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NURSING CARE ASSOCIATED TO PERIPHERAL VENOUS CATHETERIZATION

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ABSTRACT

Objective: to analyze the nursing interventions to be performed when using the peripheral venous catheter (PVC), based on the most recent scientific evidence.

Methods: this review consists in a systematic review of literature, based on the question “What are the most evident infection control measures associated with peripheral venous catheterization in critically ill patients in the context of an emergency service?”. Using the keywords in Health Sciences MeSH and DeCS, the keywords were structured: Nursing AND Peripheral Catheterization AND Phlebitis. It was decided to use the EBSCO Host Web databases: CINAHL Plus & MEDLINE and B-On, in the chronological grid of 2017-2019.

Results: six items were selected. The results were grouped into two main topics: “Risk factors associated with increased complications of peripheral venous catheterization” and “Quality improvement in interventions associated with peripheral venous catheterization: strategies and decision making”.

Conclusions: the nurse has a fundamental role in the prevention, early identification, classification and resolution of all problems that may arise from PVC. It is because of this that you must boost your knowledge and work to improve interventions.

Keywords: nursing; peripheral catheterization; phlebitis; infection control.

INTRODUCTION

The Infections associated with healthcare (IAHC) and the consequent increase in the resistance of microorganisms, due to the systematic use of antimicrobials, are problems that correlate and are increasing worldwide. It is expected that efforts will be joined in all countries and that people do not ignore this issue and the serious consequences it brings to users. Ignorance about this problem will only lead to an increase in morbidity and mortality, length of stay, costs associated with healthcare⁽¹⁾. It is in this sense that health organizations and units are increasingly concerned with the quality of care that is provided, and for this to happen, research and study on the best measures to be adopted is necessary⁽¹⁻²⁾.

Hospitalization times are characterized by the weak ability of users to maintain good levels of immune defense, since they undergo invasive processes through various diagnostic techniques, administration of therapy and different types of monitoring⁽²⁾.

Obtaining peripheral venous accesses using catheters is one of the most common nursing interventions. PVC is essential for the administration of intravenous therapy, since it provides us with less invasive vascular access, of less complexity and with some speed⁽²⁻⁹⁾. Despite being one of the methods chosen for administering medication, PVC is also indicated for infusing fluids, blood and/or blood components, parental nutrition and for diagnostic purposes^(3-6,9).

Studies show that from 58.7% to 86.7% of users in hospital need PVC, thus becoming a large number of users in need of nursing care⁽⁶⁾. As it is a relatively easy technique to perform, its maintenance, surveillance and associated care are still neglected, a factor that is aggravated by overtime⁽⁴⁾, lack of human and material resources.

With the use of PVC, there is an increased incidence of local damage, namely phlebitis, thrombophlebitis, hematoma, pain, local infection, infiltration and leakage, catheter obstruction and accidental externalization^(3-4,6,8). According to scientific evidence, the conditions mentioned above are associated with premature failure of access in at least 69% of users⁽³⁾. Despite not being a topic addressed in this literature review, systemic complications can also be a problem and with serious consequences for the user⁽⁸⁾.

The most localized signs are manifested as small lesions around the insertion site of the PVC, which rarely acquire seriousness and are easily detectable⁽⁸⁾.

Phlebitis, one of the most frequent consequences, is characterized as an inflammation of the intimate layer of the vein, being a response to the injury caused by the insertion and use of the PVC, in addition to its subsequent use^(6,9). The incidence of phlebitis can vary from 2.5% to 70%⁽⁴⁾. The associated symptoms are pain at the insertion site, edema, erythema, heat and local sensitivity, a palpable fibrous cord, and in some more severe cases, accompanied by purulent exudate and fever^(2,5,9).

The need to study and to seek the best evidence on the risk factors associated with PVC, its complications and preventive measures is a concern in health units and nurses should manage this situation with caution and act for an efficient development and adoption of best practices, promoting decision-making for the prevention of local and systemic infections^(2,6-8).

The main objective of this review is to analyze the nursing interventions to be performed when using the peripheral venous catheter (PVC), based on the most recent scientific evidence.

METHODS

The Evidence-based practice (EBP) is an effective approach to seeking answers to questions that are evident in the clinical practice of health professionals. It presupposes the use of the best available evidence, conscientiously and with the main objective of trying to improve the provision of care, combining theoretical knowledge with the clinical experience, preferences and values of the user⁽¹⁰⁻¹¹⁾.

