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The knowledge of nurses in terms of the peripherally inserted central catheter: a descriptive study

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ABSTRACT

Aim: to analyze the knowledge of nurses in the Neonatal Intensive Care Unit on the entry, handling, maintenance and withdrawal of the peripherally inserted central catheter. **Method:** This is a descriptive, exploratory, and qualitative study involving nine nurses from the Neonatal intensive care unit of the Antonio Pedro University Hospital, Fluminense Federal University, interviewed based on a semi-structured script. The data submitted to content analysis have originated thematic categories. **Results:** knowledge of nurses regarding the statement, insertion, maintenance and removal of the catheter, standards and protocols and professional training for the care process are decisive for the safety of care to the newborn. **Conclusion:** The use of the peripherally inserted central catheter (PICC) is important in neonatology for its benefits to the infant. However, nurses need to deepen their knowledge so that the care process in the NICU is guided by ethics and based on nursing protocols aiming to base and legitimize such assistance.

Descriptors: Catheterization, Central Venous; Infant, Newborn; Neonatal Nursing.

INTRODUCTION

When a baby is born prematurely, its development stops and it becomes vulnerable. Often there is a need to take it to a Neonatal Intensive Care Unit (NICU), where the use of new technologies has contributed to the increased survival of these newborns, considering that morbidity and mortality in the neonatal period primarily affects newborns (NBs) preterm (gestational age below 37 weeks) and/or low birth weight (birth weight below 2,500 g)⁽¹⁾.

Among the numerous interventions in the NICU for the treatment/care of newborns, the installation of an intravascular catheter is the most common. The severity of the clinical condition that it presents determines the adequate intravenous therapy and the type of catheter that is suitable for the treatment⁽²⁾.

Thus, vascular accesses are essential devices for intensive care, due to the need for drug therapy, hemodynamic monitoring, and parenteral nutrition, among other indications. In neonatology, the most widely used vascular accesses are peripheral venous access (PVA), peripherally inserted central catheter (PICC) or umbilical catheter⁽³⁾.

The decision concerning the device to be used for obtaining vascular access can be challenging. Factors such as age, size, location, availability to the punch, kind of medications or fluids to be administered, predictable duration of use of the catheter, and possibility of complications influence the health team's decision⁽⁴⁾.

This study focuses on central catheter peripherally inserted, which brings out both the need for safe care of the neonate (mainly due to the guarantee of adequate technique regarding the catheter) as part of the knowledge and training of nurses, who

are among those responsible for carrying out the procedure.

The Peripherally Inserted Central Catheter, commonly known by the acronym PICC, was first described in the literature by the German physician Forssmann in 1929⁽⁵⁾. It is an intravenous device inserted through a superficial vein at the end of the body which, with the assistance of an introducer needle, progresses to the superior or inferior vena cava, featuring characteristics of a central catheter⁽³⁾. This catheter may be made of polyurethane or silicone, both biocompatible and less thrombogenic, which hinders the colonization of microorganisms. It is generally used in medium and long-term therapies, preferably inserted into the basilic vein because of its favorable anatomical features, followed by the cephalic vein⁽⁵⁾.

The choice of this device should be based on the evaluation of clinical condition of the NB and the therapeutic goals, since it allows the catheter to infuse two drugs incompatible with one another, avoiding multiple venous access and reducing the frequency of venipunctures⁽⁶⁾.

This technological breakthrough requires a specialized multidisciplinary team that has technical and scientific knowledge to promote quality care for newborns⁽²⁾. One of these professionals is the nurse, whose skills and knowledge guarantee the indication, insertion and maintenance of a peripherally inserted central catheter, as foreseen in Resolution 258/2001 of COFEN, enabling this professional to promote skilled care⁽⁷⁾. Thus, nurses are legally responsible for the insertion, maintenance, detection and resolution of complications related to catheter use⁽⁶⁾.

