	MEDLINE	Medicine	Article	Prevalence survey of the use of intravascular catheters in a general hospital.
Frimpong A et al.	2015	British Journal of Nursing	MEDLINE	Nursing	Article	Promoting safe IV management in practice using H.A.N.D.S.
Hermon A et al.	2015	Journal Critical Care Nurse	MEDLINE	Nursing	Article	Improving compliance with central venous catheter care bundles using electronic records.
Dedunska K et al	2015	American Jounal of Infection Control	MEDLINE	Epidemiology	Article	Prevention of central venous catheter-associated bloodstream infections: A questionnaire evaluating the knowledge of the selected 11 evidence-based guidelines by Polish nurses.
Alkubati AS et al.	2015	American Jounal of Infection Control	MEDLINE	Epidemiology	Article	Health care worker' knowledge and practices regarding the prevention of central venous catheter-related infection.
Barsuk, JH et al.	2015	Journal of Nursing Administration	MEDLINE	Nursing	Article	Simulation-Based Mastery Learning Improves Central Line Maintenance Skills of ICU Nurses.

Wilson C	2015	Journal Nursing Standard	MEDLINE	Nursing	Article	Preventing central venous catheter-related bloodstream infection
Jackson A	2016	British Journal of Nursing	MEDLINE	Nursing	Article	Vascular access passports.
Kaya H et al.	2016	Journal Applied Nusring Research	MEDLINE	Nursing	Article	The effect of nursing care protocol on the prevention of central venous catheter-related infections in neurosurgery intensive care unit.
Broadhurst D et al.	2016	Journal of Vascular Access	MEDLINE	Medicine	Article	Central venous access devices site care practices: an international survey of 34 countries.
Desra AP et. Al.	2016	Journal of Vascular Access	MEDLINE	Medicine	Article	Aseptic technique for accsessing central venous catheters: applynig a standardised tool to audit 'scrub the hub' pratices
Blanchard D et al.	2016	American Journal of Nursing	MEDLINE	Nursing	Article	Securement and Dressing Devices for Central Venous Catheters
Musu M et al.	2017	Journal of Hospital Infection	MEDLINE	Epidemiology	Article	Controlling catheter-related bloodstream infections through a multi-centre educational programme for intensive care units
Morrison T et al.	2017	American Journal of Infection Control	MEDLINE	Epidemiology	Article	Impact f personalized newsletters on nurses who administer central lines
Accardi R et al.	2017	Journal Ann Ig	MEDLINE	Medicine	Article	Prevention of health-associated infections: a descriptive study
Yazici G et al.	2018	Journal Applied Nursing Research	MEDLINE	Nursing	Article	Efficacy of a care bundle to prevent multiple infections in the intensive careunit: A quase-experiemntal pretest-posttest desing study
Ferrara P et al.	2018	Journal Infectious Diaseases	MEDLINE	Medicine	Article	The adherence to guidelines for preventing CVC-related infections: a survey among Italian health-care workers
Aloush SM et al.	2018	Saudi Medical Journal	MEDLINE	Medicine	Article	Nurses' compliance with central line associated blood streaminfection prevention guidelines

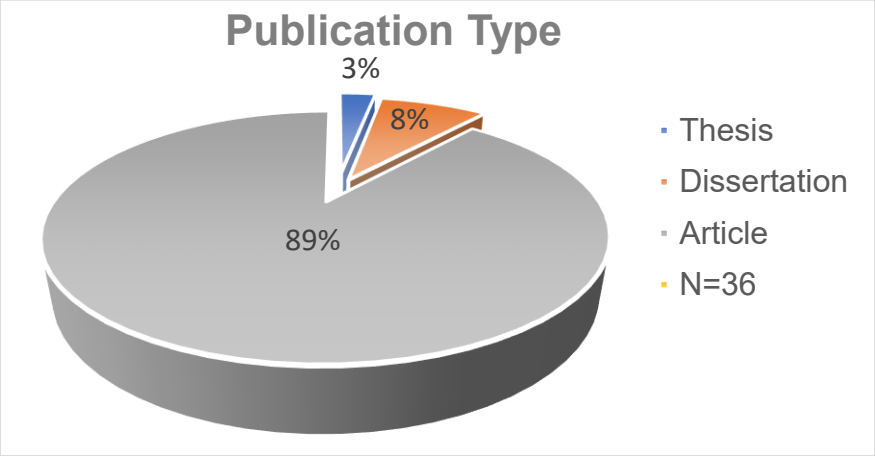
Source: Prepared by the authors.

Graph 1 – Type of scientific publication in the databases



Legend: Quantitative illustration that determines that only comprehensive research was used

Graph 2 – Type of availability of scientific publications in the databases



Legend: Illustrative graph determining the variety of studies used in the work

METHODOLOGICAL CHARACTERISTICS OF THE STUDIES

The characteristics of the literature by approach, type of study, sample, inclusion and exclusion criteria, are distributed in the table below in the following order: The first author of the works, the types of study produced and that were the target of this research, sample selection, sample size, and inclusion and exclusion criteria.

Chart 2 – Methodological design of the scientific production studied

Author	Type of study	Sample selection	N=	Criteria Inclusion	Exclusion criteria
Stocco JGD	Systematic review of the literature	Convenience	175	Randomized and quasi-randomized controlled clinical trials	Children, adolescents, adults and the elderly
Silva AGD et al.	Almost experimental	Not informed	48	Professionals who provided direct care to patients using CVCs (physicians, nurses and nursing technicians)	Not informed
Dantas GD et al	Field study	Probabilistic and intentional	30	Nursing staff	Not informed

Barbosa CV et al.	Quantitative approach research	Not informed	107	Nursing team professional with technical and higher education who provided care to patients using short-term CVC	Not informed
Silva AGD	Almost experimental	Not informed	131	The population was composed of the medical and nursing team responsible for the insertion and maintenance of central venous catheters	Not informed
Costa CAB	Transverse	Not informed	292	Health professionals (doctors, nurses and nursing technicians)	Not informed
Calil K	Evidence-based research	Not informed	67	Not informed	Not informed
Oliveira FTD et al.	Transverse	Not informed	99	Care activities related to the insertion, management and removal of CVCs	Resident doctors and nurses.
Gomes MLS et al	Quantitative approach research	Non-probabilistic	30	Dressing practices performed on patients over 18 years of age who had been using short-term CVC for more than 24 hours.	Non-nurse dressings and short-stay CVC-related dressing practices
Oliveira FTD et al	Prospective	Not informed	99	Nurses, nursing technicians and doctors.	Professionals on leave, leave or vacation; Residents of the health team
Silva AGD et al.	Transverse	Not informed	187	Physicians, nurses of nursing technicians of both sexes, regardless of age group, responsible for the insertion and maintenance of CVCs	Professionals who were on sick leave, maternity, vacations or days off during the research and those who after the third attempt to approach the study were not found
Almeida TMD et al	Evidence-based research	Not informed	32	Not informed	Not informed
Oliveira JAD et al.	Descriptive research	Non-probabilistic, intentional	103	Intravenous administration of medications in patients using central vascular catheters performed by nursing professionals	Not informed
Zingg W et al.	Prospective	Not informed	1908	Newly contacted doctors, nurses and nurses	Not informed
Dumyati G et al.	Prospective	Not informed	37	Nursing staff and leadership, nursing education in line	Not informed