Currently, the nursing profession seeks to evolve in the most qualified and structured way possible, through the provision of care that systematically seeks the excellence of its practice. Society demands it and nurses increasingly aspire to an exemplary performance that dignifies the profession, giving rise to a healthy competition for the search for the best clinical evidence/practice, ensuring the safety of the user. It is in this way that EBP becomes increasingly relevant and important in the context of the profession⁽¹⁰⁻¹¹⁾.

In order to synthesize the most recent knowledge, looking for the best evidence about PVC, it was decided to develop an integrative literature review. It is considered a scientific method that aims at the rigorous synthesis of all the researches carried out on a determined question that was previously elaborated. In general, the studies included in the construction of an integrative review are primary and another review of the literature, thus allowing the elaboration of a summary of evidence that will allow the best answer to the identified problem. It is through this type of scientific production that professionals can support their decision making and the improvement of daily professional practice⁽¹¹⁾.

To carry out the research question, the PICO methodology was used – participants (P), phenomenon of interest (I), context (Co)⁽¹⁰⁾. This concept allows realizing/guiding questions of clinical practice, starting with parts, which after thought and structured, formulate the final question. The success and relevance of the review always depend on the quality of the research hypothesis formulated. The formulation of these types of questions is a basic competence and determinant of the competence of the health professional, to face all the demands that are imposed on him in daily practice⁽¹⁰⁾.

Following this line of thought, the following research hypothesis was elaborated: What are the infection control measures with the greatest evidence associated with peripheral venous catheterization (I) in critically ill patients (P) in the context of the emergency service (Co)? Using the descriptors in Health Sciences MeSH and DeCS, the keywords were structured with the addition of the Boolean AND, as follows: Nursing AND Peripheral Catheterization AND Phlebitis. We opted to use the EBSCO Host Web databases: CINAHL Plus & MEDLINE and B-On, and in the last database referred to, the limitation of key-

words by the “Subject Terms” due to the large sample volume obtained. The research was carried out in June 2019, using the 2017-2019 timeline and the linguistic limiter of only articles in English, Portuguese and Spanish, from primary sources.

As inclusion criteria, we defined: hospitalized adults and infection control measures associated with peripheral venous catheterization. Regarding the exclusion criteria, it was stipulated: hospitalized children and elderly; adults/elderly and children in the community and infection control measures associated with other types of techniques.

This research was carried out by two critical reviewers with academic, professional and scientific experience in the subject, so the research and analysis of the sample was carried out in the most reliable and correct way possible.

On the online platforms EBSCO Host Web: CINAHL Plus & MEDLINE and B-On, a total of five thousand and seventy-six articles were obtained, which after applying research/temporal/linguistic limiters, twenty-four were obtained, adding one obtained by reference. After reading the title/abstract/full article and by duplication, nineteen were excluded, obtaining a final sample of six articles (see figure 1).