The relevance of the theme signals the need for specific knowledge from nurses for the care provided to the newborn that requi-

res the use of PICC, considering that many of these professionals are not properly trained for this activity and thus may jeopardize newborns due to inadequate care⁽²⁾. In this light, the study aimed to analyze the knowledge of NICU nurses concerning the insertion, handling, maintenance and withdrawal of the peripherally inserted central catheter.

METHOD

This is a descriptive, exploratory, and qualitative study, approved by the Research Ethics Committee of the Faculty of Medicine of the University Hospital Antonio Pedro, linked to the Fluminense Federal University, under Protocol No. 519,853/2014, as envisaged in the Resolution No. 466/12 of the National Health Council.

The setting was the NICU of the hospital, and the study participants were nine nurses who attained the only criterion for inclusion: they should be working in the Unit for at least six months. All signed the Informed Consent conditioning their voluntary participation in the study, and their anonymity and the confidentiality of information were assured by alphanumeric code (I₁ to I₉) entered as the interviews were carried out by means of a semi-structured script.

The script contained 14 questions relating to the procedures for the appointment, integration, maintenance, removal and nursing care related to the PICC. Interviews were conducted in the period from September to November 2014, recorded in a digital handset with prior authorization of the participants and later fully transcribed by the researcher. Respondents subjected the content of the texts to validation for further analysis.

We opted for the content analysis in a

thematic mode, verifying the various meanings identified in the Registration Units (RU), with a view to the construction of the thematic categories.

The proposed method enabled the creation of the following thematic categories:

- 1) Nurses' knowledge in terms of the use of the peripherally inserted central catheter;
- 2) The importance of using assistance protocol for neonatal nursing in the use of the peripherally inserted central catheter.

RESULTS

The nurse's knowledge in terms of the use of peripherally inserted central catheter

Nurses reported what they knew in terms of the indications for PICC use in the newborn clinic (e.g. hospital stay, need for food and drug treatment prolonged with deep venous access), as recommended in the scientific literature. See the statements below:

(...) The indication (...) comes from the need that the newborn has. If he is going to stay long here (...) will take medication, NPT, HV (...) the diagnosis too, right? The hospitalization time. (I1)

(...) Especially for premature infants who will go through a long period of intravenous therapy; whether it is hydration, parenteral nutrition or antibiotic use. To promote treatment and avoid a gateway, the PICC remains installed during the entire time of this venous therapy. (I7)

Regarding the advantages of using the catheter for the clinic and treatment of NB, one respondent said the following:

(...) I think there are many advantages. This is an invasive procedure and at the same time (...) requires intense care, such as sterilization and others. It is less invasive than a dissection. The duration is long, meaning you will not have to mess with the baby so much to punch a peripheral vein. You must have the necessary precautions to protect him, to avoid contamination. You must have the necessary precautions to protect him, to avoid contamination. (13)

Despite the technical knowledge regarding the PICC, there is a perceptual gap in the walkthrough catheter insertion that none of the respondents mentioned. In view of such a fact, it is worth noting the importance of planning/standardizing of the procedure for promoting qualified assistance. Below is a description of the device insertion, in the view of one interviewee:

(...) First you have to make a good assessment of the baby, to make the insertion of the PICC. Use all criteria within the standards for insertion of the PICC. After evaluating the insertion, evaluating this blood vessel, you select the area, and prepare the child by making a light sedation. Prepare the arm for inserting the PICC, in order to avoid early and late infections. Then do the PICC insertion procedure. Insert only the tip of the needle, and then

insert the catheter itself. You remove the introducer and fix the catheter at the point where it was inserted, at first with "Tegaderm". Observe if you experience any type of bleeding. Oh (...) I forgot one detail: (...) before any procedure, when you select the vein, you do the measurement of the insertion area until the area of installation, of the child's atrium. (12)

When asked about the PICC insertion procedure/technique, all nurses demonstrated awareness in terms of the importance of hand hygiene and the use of aseptic technique, which shows an important concern for infection control:

(...) Observation of the clinical condition of the NB, preparation of the material, measurement, hand wash, surgical garmenting (use of maximum barrier), opening the sterile material with aseptic technique, peripheral access puncture, catheter introduction according to a specific measure, dressing, radiological confirmation of the catheter location. (18)