				care maintenance, competency assessment.	
Borg MA et al.	Not informed	Not informed	269	Epidemiologists, infection control physicians, and nurses	Not informed
Langton H	Not informed	Not informed	21	Not informed	Not informed
Lemaster CH et al	Search Qualitative approach	Intentional	49	Administrators and nurses and doctors.	Not informed
Perez GMJ et al.	Point prevalence	Not informed	1550	Patients with one or more peripherals or CVCs	Arterial catheters
Frimpong A et al	Evidence-based research	Not informed	27	General and specialty nurses	Not informed
Hermon A et al.	Almost experimental	Not informed	500	Nursing and medical staff	Not informed
Dedunska K et al.	Not informed	Not informed	784	Nurses	Not informed
Alkubati AS et al.	Descriptive research	Not informed	100	Doctors and nursing staff	Not informed
Barsuk JH et al.	Not informed	Not informed	49	Nurses	Not informed
Wilson C	Evidence-based research	Not informed	123	Nurses	Not informed
Jackson A	Not informed	Not informed	60	Not informed	Not informed
Kaya H et al.	Field study	Not informed	160	Catheter placed at least 3 days and no systemic disturbances on hospitalization	Not informed
Broadhurst D et al.	Descriptive research	Not informed	1044	Resident physicians, nurses and vascular access specialists	Not informed
Desra AP et al.	Systematic review of the literature	Not informed	20	The entire team that accesses central venous catheters.	Not informed
Blanchard D et al.	Intervention review	Not informed	848	Not informed	Not informed
Musu M et al.	Not informed	Not informed	173	Doctors, nurses, and nursing assistants	Not informed
Morrison T et al.	Not informed	Not informed	487	Nurses	Not informed
Accardi R et al.	Quantitative approach research	Not informed	245	Nurses who work in the medical and surgical clinic wards	Pediatric Neonatology, Obstetrics-Puerperium and Gynecology, Mental Health, Resuscitation and Intensive Care, Emergency and Urgency
Yazici G et al.	Almost experimental	Not informed	120	Doctors, nurses and other auxiliary staff	Not informed

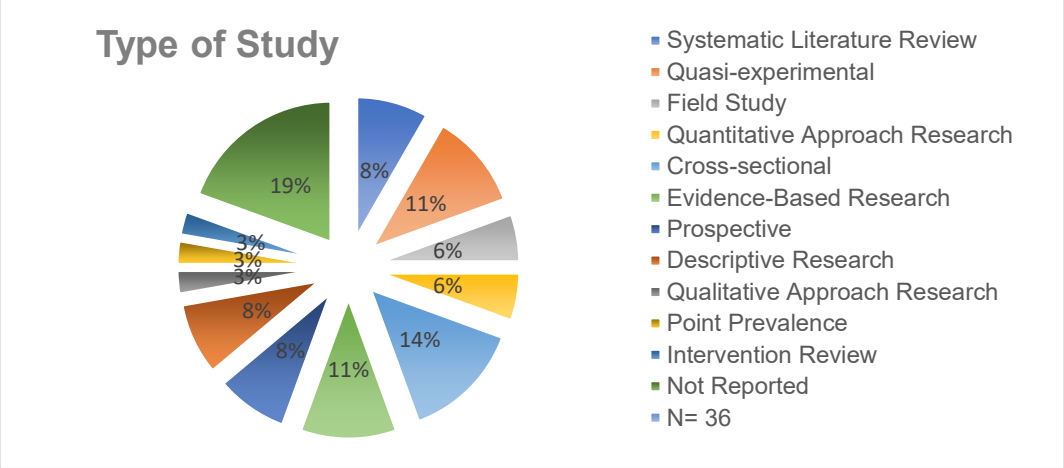
Ferrara P et al.	Transverse	Not informed	549	Healthcare professionals	Not informed
Aloush SM et al.	Transverse	Not informed	171	Credentialed nurse, working as a full-time nurse in the ICU, with at least one year of experience	Nurses with less than one year of experience

Source: Prepared by the authors.

In view of the data presented in Chart 2, it is possible to detect the variation in the samples of the studies analyzed, pointing to studies with a maximum sample size of n = 1908 and to studies with a minimum of n = 20.

In this table, the inclusion and exclusion criteria are also addressed, where it was possible to observe that of the thirty-six works studied, thirty-one presented their criteria.

Graph 3 – Type of study of the works surveyed in the databases



Legend: The predominance of the type of non-informed study was observed with 19% and with a lower predominance 3%.

Chart 3 – Implications for practice and authors' recommendations

Author	Implications for Practice	Authors' Recommendations
Stocco JGD	Studies show that the second-generation CVCs, impregnated with chlorhexidine and silver sulfadiazine that were used, showed benefits in reducing catheter colonization.	Scientific evidence is a support tool to incorporate this technology.
Silva AGD et al.	The study demonstrated, in the direct observation of the professionals, hand hygiene before and after performing and disinfecting the hub before administering medications was not completely adhered to by the nurses and nursing technicians.	It reinforces the importance of greater investment in the discussion of bloodstream infection prevention, as well as in the continuing education of teams
Dantas GD et al.	The results of this study allowed us to assess that the nursing team has weaknesses in the knowledge of the measures to prevent CHSR-CVC recommended by ANVISA and international agencies, such as the CDC.	It is suggested that protocols, standards and routines be instituted and implemented with a view to patient safety, especially the control and prevention of CHSR-CVC in critical care environments.
Barbosa CV et. Al	The study evidenced the lack of knowledge of nursing professionals in relation to the practices recommended by the institutional protocol.	The nursing team must be aware of the protection of patients who have a central venous catheter, must contribute to a treatment that can meet their needs, minimizing health risks, preventing infection, removing the catheter at the end of treatment and hospital discharge
Silva AGD	The study found that the multidisciplinary team's knowledge was limited to the measures considered the gold standard in the prevention of CVC-related bloodstream infection.	This demonstrates the importance of continuing education in an attempt to increase adherence to these measures and capable of influencing patient safety, control and prevention of bloodstream infection.
Costa CAB	The objectives of this study were achieved, since the self-reported knowledge and behavior of health professionals in the adult Intensive Care Unit regarding the recommendations of the central venous catheter insertion and maintenance bundle was analyzed.	It is suggested that protocols, standards and routines be instituted and implemented with a view to patient safety, especially the control and prevention of CHSR-CVC in critical care environments.
Calil K	The study showed that the prevention, control and elimination of Primary Bloodstream Infection (PBI) in patients using Central Venous Catheter (CVC) is configured as an area of action for "Patient Safety".	The bundle in this scenario presents itself as an opportunity to unite education for the best care practices, commitment to safe care and through the evaluation of the work process.
Oliveira FTD et al.	The study highlighted the need to approach mid-level professionals in the items antiseptic hand hygiene.	Conducting more studies that address the results of the adherence of the multiprofessional team to good practices in infection prevention can contribute to the improvement of the care results obtained.
Gomes MLS et al.	The study demonstrated non-conformities related to CVC dressing exchange practices.	It is necessary to develop improvement actions aimed at care practice, in addition to educational strategies, such as continuous evaluation of care, aiming at reducing BSI related to the use of CVC
Oliveira FTD et al	The implementation of the Positive Deviance methodology brought the possibility of a new approach to CVC care.	It was found that the Positive Deviance methodology helped in the implementation of proposals for improvements in the work process and in the development of the team for the problems identified in the care of the CVC, generating the adherence to best care practices.

