

# Nursing Care of Neonates with Percutaneous Peripherally Inserted Percutaneous Line at the Hospital Teófilo Dávila Machala

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**Abstract:- In neonatal intensive care units, health events occur in which the physiological state of the newborn is deteriorated or complicated, therefore, it is feasible to indicate the importance of channeling a percutaneous route for the administration of food and parenteral medications, which will contribute to minimize the risk of complications associated with neonatal care. The objective of this study was to determine the level of knowledge of the nursing staff of the neonatology area in the care and management of the percutaneous catheter of peripheral insertion of the Hospital Teófilo Dávila Machala. A scientific, descriptive, analytical and quantitative research was carried out with a population of 32 nurses. 87.9% were female, the prevalent age range was 26 - 30 years, 78.8% had a bachelor's degree, 90.9% were nurses, 42.4% had 2-5 years of work experience. According to the level of knowledge of the nursing staff in percutaneous catheter care before the educational intervention was low with 60.6%, increasing the knowledge after the intervention with 54.5% with a high level. In conclusion, it is necessary for the nursing staff to update their knowledge regularly in order to provide quality and warmth care to the users.**

**Keywords:- Percutaneous Catheter, Percutaneous Catheter, Nursing Care, Knowledge, Neonatology.**

## I. INTRODUCTION

Premature newborns hospitalized in the NICU often require special interventions that will arise due to the treatment that will be carried out during their hospital stay, such is the case that when establishing and managing peripheral or percutaneous venous access, the functioning of the same must be monitored with great responsibility (1).

When a drug is administered percutaneously (parenterally), it is often necessary for it to move rapidly through the body in order to achieve the desired effect. Percutaneous routes meet this need, but if they are not applied correctly, the results could be highly detrimental. Therefore, this research is important because of the need to deepen knowledge on the care and attention that should be

taken in the application of drugs through percutaneous routes (2).

The nursing professional should exercise efficient aseptic processes when handling percutaneous routes; therefore, it is ideal that when administering the parenteral medication prescribed by the physician, it should be done with the appropriate technique, that is to say: experience to apply the correct percutaneous cannulation procedure, hand washing, sterile field, identify the caliber of the vessel very contiguous to the right atrium, vital signs monitoring, verify that there is no catheter breakage, asepsis, measure the sternal midline with the area to be punctured, continue assessing the heartbeat, when introducing the percutaneous catheter, an X-ray should be performed to verify the centimeters introduced. It is feasible to mention that, when introducing parenteral drugs through this percutaneous route, the drug effect will be much faster than the other peripheral venous routes. The nurses who perform the percutaneous catheter implantation procedure need to be qualified and trained to have knowledge regarding the indications for the use of intravascular catheters, adequate procedures for the insertion and maintenance of these devices and appropriate measures for the control of mechanical and infectious complications related to the catheters. (3)

The research is aimed at determining the level of knowledge of the nursing staff of the neonatology area in the care and management of the percutaneous catheter of peripheral insertion of the Hospital Teófilo Dávila Machala. The results will serve to reduce the risk of infections associated with health care by adequately managing biosecurity measures, and thus positively change the results obtained in the development of the work through educational intervention.

## DEVELOPMENT

Due to the increasing demand of hospitalized premature neonatal patients, many times the health personnel do not exercise a good management for the safe access of percutaneous routes. In the year 2020, for the months of July - December, 45 newborns with unstable clinical condition were attended. Therefore, the fundamental

role of the nursing professional is to provide quality interventions, i.e., to constantly monitor the patient's peripheral or percutaneous routes to minimize the risk of possible phlebitis or edematization in the premature infant (4).

Role of the neonatal critical care nurse in percutaneous catheter application and management.

### **Percutaneous catheter**

Tool used for the application and management of a central line when venous cannulation is difficult to access or the time for which the baby will be hospitalized is extremely long, therefore when introducing the percutaneous catheter, we must know that its measurement is performed up to the point where the entrance of the right atrium is located (5) (6).

Central venous accessibility.

The accessibility of the veins to perform the puncture are the following: internal jugular, subclavian, femoral, percutaneous.

### **Indications**

1. Preterm newborns < 1500 grams.
2. Newborns with prolonged parenteral nutrition, vasoactive drug perfusion, necrotizing enterocolitis, etc.
3. Newborns with difficult access for cannulation and who will remain for a prolonged period of time in the NICU.