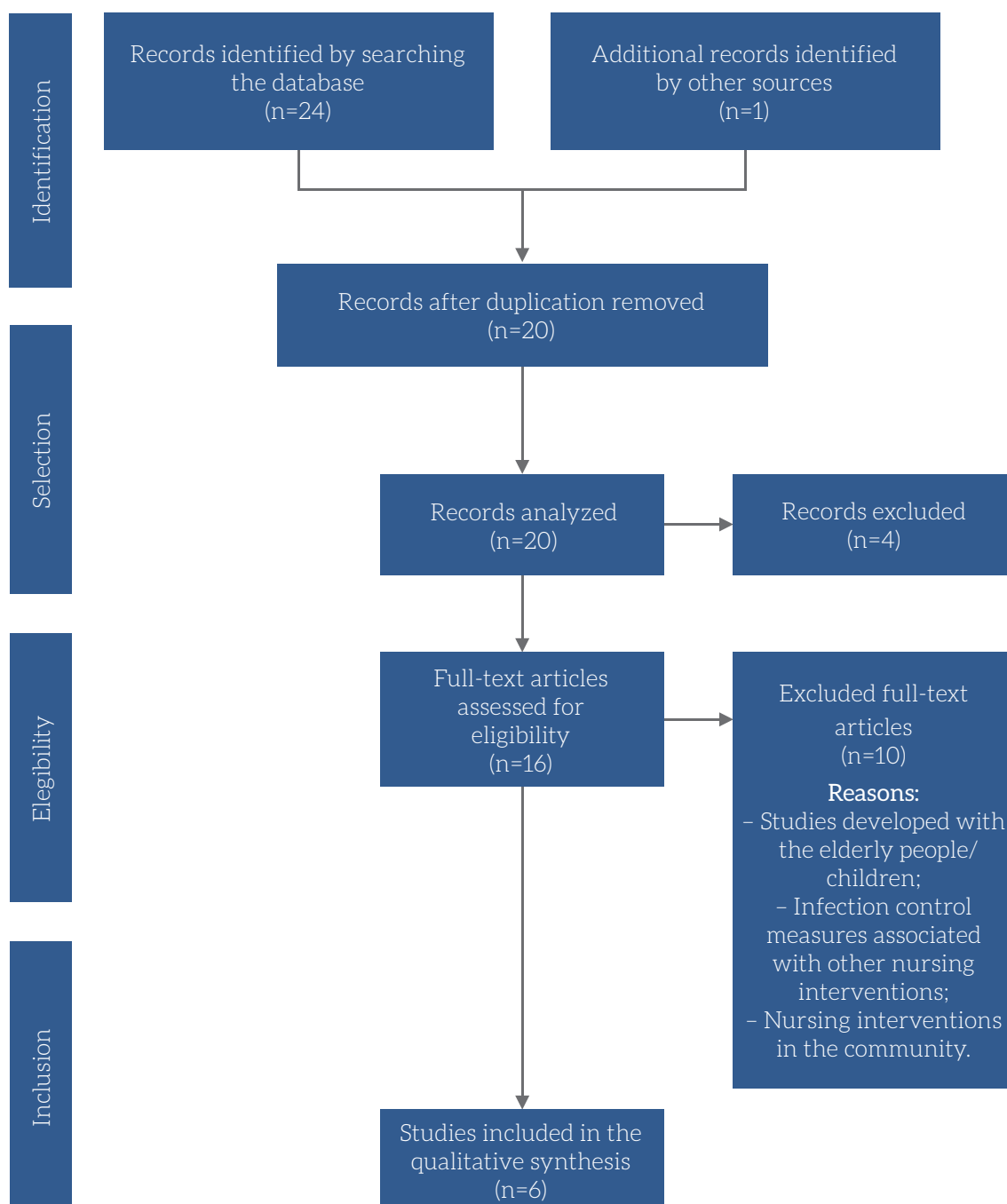


Figure 1 - Research development and sample selection based on the PRISMA algorithm.

In carrying out this article, all ethical and legal issues were taken into account, correlating them with the principles defended by the Declaration of Helsinki. Academic integrity was also taken into account, referencing and citing all articles used, with respect to all the work done by their authors.

RESULTS

There are several instruments that can be used to assess the reliability and methodological quality of the samples obtained⁽¹¹⁾. The strength/level of the evidence found is determined, the possibility of applicability of the results, the cost and the practice that are significant, clearly determining the limitation that exists between the benefits and risks of a given intervention⁽¹¹⁻¹²⁾.

In order to test the credibility of each article obtained, two instruments were applied. The classification of Joanna Briggs Institute (JBI) Levels of Evidence (with respect to effectiveness) was applied, which resulted in a Level 1.d article, a Level 3.a article, a level 3.b article, two Level 3.e articles and one Level 5.a article (see table 1)⁽¹²⁾. The JBI Grades of Recommendation table was also considered, and all articles analyzed obtained grade A (strong)⁽¹³⁾.

Table 1 – Synoptic table with selected articles.

Id	Title	Authors	Journal/Year	Method	NE
A ⁽²⁾	Prevalence of phlebitis of peripheral venipuncture: associated factors	Nobre and Martins	Revista de Enfermagem Referência (2018)	Prospective cohort study	3.e
B ⁽³⁾	Effectiveness of insertion and maintenance bundles in preventing peripheral intravenous catheter-related complications and bloodstream infection in hospital patients: A systematic review	Ray-Barruel et al.	Infection, Disease & Health (2019)	Systematic review	3.a
C ⁽⁴⁾	Clinically indicated replacement versus routine replacement of peripheral venous catheters in adults: A nonblinded, clouster-randomized trial in China	Xu et al.	International Journal of Nursing Practice	Randomized cluster study	1.d
D ⁽⁵⁾	Occurrence of Phlebitis: A systematic review and meta-analysis	Chang and Peng	Nursing Research (2018)	Systematic review	3.b
E ⁽⁶⁾	Phlebitis and infiltration: vascular trauma associated with the peripheral venous catheter	Braga et al.	Revista Latino-Americana de Enfermagem (2018)	Observational study without control group	3.e
F ⁽⁷⁾	Risk factors for the development of phlebitis: an integrative literature review	Urbanetto et al.	Revista Gaúcha de Enfermagem (2017)	Integrative literature review	5.a

In order to clarify the reading of the review and present it in an assertive and focused manner, the discussion was outlined in two key topics: “Risk factors associated with increased complications of peripheral venous catheterization” (A⁽²⁾, B⁽³⁾, C⁽⁴⁾, D⁽⁵⁾, E⁽⁶⁾, F⁽⁷⁾) and “Quality improvement in interventions associated with peripheral venous catheterization: strategies and decision making” (A⁽²⁾, B⁽³⁾, C⁽⁴⁾, D⁽⁵⁾, E⁽⁶⁾, F⁽⁷⁾).