Silva AGD et.al	The study demonstrated limited knowledge of the measures considered the gold standard in the prevention of CVC-related bloodstream infection.	Safe practices need to be cultivated in patient care. It may reflect better quality of care, patient safety, and reduced morbidity and mortality resulting from this infection.
Almeida TMD et al.	The study addresses the prevention and control of bloodstream infections associated with the use of catheters in which the patient can develop infections.	The availability of new types of catheters and dressings, which are increasingly safer and with better technical conditions, require professionals to be trained to handle them properly, ensuring safer care.
Oliveira JAD et al.	The evaluation of nursing care practices involving the administration of medications provided the identification of potentialities and vulnerabilities.	Enable better care practices for the nursing team, as well as for the construction of a safety culture, thus favoring policies and programs in the area of patient safety.
Zingg W et al.	The study demonstrates that a multidisciplinary and multimodal quality improvement program is needed to reduce central line-associated bloodstream infection.	More effort should be invested in understanding how a prevention program is adopted and implemented.
Dumyati G et al.	The study demonstrates the need for attention regarding the disinfection of needleless connectors by the nursing team.	Involvement and education of nursing staff in an evidence-based package for CVC insertion and maintenance.
Borg MA et al.	The study shows that it is necessary to reinforce the concept that effective infection prevention and control are related to behavior and biomedicine.	Infection control initiatives and antibiotic management should be evaluated and are the responsibility and competence of health professionals.
Langton H	The need to challenge health professionals with attitudes and ways of thinking and not only in behavior in the face of infection control.	Adopt psychosocial approach measures to bring attitudes and behavior and especially in education and standardization of processes.
Lemaster CH et al.	The study addresses the difficulties of employees in adopting the CVC package in the emergency.	Research should be done to create quality improvement projects, as this can bring technological advances in infection prevention.
Perez GMJ et al.	The study shows that it is necessary to make an assessment of the placement of the CVC.	Perform a checklist of catheter need, implement educational programs, and use centerline packages in catheter insertion and care.
Frimpong A et al.	Promote evidence-based practices for device insertion and care.	Implement care with packages such as HANDS in practice.
Hermon A et al.	The study shows that implementations and basic care of health care workers can reduce the rates of bloodstream infections.	Ensuring that change processes are integrated into the workflow with minimal administrative burden is crucial to the quality improvement process.
Dedunska K et al.	The study shows that many nurses are aware of the need to disinfect the connectors, but do not understand the reason for this.	That the medical team follow the standards of procedures and maintenance of the CVC, and training achievements.
Alkubati AS et al.	The study showed that professionals had low knowledge of the guidelines for preventing central venous catheter-related infection.	That medical, nursing, and infection control managers should plan periodic educational programs and training.
Barsuk JH et al.	The study showed that nurses exhibited variability in the ability to perform tasks in central line maintenance.	Professionals should be trained before they go to patient care.
Wilson C	That nurses are able to provide information on updating and preventing infection control.	Implement appropriate infection prevention techniques in all circumstances.

Jackson A	The study developed documents for better insertion of the CVC.	Implement a passport with information for the insertion of the CVC by health professionals.
Kaya H et al.	The study showed that nursing professionals need CVC care protocols.	That health professionals are informed about the use of protocols.
Broadhurst D et al.	The study identified implications with practice in the care of the central venous access device site.	More research and education is needed to ensure that central venous access device care is performed effectively to minimize preventable complications.
Desra AP et al.	The study implemented a standardized model to monitor the practices of scrubbing the hub.	The objective of this tool is to facilitate quality improvement initiatives in the various high-risk inpatient and outpatient settings.
Blanchard D et al.	The study shows that the drug-impregnated dressing (chlorhexidine or silver gluconate) reduces catheter-related bloodstream infection compared to unmedicated dressing.	More high-quality research is needed to examine the effectiveness of the wide range of dressings and safety products available.
Musu M et al.	The study determined an educational program addressed among health professionals regarding adherence to evidence-based practices.	He suggests implementing educational programs to reduce the risks of infection, as it is a strategy that works in a short period.
Morrison T et al.	The study demonstrated a feedback intervention in the subsequent identification of decreased central line-associated bloodstream infections.	The quality improvement project is a tool to provide feedback to professionals and improves the management of central lines by nurses.
Accardi R et al.	The objective of this study was to verify the level of knowledge about the nursing team's adherence to the guidelines on infection prevention and control in health care.	Achieve better adherence to infection prevention and control practices for nursing teams.
Yazici G et al.	The increase in invasive procedures that cause infections related to health care favors the increase in mortality, morbidity and cost of treatment.	Utilize infection control programs effectively and ensure control to prevent or at least decrease the frequency of healthcare-related infections.
Ferrara P et al.	The study highlights the lack of knowledge and evidence-based practices on the management of CVCS.	Education and training programs to improve knowledge, and organizational guidance to address adherence to evidence-suggested best procedures for CLABSI reduction and patient safety.
Aloush SM et al.	Further improvement in compliance and patient outcomes could be achieved by decreasing the nurse-patient relationship.	Lowering the nurse-patient ratio would help improve nurses in compliance and avoid CLABSI.

Source: Prepared by the authors.

DISCUSSION

According to Massaroli et al., (2011) the activities instituted by Ordinance 2616/98 are directed to the health team in a multiprofessional way that together will carry out strategies for implementing actions that will promote hospital infection control.

According to Viana (2011), the nursing team plays a primary role in the maintenance care of the CVC. Among the actions carried out are the daily evaluation of the real need for maintenance of the device, evaluation of the dressings that should be changed whenever wet, dirty or loose, evaluation of the catheter insertion site, guidance for the technical team regarding the protection of the catheter during bathing, and antisepsis with 70% ethyl alcohol in the extremities, before and after use.

Hospital Infection Control was historically evidenced with Florence Nigthingale during the Crimean War, where she established nursing care techniques aimed at hygiene and cleaning of the wards adopting aseptic techniques with the aim of reducing the harm of infection.

Other studies describe that health teams with an emphasis on nursing are made up of professionals present in the care of patients, playing an important role in the prevention of HAIs, and hand hygiene is the main way to reduce infections. The reduction of health problems is the responsibility of the entire team, where the health professional can carry out educational actions so that all those involved during the handling of catheters are trained (GIAROLA et. al., 2012).