A very important factor at the end of the catheter insertion procedure is the radiological confirmation of its tip. Even taking into account that this is a highly relevant procedure, it was mentioned by only two nurses:

(...) Subsequently the position of the catheter is checked by the X-Ray. (15)

(...) Puncture of peripheral access, catheter introduction in certain measure, dressing, radiological confirmation of the catheter location. (16)

A nurse demonstrated knowledge regarding the maintenance of the PICC:

(...) The serum used is the physiological, and it should always be used with the 10ml syringe in order to wash the catheter, especially after the infusion of drugs to avoid the accumulation of salts in the lumen of the catheter. (...) It is necessary to observe the member where it was inserted. All these issues are important: if they have reflux or not; if they try to resist or not. (I9)

For good handling of the catheter, it is important to thoroughly observe the aseptic technique during the procedure, as stated below:

(...) The handling should also be done with aseptic technique, always using gloves and sterile equipment; making the disinfection of the "tap" for washing the catheter. (I4)

(...) The handling is done with a sterile glove, and 70% alcohol. Rub the connections to put the medication or HV or TPN (Total Parental Nutrition). (I9)

Regarding the handling of the PICC, with respect to the catheter insertion curative, a nurse reported the following:

(...) The first change is made 24 hours after insertion. If the dressing is dirty or if it is bleeding profusely, it can be done before. The subsequent dressings should be done only when necessary. (I2)

Regarding knowledge of the nurse related to the necessity for catheter removal, one respondent explained how this happens:

(...) The PICC is removed by the end of intravenous therapy, when there is a local infection or catheter-related bloodstream. This is (...) when there are signs of local phlebitis or when there is obstruction, disruption or externalization of the catheter. (I6)

Given what respondents said, it is clear that there is a need for theoretical, practical and scientific knowledge to promote appropriate care of NBS, in order to preserve their safety and avoid excessive handlings that could damage their health.

The importance of using assistance protocol for neonatal nursing in the use of peripherally inserted central catheter

It is important for each department to develop its own protocol, taking into account the characteristics of the patients and the human and material resources available in the institution. Regarding the protocol for the catheter procedure in question, there are two statements:

(...) The protocol is important to guide the team in relation to handling, to work. (...) If you do not have a parameter to follow, you become disorganized. (...) It is important to follow a protocol; everyone learns how. A better guidance regarding the right routine is necessary. (I4)

(...) If there is a protocol to be followed, everything is easier, more

feasible. From the moment that we follow a care sequence, things flow better, the risks to children diminish, and the risks for professionals decrease. Things tend to develop in the expected way, and this influences the quality of care. (I5)

A good record is fundamental to obtain a better evaluation of the care process:

(...) For me, the systematization would be the application of a maintenance protocol. In this there would be a specific form for inserting data and another for monitoring and daily record of the dressing, (...) catheter patency, aspect of the puncture site, dressing changes, and intercurrents occurred. (I9)

Therefore, it can be inferred that the protocol to be observed regarding the use of PICC should allow the nursing care process to be performed properly, promoting healthcare safety to the NB and nursing staff by ensuring compliance with all the steps necessary for using this type of catheter.

DISCUSSION

The catheter is indicated for long-term therapy (more than six days), parenteral nutrition administration, infusion of vesicant or irritant medications, and administration of chemotherapeutic⁽⁸⁾. When used at an early stage, it reduces the common peripheral punches and the manipulation of the NB, minimizing invasive procedures, stress and discomfort, and making it a safe and quality procedure⁽¹⁾.

Ensure the safety of infants is essential to providing quality care. However, if on one hand care interventions seek to improve such assistance, on the other, the combination of processes, technologies, and human resources related to health care can become a risk factor for the appearance of errors and adverse events⁽⁹⁾. Thus, it is necessary for nurses to know the indications for the PICC therapy, as it requires technical expertise, clinical judgment, and conscious, safe, and effective decision-making.