### **Contraindicated**

- In infants with congenital malformations.
- Neonates admitted to receive medical/pharmacological treatment for a short period of time.

### **Effective procedure**

1. Knowledge and experience of the procedure to be followed for percutaneous cannulation.
2. Hand washing and the respective safe placement of personal protective equipment.
3. Sterile fields.
4. When locating and positioning the vein, it should be as close as possible to the right atrium.
5. Hemodynamic monitoring (assessment and evaluation of vital signs) to determine and avoid possible arrhythmias during percutaneous catheter placement.
6. Asepsis of the percutaneous catheter, before introducing the syringe with heparinized saline solution, the permeability and measurement of the catheter should be checked (it should be observed if there is no obstruction); finally, the heparinization regimen is administered to facilitate the passage of the catheter, which should not be moved abruptly and should be fixed with small gauze and transparent dressing.

7. An X-ray should be performed to be absolutely sure that the percutaneous catheter was inserted safely. In case of a correct procedure, the date/time of percutaneous insertion should be noted with the catheter centimeters.
8. Start parenteral medication and change the perfusion system every 24 hours in a sterile manner.
9. Monitor possible inflammatory signs or redness. In case of hyperthermia or sepsis, the percutaneous route is withdrawn (7).

### **Treatment**

In case of infectious signs, the percutaneous catheter must be removed and a culture must be performed urgently, and antibiotic therapy must be administered to avoid sepsis (8).

### **Consequences**

Adiposity, burn injuries, extravasation, gas embolism, thrombosis, sepsis, cardiac complications.

### **Precautions**

Any procedure performed with the preterm neonate should be under biosafety standards and with sterile fields to reduce the risk of infections; in case of a malfunction it should be removed so as not to cause damage to the baby (9).

### **Prevention:**

- Biosafety to avoid healthcare-associated infections.
- Hand washing before and after each procedure and application of sterile gloves (biosafety measures).
- Monitoring of vital signs every shift (heart rate, respiratory rate, oxygen saturation and temperature).
- Control of ingestion and elimination.
- Hourly diuresis control.
- Initial and daily weight control with height and body mass index.
- Monitor skin fold status and turgor.
- Daily monitoring of the condition of the catheter to avoid complications such as obstruction, extravasation or accidental extraction with daily change of gauze and dressings (10).
- Change every 24 hours the perfusion system in sterile form and after 48 hours the ports or lumens to avoid thromboembolism.
- Do not measure central venous pressure, nor administer blood products, nor draw blood at the percutaneous catheter site.
- Monitor skin turgor and immobilization of the upper or lower limb.
- On a daily basis, determine the presence of inflammatory signs, leakage, bleeding, etc.
- In case of hyperthermia or sepsis, the percutaneous line should be withdrawn and culture should be requested urgently.

- The catheter should be flushed (before and after each administration of medication).
- Create a calm environment, provide support and comfort.
- Be attentive and alert for the following signs/symptoms: respiratory distress, fever > 38 °C, seizure, cyanosis, jaundice, weak sucking, irritability, crying, etc.
- Record the procedure in the infant's nursing reports (11).

#### **Knowledge that the nursing staff should possess**

1. Cephalocaudal assessment of the patient with special focus on skin turgor.
2. Apply the five moments for safe hand washing.
3. Visualize the catheter insertion area.
4. Clean, safe and sterile field.
5. Disinfection of the puncture site with chlorhexidine or povidone iodine. The catheter must be without tears and the flushing system with physiological saline (12).

#### **OBJECTIVES**

##### **General**

- To determine the level of knowledge of the nursing staff of the neonatology area in the care and management of the percutaneous catheter of peripheral insertion of the Hospital Teófilo Dávila Machala.

##### **Specifics**

- To determine the study population according to sociodemographic variables of research interest.
- To evaluate the level of knowledge of the nursing staff in the care of percutaneous neonates in the study population.
- To carry out an educational intervention on the care and management of percutaneous peripherally inserted catheters.
- To assess the impact of the educational intervention on the nursing staff.

## **II. METHODOLOGY**

#### **Type of research**

A descriptive, analytical study was carried out with a quantitative approach.