The satisfaction of the professional, dialogue and support for the team by the administration are essential to ensure patient safety. Knowing the perception of health and nursing professionals on the subject of patient safety contributes to the improvement of health care and to the reduction of risks to the patient. Nursing has a fundamental participation in the processes that aim to guarantee and improve the quality of care provided in health units. However, isolated measures of training and qualification of professionals are not enough to guarantee the absence of risks (GONÇALVES et al., 2012).

In the view of Henrique et al. in 2013, the responsibility of health professionals in the development of their management activities, including coordination and/or supervision, should be preceded by training that allows them to develop administrative and technical assistance. However, this professional must literally keep up to date with new scientific knowledge to provide safe and quality care.

For Nicolao and collaborators, in 2013 the health professional must expose his scientific and technical knowledge related to technological advances to carry out specific activities with each profession. In the case of nurses, for example, performing the puncture and administering medications in a technical way and supported by the pharmaceutical team. Considering that it is his responsibility to take care of the dressings and prevent complications.

Other literary instruments express the determination of the existence of a Hospital Infection Control Commission (CCIH) and an infection control program in hospitals by the Ministry of Health by Law No. 9431 of 1997. Ordinance 2616/98 established guidelines and norms to encourage the prevention and control of hospital infections, establishing that the CCIH team should be formed by health professionals with higher education, they are chosen and divided into consultant members, and in this context the nurse has a main role along with another professional with higher education. The commission aims to assist,

inform and update the techniques and methods of prevention of cross-infection, notification system, epidemiological surveillance, which provides protocols and routine standards.

Frontline health professionals, including nurses involved in infection prevention, must always be up to date on the subject, so that they can be multipliers of information and routines together with the teams. The nurse has a leading role within a team, so he must implement protocols that can improve his care, avoiding damage to the patient's health. The duty of the professional nurse is to guarantee the person, family and the community care free of damage resulting from malpractice, negligence or imprudence exposed in the nursing code of ethics.

There are many duties and responsibilities of health professionals previously highlighted in law 9431, taking as an example the nurse is his responsibility to encourage, provide opportunities and produce technical, scientific and cultural improvement of the team under his supervision. Thus, even if he is not occupying the position of CCIH, he can exert interventions within the hospital units to reduce the incidence of health-related infections, and develop strategies with infection control actions, with folders and posters placed in places that all the teams can see in order to encourage prevention habits and behaviors. Continuing education is a way to assist in the control and prevention of health problems where the nurse has an indispensable role by developing Standard Precautions (PP) training (Dutra et al., 2015).

Hospital infection control (HI) occurred in the twentieth century, in Brazil it took place in the mid-70s, its evolution occurred through Brazilian hospitals that followed the development of other countries in the face of HAIs. In 1980, the topic of hospital infection gained the media through complaints from patients and professionals who were in charge of promoting infection prevention actions. Therefore, the Ministry of Health (MS) created a normative together with a working group integrated with the Ministry of Education and Social Security, Ordinance MS 196/83, of June 24, which proposed the creation of the Hospital Infection Control Commission (CCIH) (Oliveira et. al., 2016).

Nurses who work in hospital units at the CCIH need to have knowledge and skills to develop educational actions, with the aim of providing safety in the care of the patient and all those involved. It is responsible for reducing the incidence of adverse events that affect hospitalized patients and professionals. Its attributions are related to the epidemiological surveillance of infections, understanding the diagnosis, notifications and consolidations of reports, observation of the work of the teams by the rate of infections affected in the sectors, the incidence of infections caused by outbreaks associated with nursing care, recommends isolation and precautionary measures for communicable diseases to prevent

their spread, assists in the conduct of the use of prescribed antimicrobials and elaborates protocols that can help the treatment of HAIs. Institutions, together with continuing education, have the responsibility to improve professionals not only in sectors prone to infection, but in all sectors where the patient may be treated, as a simple mistake can lead to a person's death. (Barros et. al., 2016).

According to Santos et al., (2014) Law 7.498 on the Professional Practice of Nursing, where in the sole paragraph, item I of article 11, it says that it is the nurse's responsibility to prevent and control infections, emphasizing the commitment to CVC on a daily basis, with the objective of maintaining and assessing the risks that the patient may have when using the catheter. Sousa et al., (2017) describe the recognition of the nursing professional as a mediator to reduce the risks of infection and patient safety, maintaining the quality of care.

Catheter dressings are extremely complex and their replacement is the responsibility of the nurse, which is supported by the Law of Professional Nursing Practice, however the Code of Ethics for Nursing Professionals emphasizes that care for another professional category is prohibited, except in emergency cases. However, with the existing care reality in many hospital units, nursing technicians have been changing CVC dressings, even knowing that this activity is exclusive to nurses, as the work overload and professional deficits favor the nurse not changing the dressing. However, it is known that the nurse has the scientific knowledge for a periodic evaluation of the change of CVC dressings and the nursing technician, in his care and knowledge, must report to the nurse the state and validity of the dressing (Barbosa et al., 2017).

The control of HAI has become a complex and challenging process, because from the ethical and legal point of view associated with the lack of professionals, financial resources for investments in adverse events, and great difficulties for many units to acquire HAI prevention programs. Because all hospital institutions must form a CCIH for the implementation of the Hospital Infection Control Program (HICP) with the objective of planning sets of actions with the purpose of building quality indicators regarding the care provided by professionals. The nurse who is in charge of the HICP plays a fundamental role in care, surveillance, in the production of indicators and in management. The nurse's role in care favors the production of strategies, practices, prevention and control of the growth of the rate of health-related infections (Lamblet; Padoveze, 2018).

According to Andrade et al., 2010 and Siqueira et al., 2011, the risk factors are related to the duration and installation time of the catheter, the type of device, the number of lumens that this catheter has, the techniques used at the time of catheter insertion, the catheter insertion site, and types of infusions to be administered. Siqueira et al., (2011)

point out in their review that the implantation of the catheter in the inguinal site has a higher rate of bloodstream infection compared to the jugular and subclavian veins.

In the view of Junior et al., (2010) the types of catheter infection occur in three phases, ostium infection that is characterized by hyperemia and purulent secretion from the orifice, catheter tunnel infection or bag that presents hyperemia and secretion by a greater extension of the catheter, however these signs are perceived in patients who use semi-implantable catheters, In fully implantable cases, hyperemia occurs in the port store and is characterized as a store infection. Catheter-related bacteremia is the third type of infection and relates to short-term catheters where the signs of infection are the presence of hyperthermia and tremors.

According to Rosado et al., (2011) bloodstream infections in patients hospitalized in the Intensive Care Unit (ICU) may be associated with low immunity due to the disease installed in the body, nutritional status, and the performance of invasive procedures such as CVC, indwelling urinary catheter and orotracheal tube coupled to a mechanical ventilator. Sepsis is associated with blood product infusions, cardiac surgeries, catheter permanence time, corticosteroids for kidney problems, low leukocytes, types of devices and their composition, insertion site, infused solutions, and catheter handling.

In the view of Corrêa et al., (2012) there are numerous risk factors that are associated with catheter-related bloodstream infection (CRBSI). Intrinsic factors are related to patients with low immune systems, severe disease status, existing comorbidities, malnourished and pathogens of the resident skin microbiota. And extrinsic catheters are associated with specific types of catheters, insertion site, amounts of lumens, and the prolongation of catheter stay. Another factor also contributes to the permanence of prolonged hospitalizations and the precaution regarding care with catheter maintenance.