DISCUSSION

Nowadays, the watchword is education. Educating nurses as to the indications for the use of peripheral venous catheters, the most appropriate interventions for insertion/maintenance of the same and the infection control measures that can be adopted is one of the main purposes of this literature review.

Nurses are the professional class that most handles this type of material and even insert it, watch it and, in the event of any change that may make its continuity unfeasible, perform the extraction and if necessary proceed to the reintroduction of a new one^(2,6-7).

The need to study and to explore knowledge for the complications associated with PVC in patients in a hospital context becomes a priority in clinical practice, being considered an indicator of the quality of institutions^(2,6). Thus, the aim is to train professionals to make a more assertive and critical decision when using PVC^(2,6-7).

It is possible to find scientific evidence regarding bundles of interventions associated with the central venous catheter, but the information and knowledge about the peripheral venous catheter is still very limited, requiring more studies and more investment in the area⁽³⁾.

Risk factors associated with increased complications of peripheral venous catheterization

The pathogenesis process associated with PVC is linked to four factors: through the migration of the microbiota existing on the surface of the user's skin, which ends up undergoing entrainment when the catheter is inserted, colonizing it^(2,5); contamination of the PVC lumen when there is direct contact with the hands of those who handle, fluids or other previously contaminated devices^(2,5); colonization of PVC through the bloodstream, previously contaminated by another infectious focus⁽²⁾; through the infusion of previously contaminated fluid therapy, which will lead to a systemic infection⁽²⁾.

According to the evidence, it was concluded that PVC acts as an important extrinsic risk factor for nosocomial infections, increasing their prevalence to 11.7%, and in the absence of the catheter it was only 8.3%⁽²⁾.

There are risk factors intrinsic to the user, namely, the person's gender^(5,7), increased age^(2,5), body mass index⁽⁵⁾, severity of the pathology and associated comorbidities⁽⁵⁾, nutritional status⁽⁵⁾ and patients with Diabetes Mellitus (the pathology damages the endothelium of the vessels, increasing the associated risks)⁽²⁾.

One of the main causes of phlebitis described in the literature is closely related to the chemical irritations caused by the therapy administered, namely antibiotics^(2,5,7), of which Vancomycin stands out⁽²⁾. Solutions with pH of extremes or high concentrations are also associated⁽⁵⁾.

The repeated, frequent puncture and a weak capacity for the technique can increase the damage to the vessel, potentiating a greater difficulty in vascular insertion. The mechanical damage associated with the puncture can also result in phlebitis, being a relevant factor to be given importance⁽⁴⁻⁵⁾. In addition to these factors, venous damage can be caused by PVC material, length and gauge^(2,5). The data show an increase in the rate of phlebitis in users with 16-gauge or 18-gauge catheters, with evidence showing that smaller catheters occupy less space, which leads to an increase at the local level of blood flow, preventing damage to the inner layer of the vein (therefore, the probability of phlebitis decreases considerably)⁽⁵⁾. Catheterizations that are prolonged over time may also be a negative factor^(2,5-7).

Increasing the number of catheters in use in the person can influence the hypothesis of developing phlebitis, evidencing an increase of 1.37 times more probabilities⁽⁶⁻⁷⁾.

Some investigators report that there may be an influence on PVC complications, depending on where the person is punctured, however there is still no data that would lead to a consensus. Doubts vary between catheterizing the vessel at the level of the antecubital fossa, in the different locations of the forearms and back of the hands^(5,7). Despite the fact that the back of the hand is the site of choice for the technique, one of the articles shows an increase in the prevalence of phlebitis in this site, as it presents vessels with less caliber, more sinuous and with less hemodilution capacity, causing greater irritation^(2,5).

It is very important, in the case of peripheral venous accesses placed in emergency situations, there are data that show an increase in complications associated with the moment^(3,7).

Although it is important to recognize the risk factors associated with PVC, some of the articles studied address the need to use a phlebitis classification scale^(2-3,5,7), namely the Phlebite Scale Portuguese version⁽²⁾, in sense of combining the knowledge of risks with the prevention of these situations.