#### **Population**

For the following study there was a population of 34 nurses working at the Teófilo Dávila hospital in Machala in the neonatology and pediatrics areas.

#### **Inclusion and exclusion criteria**

**Inclusion Criteria:** Nursing professionals working in the hospital in the neonatology and pediatrics areas who agreed to participate in the research.

**Exclusion Criteria:** Nursing professionals working in other areas of the hospital, those who do not agree to participate in the study, professionals who are not present on the specific day for data collection.

#### **Instruments**

The instrument "Nurses' knowledge questionnaire on peripherally inserted catheter maintenance" used in the research by Clemencia Livia in 2019 (20) was used. The survey was validated by expert judgment, the same that is formed by 25 items. It consists of two dimensions: general knowledge from 1-20, and knowledge of maintenance from 21 to 25, and will be graded according to the value of the scores obtained: correct answer = 1 point and incorrect answer = 0 points, leaving three levels of qualification: High Level: score 19 - 25, Medium Level: score 11-18 and Low Level: score 0-10. Sociodemographic questions will be added to the survey, such as: gender, age, position held, work experience, academic degree.

**Procedure:** The population was accessed using criteria of accessibility and economy by digital means: ZOOM, in which the informed consent was detailed and the data of the participants were collected through the form in Microsoft Forms in which the questions were asked to determine the sociodemographic variables, the level of knowledge on the subject raised, the data collected were codified, which were for the exclusive use of this research, codified with the participant's number, without registration of name or surname.

**Statistical analysis:** A descriptive analysis was performed using percentages, frequencies, measures of central tendency, and then a normality test was performed using Shapiro Wilk (W). Parametric tests were used for the correlation of sociodemographic variables and the level of knowledge, using Pearson's correlation coefficient. InfoStat and SPSS 26 programs were used for the aforementioned statistical analyses.

## **III. RESULTS**

#### **Sociodemographic profile**

Table 1 presents the characteristics of the population studied. When analyzing the sociodemographic characteristics, it can be determined that of the 33 participants, the prevalent age range is 26 - 30 years, 87.9% are female, 78.8% have a bachelor's degree, 90.9% have the position of nurse, 42.4% have work experience between 2-5 years.

**Table 1. Description of sociodemographic characteristics**

Characteristics		f	%
<b>Age</b>	18-25 years old	10	30,3
	26-30 years old	15	45,5
	31-40 years old	7	21,2
	Over 40 years old	1	3,0
<b>Gender</b>	Female	29	87,9
	Male	4	12,1
<b>Position held</b>	Area Manager	2	6,1
	Coordinator	1	3,0
	Nurse	30	90,9
<b>Work experience</b>	Less than 1 year	9	27,3
	2 -5 years	14	42,4
	6 -10 years	8	24,2
	11 years or more	2	6,1
<b>Academic degree</b>	Bachelor's Degree	26	78,8
	PHD	1	3,0
	Magister	4	12,1
	Others	2	6,1

**Table 2. Description of the level of knowledge of nursing care of neonates with percutaneous peripherally inserted IV (pretest).**

Knowledge level	f	%
<b>High level</b>	1	3,0
<b>Medium level</b>	12	36,4
<b>Low level</b>	20	60,6

Table 2 presents the evaluation of the level of knowledge of the nursing personnel working in the neonatology and pediatrics areas of the Hospital Teófilo Dávila de Machala, for which three levels were considered, determining that 60.6% of the participants have a low level of knowledge about nursing care in percutaneous neonates.

**Educational intervention**

Care of neonates should be supported by reliable evidence to restore their health status in the shortest possible time. Hospital complications such as infections related to catheters and intravenous devices should be minimized so as to offer neonates and their families a less traumatic hospital stay free of malpractice.

In the face of this evidence-based practice, professional updating is considered mandatory; therefore, information was provided to nurses. The information was imparted in clear and concise language in a way that optimized time and improved staff knowledge.