In Shah's 2013 view, the risk factors are associated with the patient, the device and the professional performing the insertion. In relation to the patient, it is focused on his health condition, the reduction of leukocytes, granulocytes, skin lesions, the amount of catheter lumens also favors infection, infections with non-tunneled catheters highlight the anatomical site, the femoral site has the highest incidence of risk of infection, the neck as intermediate and subclavian the lowest risk for infection.

For Henrique et al., (2013) comorbidity diseases such as systemic arterial hypertension, diabetes mellitus and chronic renal failure are risk factors that lead to CHF related to CVC. Risk factors for bloodstream infection are associated with pre-existing diseases, the form of catheter placement, the choice of site, length of stay, and the reason for catheterization. The administration of parenteral nutrition is also a risk factor that can

cause an increase in bloodstream infection. Lack of personal hygiene, transparent occlusive dressings, moisture at the insertion site, nasal colonization by *Staphylococcus aureos,* and adjacent infections favor bacterial infection of the bloodstream. Hemodialysis-related infections include contamination of the dialyzer and equipment, untreated water, administration of drugs to increase immunity, decreased hemoglobin level, recent hospitalization or surgery (Gahlot et al., 2014).

In the view of Crivelaro et al., (2018) the risk factors associated with catheter infection are related to prolonged hospitalizations, the use of immunosuppressants, antibiotic therapy, underlying diseases, nutrition, invasive procedures, and the ventilatory prosthesis coupled to the mechanical ventilator.

For Andrade et al., (2010) the microorganisms present in bloodstream infections are *Staphylococcus aureos, Enteroccoccus*, *Klebsiela* and *Pseudomonas*. Danski et al., (2017) adds *coagulase-negative Staphylococcus*, *Acinetobacter spp,* and *Pseudômonas aeruginosa*. Silva et. al., (2018) in its review points out, but two agents the *Acinetobacter baumannii* and *Candida spp.*

According to Todeschini and Trevisol (2011), the intravascular device favors microorganisms to invade the bloodstream, causing bacteremia, increasing the mortality rate of patients. The pathogens related to bacteremia are *Pseudomonas aeruginosa* and *coagulase-negative Staphylococcus.* And in the culture of the catheter tips, the etiological agents associated with bloodstream infection are *coagulase-negative Staphylococcus* and *Staphylococcus aureus,* in addition *to Enteroccoccus faecalis, Pseudômonas aeruginosa and Candida albicans.*

For Corrêa et al., (2012) the pathogens that cause bloodstream infections in the hospital environment have changed over the years. Between the years 1986-1989*, Staphylococcus spp., coagulase-negative Staphylococcus and Staphylococcus aureus* were recurrent causes of bloodstream infection. In the year 1992-1999 were the *most* frequent microorganisms found in hospital environments that cause BSI are *coagulase-negative Staphylococcus with* a percentage of 31.3%, *Staphylococcus aureus* with 20.2%, *Enteroccoccus* spp. com 9.4% and *Candida spp.* with 9%.

According to Shah et al., (2013) the microorganisms related to bloodstream infection have specific characteristics of the host, where infections in hemodialysis catheters are *Staphylococcus aureus,* patients with malignant neoplasms are found with gram-negative bacilli in the insertions made in the femoral accesses. In addition, bacilli, yeast, Gram-negative, and *candida* are being associated with infusions of parenteral nutritions.

According to Mendonça et al., (2011) the occurrences of these infections in Brazil vary from 3.2 to 40.4 of this event per thousand days of catheter and mortality from 6.7% to 75%. Alvim *et. al*., (2017) points to percentage data of patients who contract health-related infections, where 5 to 15% for patients hospitalized in other sectors and 25 to 35% in Intensive Care Units (ICU).

According to Silva and Oliveira (2018), in Brazil, the structuring of epidemiological data on catheter-related BSI in ICUs began in 2010 with the formation of FormSUS. It highlights that the incidence of infection in 2015 was 4.1 to 5.1 per 1000 CVC/day.

According to Brasil (2009), the hand hygiene of health professionals who provide care to patients with resistant microorganisms should follow three essential steps to avoid transmissibility, a topical agent with antimicrobial efficacy, adequate use by applying the correct technique and time recommended by the appropriate regulations.

For Andrade et al., (2010) hand hygiene, asepsis of connections, use of sterile materials and aseptic techniques in dressing are important factors for infection prevention. Santos et al., (2014) emphasize that antisepsis of the catheter hubs is significant in the prevention of infections related to the use of CVC, a procedure that should be performed before and after manipulations and infusions.

For Rosado et al., in 2011, improvements related to the care of intravenous devices were strengthened through bundles that were inserted as strategies currently applied. The *Institute for Healthcare Improvement* (IHI) has developed structured practices to improve the care process to benefit the discharge of this patient. Brachine et al., (2012) point out that there are several strategies that have been developed to minimize the risks of catheter-related bloodstream infection (CRBSI). Some are described in the *Center for Disease Control and Prevention* (CDC) as standards *(Guidelines for the Prevention of Intravascular Catheter-Related Infections*) and these guidelines are being implemented as a form of intervention protocols divided into care groups that were called bundles by the British. Consonant, bundle has become paramount in patient safety when inserted in care.

Strict care should be taken before insertion of the central catheter, such as strict antisepsis of the hands with 10% PVP-I degerming antiseptic solution or 2% chlorhexidine degerming; wearing gloves does not exempt hand antisepsis; perform antisepsis of the patient's skin and then clean with soap and water or degerming solution using 2% alcoholic chlorhexidine, 70% alcohol or 10% alcoholic or topical PVPI may also be used in the absence of the above. Wear complete appropriate clothing, i.e., sterile gloves, mask, cap, sterile apron and sterile drape, for insertion of the central venous access (Passamani and Souza 2011).

According to Brachine in 2012 and Santos et al. in 2014, the daily action and checklist help in the process of inserting catheters, as non-compliance with the list contributes to the interruption of the procedure. The strategy of interventions that are inserted within the bundle facilitates nursing care, reducing the incidence of adverse events and infection.

According to Brachine et al., (2012) the use of 0.5% alcohol chlorhexidine gluconate in skin preparation before catheter insertion is a recommended measure based on scientific evidence. Santos et al., 2014, describe that performing body hygiene with the 2% chlorhexidine solution in the daily bath of patients using CVC and the use of a sponge with chlorhexidine in the vicinity of the catheter insertion favors the reduction of infections.

According to Mendonça et al., (2012) the implementation of courses on infection prevention measures favors the reduction of the incidence of the disease with a series of attitudes and procedures, such as: correct hand hygiene, the correct use of individual equipment, the safe administration of injectable drugs and the performance of aseptic tests at the time of insertion of the devices.