The PICC is the first choice among intravascular devices, and its indication should be made at an early stage; however, such a device is not recommended for all infants. Where appropriate, the multidisciplinary team should assess and indicate its use or not^(8,10). For this, it is necessary to have adequate knowledge regarding the correct technique for using the PICC, to avoid compromising the safety and quality of care, preventing the occurrence of diseases such as sepsis, which may compromise the health and well-being of the NB⁽²⁾.

The installation of the PICC brings many benefits to the therapy of newborns, and prevents numerous complications, such as unnecessary punches. This type of catheter has been suggested as the most suitable for low levels of infections and complications when compared to other central vascular devices in both the insertions of the act, such as during maintenance and removal. It is a procedure that guarantees the NB a safe venous access for the infusion of irritating and/or vesicant medicaments, as previously stated, decreased pain caused by repeated venous punctures, and stress caused by excessive handling; therefore, this is imperative for the survival of the increasingly premature newborns^(8,11,12), thus confirming the benefits

of using the PICC in the nursing care aimed at newborns.

Among the numerous interventions conducted in the NICU, the insertion of the PICC is, undoubtedly, one of the most frequent. The severity of the clinical condition presented by the NB determines the intravenous therapy to be administered, thus defining the appropriate type of the treatment catheter⁽²⁾. Therefore, the nurses' knowledge regarding the technique of catheter insertion, observing the care protocols of the units, becomes necessary and essential for the safety of newborns, in order to avoid possible entry errors, resulting in an ethical care supported professionally in legislation and safety regulations.

The installation technique, according to respondents, consists of inserting the PICC along the limb, into a peripheral vein, until above the junction of the superior vena cava and the right atrium (at the second right intercostal space or third right costal cartilage), or the inferior vena cava (at the hemi-diaphragm level) when inserted into the lower limb. However, the technique description is incomplete and therefore incorrect, thus making this procedure unsafe due to lack of specific knowledge. Another issue is the lack of standardization of actions in a clinical protocol, as it reveals an assistance fragility that causes insecurity in the care process.

It is important to highlight the bloodstream infection rates that result from lack of knowledge related to the PICC, since this can turn the installation of the catheter into an unsafe procedure that could affect the health of infants. The main reasons described in the scientific literature are: microflora, contaminated infusions, and contamination of the catheter prior to insertion⁽¹³⁾. However, infections related to the PICC insertion procedure can be avoided by means of aseptic

techniques and especially with the completion of continuing education programs based on recommendations of the National Health Surveillance Agency (ANVISA), which recommends comprehensive ethical care in order to promote care safety. The hand hygiene and skin preparation for the insertion of the catheter are examples of actions that promote such care, establishing a contact barrier.

Another important issue is the selection of the catheter insertion site and its permanent daily review, as well as the prompt removal of the equipment when necessary⁽¹⁴⁾. In carrying out the aseptic determinations described, the nurse will be acting ethically, performing a safe and responsible care and, especially, preventing further contamination during the procedure in focus.

Another very important factor at the end of the PICC insertion procedure is a radiological confirmation of the catheter tip. Success is obtained when it is positioned centrally, that is, in the vena cava superior, when inserted in upper limbs and head region; or the inferior vena cava, when inserted in the lower limbs. Considering that the catheter tip location may limit or prevent the use of this device, its control through X-ray is essential⁽¹⁵⁾, and if this is not performed it can generate negative and detrimental results in achieving success in the use of the PICC. Thus, with respect to radiological confirmation, there was no testimony on this subject, leading to the inference that the legal recommendations for the confirmation of the catheter position are not being observed strictly in the care process, which can result in aggravations to the health of the newborn.

It should be noted, however, that the radiological identification is not always easy, especially in neonates. This explains the importance of a thorough investigation of the

X-ray of the catheter to ascertain its position and correct insertion; therefore, nurses must not refrain from carrying it out, as they are always supported by the care protocols for catheter insertion in force.