An educational intervention was carried out with the objective of improving the knowledge of nursing care of neonates with percutaneous peripherally inserted IV, the educational process was carried out using the ZOOM platform where the topics covered are summarized in the following table:

**Table 3. Didactic unit plan**

OBJECTIVE	CONTENTS	METHOD	AUXILIARES DE ENSEÑANZA
To improve the nursing staff's knowledge of nursing care of neonates with percutaneous peripherally inserted IVs.	TOPIC PICC neonates Introduction Objectives Indications Contraindications Steps of the procedure Technique to be performed Materials Biosafety Types of catheters- and sizes by numbers Corroboration of catheter insertion (Rx) Complications Benefits	The e-learning method was used	- Digital presentation - slides - Educational videos

	Care and maintenance Pathophysiology Anatomy (veins - arteries) Description of the veins of the human body		
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**Impact of the educational intervention on the nursing staff.**

The result presented in this research points out the need to develop activities for nursing updating in order to evaluate and create technologies related to the work process.

The results show that the educational intervention had a positive impact, as 54.5% have a high level of knowledge about nursing care of percutaneous neonates, while 0% after the intervention have a low level of knowledge (Table 4).

**Table 4. Description of the level of knowledge of nursing care of neonates with percutaneous peripherally inserted catheter (post-test).**

Knowledge level	High Level		Medium Level		Low Level	
	f	%	f	%	f	%
Knowledge level (pre-test)	1	3,0	12	36,4	20	60,6
Knowledge level (post-test)	18	54,5	15	45,5	0	0,0

**IV. DISCUSSION**

Promoting the training of professionals who handle intravenous catheters is an international recommendation, so that an adequate level of knowledge is essential for working in the ICU. In this context, the nursing staff plays the role of educator of the team. In addition, knowledge of nursing care of neonates with peripherally inserted percutaneous lines should be periodically assessed, and this role can only be performed by trained professionals.

Percutaneous catheter insertion is indicated for patients who will remain in the hospital for long periods, in very low birth weight neonates, PICC reduces painful procedures and prolongs the time of intravenous therapy, without the incidence of sepsis. Studies show that total parenteral nutrition (TPN) via PICC is favorable for nutritional intake. In addition, there is evidence that relates the use of PICC with a lower number of catheters used to comply with therapy (17, 18,20).

During insertion, the professional should use maximum barrier precautions: mask, cap, sterile gown, gloves and surgical drapes. For skin antiseptics, chlorhexidine is indicated as the antiseptic of first choice; however, there is no evidence regarding the comparison between chlorhexidine, tincture of iodine and 70% alcohol solution. The antiseptic should be well dried prior to puncture. Hand hygiene should be strictly performed every time the catheter is handled (18).

Morales and collaborators affirm that intravenous therapy in neonates is the most used tool to treat several pathologies, being indispensable for the administration of medicines, parenteral nutrition, hemoderivatives, liquids and electrolytes, so it must be considered as a life line, being indispensable for the success of the treatment, so the care of the catheter must be meticulous, being necessary that the health personnel have updated knowledge in this procedure to maintain and improve the health of the neonate (21).

Similarly, Chulle and collaborators state that the low rates of complications reported in the insertion and maintenance of the PICC line in neonates is related to the expertise of the nursing staff in the ICU (7). Likewise, Cumpa in his article points out that there is a relationship between the knowledge of percutaneous catheter in the neonatal intensive care unit and the care provided by the nursing staff, stating that when there is a high level of knowledge, the care provided is good (22).

Thus, the peripherally inserted central catheter stands out as a necessary tool for safe care. It has a number of advantages such as ease of insertion and handling, duration that favors prolonged intravenous therapy, reduction of multiple punctures, pain and risk of skin lesions. In addition, it is considered as the first choice for being an excellent device inserted by peripheral venipuncture, centrally positioned, with the intention of improving the quality and safety of nursing care to the neonate, nurses should prioritize care on the insertion technique associated with the peripherally inserted central catheter, its maintenance, as well as issues related to the choice of vein, the expected results with the therapy.

**V. CONCLUSIONES**

Neonatal care should be supported by reliable evidence to restore health in the shortest possible time. Hospital complications, such as bloodstream infections related to catheters and intravenous devices, should be minimized to provide neonates and family with a less traumatic hospital stay free of malpractice.

Based on the results of the research, professional updating is considered necessary and mandatory; therefore, ways should be created to facilitate information to the nursing staff.

Educational interventions should be consonant where scientific evidence should be incorporated into clinical



practice, allowing the acquisition and validation of knowledge. Therefore, there is a need to return the results of studies to practice and the topics of re-investigation are the result of the need for the same in an objective and applicable way in their routine.

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