Care with procedures related to vascular access should be a priority for the entire team that accompanies the patient, so that effective multidisciplinary and interdisciplinary surveillance enables the prevention and control of probable complications. The manipulation of vascular access is a routine nursing practice, and the nurse is responsible for guiding and supervising the team in relation to the performance of care and correct technique. Therefore, considering the high complexity of the insertion and constant manipulation of the vascular access, it is essential to continue educating the nursing team, focusing on the standardization and performance of specific care and rigorous aseptic techniques (Rigotti et al., 2012).

The treatment after semi-implantable catheters of prolonged permanence should be performed by the nursing staff daily until the skin heals and after the tunnel heals it will not be necessary to make a dressing. For fully implantable long-term catheters, the dressing does not need to be made while the catheter is not being used. After drug administration, the catheter should be salinized with saline solution (0.9%) before needle extraction (Santos et al., 2013).

It is not recommended to collect blood for laboratory tests through the catheter; not unblocking the catheter or aspirating a clot; The use of ointment with antimicrobials may deteriorate the catheter material and lead to antibiotic resistance, thus being contraindicated. In view of the references raised and studied, it is concluded that CVC is a technological resource that is widely necessary for the treatment of several patients in

numerous situations. However, its use requires specific nursing care for its conservation in order to postpone the complications associated with it. Therefore, it is up to the nurse to have technical-scientific knowledge, skill, daily evaluation of the catheter and permanent training of the nursing team through the implementation of current protocols in order to guide professionals on the importance of correct handling of devices, thus reducing the risks for the development of infection resulting from the use of CVC, as well as other types of complications, therefore, prioritizing patient safety in the face of adverse health reactions.

According to Henrique et al., (2013) nursing plays an important role in reducing the rate of BSI and in patient safety with the training of nursing teams with the objective of encouraging professionals to perform better in care. According to Oliveira et al., (2017) less than 50% of health professionals have received continuing education and believe they preserve a good commitment related to hand hygiene (HH).

Catheter-related bloodstream infections were reduced after the insertion of catheters impregnated with antibiotics, called first-generation catheters, with all after evidence-based research it was observed that catheters impregnated with chlorhexidine and silver sulfadiazine showed better efficacy in terms of the rate of bloodstream infections, this was called second-generation catheter. But it is necessary to carry out an assessment regarding the need to place CVCs in patients, this assessment must be done by the multidisciplinary team so that together they can implement care at the time of insertion and maintenance (Stocco, 2014).

Hand hygiene of health professionals before and after contact with patients can favor the reduction of infections in the hospital environment. However, continuing education is necessary, as well as educational measures such as training with the practice of hand hygiene (Silva, et al., 2017). For Dantas et al., 2017, Oliveira et al., 2017 and Silva 2017, health professionals are aware of hand hygiene practices and antisepsis in hubs, but they do not perform them adequately in care. Many nurses are not aware of the measures to prevent bloodstream infection by ANVISA and international bodies. Therefore, it is necessary to implement protocols regarding catheter insertion and manipulation, in addition to educational workshops for continuing education on the prevention of catheter-associated infections.

Some health professionals are unaware of the set of interventions called Bundle that is indicated for patients with CVC, the Bundle is composed of interventions based on scientific evidence with the objective of effectively reducing IPCS, it is composed of hand hygiene, use of maximum barrier precaution, skin antisepsis with chlorhexidine, selection of

the best insertion site for CVC passage and the daily review of the need for CVC permanence. However, many hospitals do not adhere to prevention measures, favoring the disorderly growth of the infection rate. They also point out the need to evaluate the insertion site, the subclavian and jugular that are more suitable for insertion, with everything avoiding insertion in the femoral of adults. In this context, hospital unit managers need to implement insertion and maintenance protocols, as well as educational workshops for continuing education for all professionals who provide care to patients with CVCs so that they can have better adherence to the prevention of PBSI (Calil 2014, Oliveira 2016, Costa 2017, Silva et al., 2018).

For Gomes et al., (2017) the dressings and maintenance of the CVCs are performed by the nurse, but some conformities not adhered to at the time of change can cause BSI. For an effective change of dressing, it is necessary to wash the hands before and after handling, antisepsis of the connectors with alcohol solution, identification of the dressing, in addition to the record of the dressing, informing the aspect of the insertion site and skin. The studies by Oliveira et al., 2017 showed that the Positive Deviance methodology enabled a new approach to CVC care, as it identified important aspects in care as opportunities for improvement, with a suggestion of investment in theoretical and practical knowledge about the prevention of catheter-related infections.

In the view of Santos et al., (2014) the use of transparent film has an advantage in reducing expenses for the hospital unit, allowing the observation of the insertion, because if it does not indicate bleeding and secretion, they can remain for up to seven days. Related to sterile gauze, which is at a disadvantage when it comes to expenses for the hospital unit, the dressing has to be changed every two days or when they are damp.

According to Oliveira et al., (2016) the importance of hand washing occurred in 1847, where Semmelweis observed that women who were evaluated by medical students were taken to death in the maternity ward. With this, it showed that the hands are the main door of transmission of microorganisms, and that the use of solutions before and after examining the patients showed a reduction in mortality.

CONCLUSION

It was possible to observe with all results that there are several factors for the cause of nosocomial infection, especially during invasive procedures, such as the insertion and maintenance of venous catheters. Venous catheters have become widely used in institutionalized patients, especially Intensive Care Unit patients, becoming fundamental in long-term therapy. Its efficacy allows greater safety in the handling of these patients,

ensuring a satisfactory route to administer medications, transfusions of blood products, nutritional and parenteral therapy, for example. Despite the advantages it offers, catheterization configures a series of infectious complications.

There are numerous risks of colonization and supposed catheter-related infection, factors associated with low patient immunity or catheterization. The amount of lumens favors infection, the nurse's procedure before and during the dressing manipulation, the instability of the disease, all these circumstances increase the probability of infection, the catheter can be contaminated by the patient's microbiota or by the hands of the nurse who handles it, all contribute to the incidence of infection by the catheter.

Infection prevention and control should be part of the professional's training, one of the most effective techniques in preventing infection is hand hygiene, this low-cost and scientifically proven habit, but still quite deficient. The preventive technique is the responsibility of the team, as its care for the patient is permanent, so the entire team must have the technical and scientific awareness of the appropriate dressings and appropriate solutions for skin asepsis.

It is extremely important that nurses are up to date on the subject, being able to be a multiplier of knowledge for the team and a minimizer of risks. As a leader, he must implement protocols to ensure patient care and safety, even if he is not occupying the position of CCIH, he can perform interventions to reduce the rate of infections. Continuing education is a way to control and prevent health problems, where nurses play an essential role in developing training. The competence and exclusivity of the professional nurse to perform the dressing, supported by the Law of Professional Nursing Practice, stands out.

According to the research carried out, it shows the difficulty of adherence to hand hygiene, due to several factors, such as individual, behavioral, cultural, organizational, among others, and should be considered during the planning of the strategy.

Therefore, it was possible to evidence the role of the multiprofessional team with emphasis on the nurse in the prevention and control of HAI in the CCIH. The excellence of the CCIH of these professionals in hospital institutions is scientifically proven, with this, the dissemination of the activities of the commission, its objective and transcendence become a challenge and a new possibility to carry out the planning proposed for the coming years seeking to prevent and control infection, aiming to reduce the rates of deaths related to them.