The catheter maintenance procedures described by nurses show that some respondents have knowledge gaps in the care process, highlighting the lack of an institutional routine to be followed by all teams. This fact contradicts the safety recommendations and undermines the ethical performance of nurses in their practice, as the health facilities should provide regulations for this maintenance in order to prevent the occurrence of complications related to catheter use.

As regards the reasons for early removal of the PICC, it is considered that suspected bloodstream infection is the most important. This infection occurs by the presence of microorganisms in the catheter tip and blood cultures⁽⁸⁾. It is therefore essential to be aware that most catheter-related infections result from the contamination of the hub (cannon), the lumen of the catheter, or the infused solution⁽¹⁶⁾, and the health team is responsible for the preventive actions of such infection, since its role is essential in the handling of intravenous devices. Therefore, ANVISA recommends that all professionals dealing with the said device must have high-level training, continuing education, specific training and assessment of knowledge of the institutional guidelines aimed at prevention, for ethical care and safety of the care process.

As for the dressing, the role of nurses is essential to its realization, since they are responsible for choosing the type to be used as well as the technical procedure and the observation of the integrity for catheter insertion ostium, aimed at early detection of complications. It is recommended that the

first dressing is carried out with sterile gauze and this should be replaced by transparent semipermeable membrane in the subsequent dressings. The products and materials used to stabilize the catheters must be sterile and it is essential to prevent the device from moving during the exchange of the cover⁽¹⁴⁾. These professionals are responsible for continuous monitoring to identify changes related bloodstream infection, and other complications that may affect the proper functioning of the catheter.

The PICC dressing complies with two functions: it creates an environment that protects the site of catheter insertion and prevents its displacement⁽¹⁰⁾. Thus, during their work, nurses are knowledge holders in relation to the proper care implementation, according to the correct technique, and they must be alert to prevent any complications, as established by the legislation that regulates the professional practice of nursing.

With regard to the removal of the catheter, the main causes of such occurrence are: the end of the proposed therapy, rupture or breaking of the catheter, improper positioning of the catheter, fluid leakage, and the presence of infection and inflammation. Thus, it is for nurses to identify the reason for the removal and to discontinue therapy⁽¹⁷⁾. As a matter of fact, respondents evidenced knowledge in terms of indications of catheter removal, mainly those related to infection and completion of drug therapy. However, the importance of blood culture collection directly through the catheter before removing it on suspicion of infection should be noted, since this practice is expected by ANVISA.

The nursing protocol for inserting, handling/maintaining, and withdrawing the PICC becomes essential for the quality of care and the standard to be implemented in the health

facility, preventing possible damage to the NB, and ensuring the safety of the procedure and the autonomy of the team regarding neonatal care throughout the care process involving the catheter.

In this sense, nurses highlight the need for a daily record of care for the handling, maintenance and possible post-puncture interurrences, in order to prevent complications in the procedure, and also the construction of a specific protocol that can contribute to the everyday practice of those who are in charge of this procedure, directing nursing practice in terms of the use of this catheter, aiming primarily to standardize the conduct and improve the quality of care in the NICU, which becomes crucial for the success of this practice with the PICC⁽¹⁾. In addition, the protocol allows for the systematization of nursing care in relation to the PICC, since it regulates the nursing conduct in the management of the catheter, providing more safety in implementing this important technical procedure.

CONCLUSION

The use of the PICC is vital in Neonatology due to the numerous benefits that this procedure provides to the neonate, especially with regard to decreased peripheral punctures and hence pain and stress, in addition to promoting a safe venous access for the infusion of the prescribed therapy.

Thus, the nurses in the study know the indication, insertion, handling, maintenance and removal of the catheter; however, they need to deepen their knowledge in terms of the PICC, always based on an ethical and safe care during the care process, thus ensuring better quality care to newborns.

In addition, the need to build a specific nursing protocol for the insertion, maintenance and removal of the PICC became evident, with the support of the health unit management, sharing a safe care logic, and supported in an ethical practice. Therefore, this practice legitimizes the actions of neonatal nurses in terms of promoting care related to this catheter and thus providing further benefit to the newborns admitted to the NICU.

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