Quality improvement in interventions associated with peripheral venous catheterization: strategies and decision making

For the provision of quality care to the PVC, the evidence highlights the selection of the type of catheter and the insertion site, the use of aseptic technique, a rigorous cleaning and disinfection of the skin before insertion, the maintenance of the catheter and the site, the implementation of a substitution strategy in case of need and antibiotic prophylaxis^(2-3,5,7).

Frequent and daily monitoring of inflammatory signs at the site of insertion of the PVC is recommended, namely sensitivity and pain, watching and palpating through the occlusive dressings or visualizing if the dressing is a semi-permeable transparent film⁽²⁻³⁾. The integrity of the dressing must also be checked⁽³⁾.

It is recommended to clean with soap and water and disinfect with alcoholic hand solution, before and after palpating the catheterization site, during the procedure and maintenance⁽²⁻³⁾. The recommended antiseptic for the disinfection of the user's skin is alcohol 70°⁽²⁾, iodine tincture⁽²⁾ and 2% chlorhexidine gluconate (the latter being the preferred product)⁽²⁻³⁾. According to the Infusion Diseases Society of America, the skin must be previously clean before using the antiseptic and the time necessary for contact and drying must always be respected⁽²⁾.

Regarding calibers, the 18 gauge is defined as the one chosen for therapeutic needs, taking into account the moderate caliber⁽²⁾. However, there is no unanimity in the decision, and in another study it is recommended to choose the caliber 20-22 gauge⁽³⁾.

The PVC insertion site in adults is preferable at the level of the upper limbs, compared to the lower limbs, as the latter increases the occurrence of tissue damage, thrombophlebitis and ulcers⁽⁵⁾. The data show that the insertion of the PVC into the antecubital fossa or forearm led to an occurrence of phlebitis 40% less than the puncture on the back of the hand. The justifying reason for these data is that the decrease in the development of phlebitis is less likely in larger blood vessels⁽⁵⁾.

As for the change in PVC, opinions are not unanimous. The Infusion Diseases Society of America opted to remove the indication that the PVC should be changed within a specific interval of time, stressing that the material should be changed only in case of the pre-

sence of clinical signs of phlebitis or when there is a need to administer food parenteral route^(2,4,6-7). Another study states that there should be a policy of changing every 72h⁽³⁾ and others go further and establish a time period between 72h to 96h in adults^(4-5,7). It should be noted that the evidence underlines the need to consider when choosing the time to re-train, as it is a time that causes discomfort, pain and anxiety to the user^(3-4,7), in addition to increasing the associated costs⁽⁴⁾.

PVC withdrawal is indicated after the first signs of phlebitis are observed or when there is a prescription for suspension of intravenous therapy^(2,4-6). Venipuncture, in the context of an emergency service, should not go beyond 48 hours of catheterization, and after that time, the catheter must be changed⁽³⁾. These measures will help to reduce the infection rate associated with PVC⁽²⁾.

The most frequently used dressing with the most benefits is the transparent film, with transparency being its greatest advantage, allowing the visualization of the puncture insertion site^(2-3,6). The only disadvantage is related to the high associated costs⁽²⁾.

The use of alcohol-impregnated caps and minimizing the manipulation of serum systems are also recommended in reducing PVC contamination⁽³⁾.

The use and application of the Phlebitis Scale is recommended for the prevention and early recognition of the first signs of phlebitis⁽²⁻³⁾. The documentation and registration of techniques and manipulations associated with PVC are good predictors for its optimization^(3,6-7).

In order to achieve greater application, adherence and good practices associated with peripheral venous catheterization, the evidence points to the need for teaching policies, empowerment and ease regarding the materials to be used and guidelines to be followed. The realization of training, development of works and posters at the institutional level can be useful to optimize the role of nurses in this area⁽³⁾.

CONCLUSION

After fully reading all the researched evidence and reflecting on the topic, the existing gaps and the pressing need to continue researching, studying and analyzing the need to develop bundles of interventions and guidelines associated with peripheral venous catheterization is easily identified. Existing publications are still unable to suppress the needs of professionals, failing to achieve optimal indicators in infection control and in reducing complications associated with the technique.

The nurse has a fundamental role in the prevention, early identification, classification and resolution of all problems that may arise from PVC. It is because of this that they must boost their knowledge, work towards continuous improvement of care and try to achieve the best possible quality indicators.

This review allows all knowledge to be gathered, based on the most recent scientific evidence, so that interventions associated with peripheral venous catheterization that are more differentiated and of higher quality can be promoted by nursing professionals.

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