REFERENCES

1. Albuquerque, A. (2016). A segurança do paciente à luz do referencial dos direitos humanos. *Revista de Direito Sanitário, 17*(2), 117–137. https://doi.org/10.11606/issn.2316-9044.v17i2p117-137

2. Alvim, A. L. G. (2017). Conhecimento dos profissionais de enfermagem em relação às medidas de prevenção das infecções. *Revista de Enfermagem UFPE On-Line, 11*(1), 18–23. https://doi.org/10.5205/1981-8963-v11i1a11873p18-23-2017

3. Andrade, M. R. S. O. C. (2010). Risco de infecção no cateter venoso central – Revisão de literatura. *Revista Brasileira de Enfermagem On-Line, 9*(2), 1–8. https://doi.org/10.5935/1676-4285.20103109

4. Barbosa, C. V. C. C. G. M. G. (2017). Saberes da equipe de enfermagem sobre o cuidado com cateter venoso central. *Revista de Enfermagem UFPE On-Line, 11*(11), 4343–4350. https://doi.org/10.5205/reuol.23542-49901-1-ED.1111201710

5. Barros, M. M. A. P. C. S. (2017). O enfermeiro na prevenção e controle de infecções relacionadas à assistência à saúde. *Revista Univesitas: Ciências da Saúde de Brasília, 14*(1), 15–21. https://doi.org/10.5102/ucs.v14i1.3411

6. Belela-Anacleto, A. S. C. P. P. (2017). Higienização das mãos como prática do cuidar: Reflexão acerca da responsabilidade profissional. *Revista Brasileira de Enfermagem, 70*(2), 461–464. https://doi.org/10.1590/0034-7167-2016-0189

7. Brachine, J. D. P. P. P. (2012). Método bundle na redução de infecção de corrente sanguínea relacionada a cateteres centrais: Revisão integrativa. *Revista Gaúcha de Enfermagem, 33*(4), 200–210. https://doi.org/10.1590/S1983-14472012000400025

8. Brasil. Agência Nacional de Vigilância Sanitária. (2009). *Segurança do paciente em serviços de saúde: Higienização das mãos*. http://bvs.saude.gov.br/bvs/publicacoes/seguranca_paciente_servicos_saude_higienizacao_maos.pdf

9. Brasil. Agência Nacional de Vigilância Sanitária. (2010). *Orientações para prevenção de infecção primária de corrente sanguínea*. file:///C:/Users/2246645/Downloads/prevencaoInfeccaoCorrente.pdf

10. Brasil. Agência Nacional de Vigilância Sanitária. (2013). *Protocolo para prática de higienização das mãos em serviço de saúde*. file:///C:/Users/2246645/Downloads/protoc_higieneDasMaos.pdf

11. Brasil. Agência Nacional de Vigilância Sanitária. (2017). *Critérios diagnósticos de infecções relacionadas à assistência à saúde*. file:///C:/Users/2246645/Downloads/CRITERIOS_DIAGNOSTICOS_IRAS_03%20(3).pdf

12. Brasil. Agência Nacional de Vigilância Sanitária. (2017). *Medidas de prevenção de infecção relacionadas à assistência à saúde*. a3f23dfb-2c54-4e64-881c-fccf9220c373

13. Capucho, H. C. C. S. H. B. (2013). Necessidade de implantar programa nacional de segurança do paciente no Brasil. *Revista Saúde Pública, 47*(4), 791–798. https://doi.org/10.1590/S0034-8910.2013047004402

14. Corrêa, K. L. A. J. R. (2012). Diferença de tempo de positividade: Método útil no diagnóstico de infecção de corrente sanguínea relacionada com cateter? *Jornal Brasileiro de Patologia e Medicina Laboratorial, 48*(3), 195–202. https://doi.org/10.1590/S1676-24442012000300007

15. Crivelaro, N. C. B. F. S. W. (2018). Adesão da enfermagem ao protocolo de infecção de corrente sanguínea. *Revista Enfermagem UFPE On-Line, 12*(9), 2361–2367. https://doi.org/10.5205/1981-8963-v12i9a234886p2361-2367-2018

16. Danski, M. T. R. P. B. W. F. (2017). Custos da infecção relacionada a cateter central em adultos: Revisão integrativa. *Revista Baiana de Enfermagem, 31*(3), 1–10. https://doi.org/10.18471/rbe.v31i3.18394

17. Dutra, G. G. C. B. L. S. C. (2015). Controle de infecção hospitalar: Função do enfermeiro. *Revista de Pesquisa Cuidado Fundamental Online, 7*(1), 2159–2168. https://doi.org/10.9789/2175-5361.2015.v7i1.2159-2168

18. Gahlot, R., Nigam, C., Kumar, V., Yadav, G., & Anupurba, S. (2014). Catheter-related bloodstream infections. *International Journal of Critical Illness & Injury Science, 4*(2), 162–167. https://doi.org/10.4103/2229-5151.134184

19. Gil, A. C. (1991). *Como elaborar projetos de pesquisa* (3rd ed.). Atlas.

20. Giarola, L. B. B. C. B. M. W. (2012). Infecção hospitalar na perspectiva dos profissionais de enfermagem: Um estudo bibliográfico. *Revista Cogitare Enfermagem, 17*(1), 151–157. http://www.redalyc.org/articulo.oa?id=483648962022

21. Gonçalves, L. A. A. O. B. F. G. P. (2012). Alocação da equipe de enfermagem e ocorrência de eventos adversos/incidentes em unidade de terapia intensiva. *Revista da Escola de Enfermagem da USP, 46*(Esp.), 71–77. https://doi.org/10.1590/S0080-62342012000700011

22. Henrique, D. M. T. A. T. F. M. A. S. (2013). Fatores de risco e recomendações atuais para prevenção de infecção associada a cateteres venosos centrais: Uma revisão de literatura. *Revista de Epidemiologia e Controle de Infecção, 3*(4), 134–138. https://doi.org/10.17058/reci.v3i4.4040

23. Junior, M. A. N. M. J. P. A. F. R. (2010). Infecções em cateteres venosos centrais de longa permanência: Revisão da literatura. *Jornal Vascular Brasileiro, 9*(1), 46–50. https://doi.org/10.1590/S1677-54492010000100008

24. Lambert, L. C. R. P. M. C. (2018). Comissões de controle de infecção hospitalar: Perspectiva de ações do conselho regional de enfermagem. *Cadernos Ibero-Americanos de Direito Sanitário, 7*(1), 29–42. https://doi.org/10.17566/ciads.v7i1.426

25. Massaroli, A., Martini, J. G., Lino, M. M., Spenassatto, D., & Massaroli, R. (2017). Educação permanente para o aperfeiçoamento do controle de infecção hospitalar: Revisão integrativa. *Revista Saúde & Transformação Social / Health & Social Change, 8*(3), 7–15. https://doi.org/10.21675/2357-707X.2017.v8.n3.1115

26. Mendonça, K. M. N. B. S. T. P. (2011). Atuação da enfermagem na prevenção e controle de infecção de corrente sanguínea relacionada a cateter. *Revista Enfermagem UERJ, 19*(2), 330–333. http://www.facenf.uerj.br/v19n2/v19n2a26.pdf
27. Nere, C. S. S. S. R. P. S. (2017). A atuação da enfermagem no controle da infecção hospitalar: Revisão integrativa. *Revista Ciência & Saberes, 3*(3), 630–635. http://www.facema.edu.br/ojs/index.php/ReOnFacema/article/view/192

28. Nicola, C. P. E. (2013). A história da venopunção: A evolução dos cateteres agulhados periféricos ao longo dos tempos. *Revista Conhecimento Online, 1*(5), 1–11. https://doi.org/10.25112/rco.v1i0.233

29. Oliveira, A. C. O. (2013). Infecções relacionadas ao cuidar em saúde no contexto da segurança do paciente: Passado, presente e futuro. *Revista Mineira de Enfermagem, 17*(1), 216–220. https://doi.org/10.5935/1415-2762.20130018

30. Oliveira, A. C. P. A. O. (2013). Intervenções para elevar a adesão dos profissionais de saúde à higiene de mãos: Revisão integrativa. *Revista Eletrônica de Enfermagem, 15*(4), 1052–1060. https://doi.org/10.5216/ree.v15i4.21323

31. Oliveira, A. C. P. G. (2017). Monitorização da higienização das mãos: Observação direta versus taxa autorreportada. *Revista Eletrônica Trimestral de Enfermería, 16*(4), 334–343. https://doi.org/10.6018/eglobal.16.4.277861

32. Oliveira, H. M. S. L. (2016). Políticas de controle e prevenção de infecções relacionadas à assistência à saúde no Brasil: Análise conceitual. *Revista da Escola de Enfermagem da USP, 50*(3), 505–511. http://www.scielo.br/pdf/reeusp/v50n3/pt_0080-6234-reeusp-50-03-0505.pdf

33. Otani, N. F. (2011). *TCC: Métodos e técnicas* (2nd ed.). Visual Books.
34. Passamani, R. F. S. S. R. O. S. (2011). Infecção relacionada a cateter venoso central: Um desafio na terapia intensiva. *Revista Hospital Universitário Pedro Ernesto UERJ, 10*(1), 53–58. http://revista.hupe.uerj.br/detalhe_artigo.asp?id=128

35. Pedrolo, E. L. O. M. D. (2013). Evidências para o cuidado de cateter venoso central de curta permanência: Revisão integrativa. *Revista de Enfermagem UFPE On-Line, 7*, 4199–4208. https://doi.org/10.5205/reuol.4134-32743-1-SM-1.0705esp.201313

36. Perin, D. C. E. H. S. (2016). Evidências de cuidado para prevenção de infecção de corrente sanguínea relacionada a cateter venoso central: Revisão sistemática. *Revista Latino-Americana de Enfermagem, 24*, 1–10. https://doi.org/10.1590/1518-8345.1233.2787

37. Rigotti, M. A. S. S. S. S. S. (2012). Estudo de revisão: Medidas preventivas para se evitar a infecção do cateter venoso central. *Revista Conexão Eletrônica, 6*(1/2), 1–13. http://revistaconexao.aems.edu.br/wp-content/plugins/download-attachments/includes/download.php?id=1433

38. Rosado, V. R. C. (2011). Fatores de risco e medidas preventivas das infecções associadas a cateteres venosos centrais. *Jornal de Pediatria, 87*(6), 469–477. https://doi.org/10.2223/JPED.2134

39. Rupp, M. E., & Karnatak, R. (2018). Intravascular catheter-related bloodstream infections. *Infectious Disease Clinics of North America, 32*(4), 1–23. https://doi.org/10.1016/j.idc.2018.06.002

40. Santos, S. F. V. A. C. M. E. (2014). Ações de enfermagem na prevenção de infecções relacionadas ao cateter venoso central: Uma revisão integrativa. *Revista Sobecc, 19*(4), 219–225. https://doi.org/10.5327/Z1414-4425201400040008

41. Serra, J. N. B. C. (2016). Situações dos hospitais de referência para implantação/funcionamento do núcleo de segurança do paciente. *Revista Cogitare Enfermagem, 21*(5), 1–9. https://doi.org/10.5380/ce.v21i5.45925

42. Shah, H., Bosch, W., Thompson, K. M., & Hellinger, W. C. (2013). Intravascular catheter-related bloodstream infection. *The Neurohospitalist, 3*(3), 144–151. https://doi.org/10.1177/1941874413476043

43. Silva, A. G. O. (2017). Adesão às medidas para prevenção da infecção da corrente sanguínea relacionada ao cateter venoso central. *Revista Enfermagem em Foco, 8*(2), 36–41. https://doi.org/10.21675/2357-707X.2017.v8.n2.977

44. Silva, A. G. O. (2018). Impacto da implementação dos bundles na redução das infecções da corrente sanguínea: Uma revisão integrativa. *Revista Brasileira de Enfermagem, 71*(Suppl. 4), 1597–1604. https://doi.org/10.1590/0034-7167-2017-0354

45. Siqueira, G. L. G. H. C. N. C. C. (2011). Infecção de corrente sanguínea relacionada a cateter venoso central (ICSRC) em enfermeiras: Estudo prospectivo comparativo entre veia subcl \ávia e veia jugular interna. *Jornal Vascular Brasileiro, 10*(3), 212–216. https://doi.org/10.1590/S1677-54492011000300005

46. Sousa, A. F. L., Moura, M. E. B., & Levin, A. S. (2017). Prevenção e controle de infecção na formação do enfermeiro: Estudo descritivo. *Online Brazilian Journal of Nursing, 16*(2), 199–228. https://doi.org/10.17665/1676-4285.20175560

47. Sousa, P. (2014). *Segurança do paciente: Conhecendo os riscos nas organizações de saúde*. Fiocruz.

48. Souza, R. F. F. S. (2014). Estudo exploratório das iniciativas acerca da segurança do paciente em hospitais do Rio de Janeiro. *Revista Enfermagem UERJ, 22*(1), 22–28. http://www.e-publicacoes.uerj.br/index.php/enfermagemuerj/article/view/11399/8972

49. Tardivo, T. B. N. J. (2008). Infecções sanguíneas relacionadas aos cateteres venosos. *Revista Brasileira da Sociedade Brasileira de Clínica Médica, 6*(6), 224–227. http://files.bvs.br/upload/S/1679-1010/2008/v6n6/a224-227.pdf

50. Todeschini, A. B. T. (2011). Sepse associada ao cateter venoso central em pacientes adultos internados em unidade de terapia intensiva. *Revista Brasileira de Clínica Médica, 9*(5), 334–337. http://files.bvs.br/upload/S/1679-1010/2011/v9n5/a1853.pdf

51. Zerati, A. E., Wolosker, N., & Puech-Leão, P. (2017). Cateteres venosos totalmente implantáveis: Histórico, técnica de implante e complicações. *Jornal Vascular Brasileiro, 16*(2), 128–139. https://doi.org/10.1590/1677-5449.008216