

## CHARACTERIZATION OF PERIPHERAL VENOUS CATHETER USE IN A UNIT SPECIALIZED IN ADOLESCENT HEALTH

### MOTIVOS DE RETIRADA E PRINCIPAIS COMPLICAÇÕES EM CATETERES VENOSOS PERIFÉRICOS: ESTUDO DESCRITIVO

### CARACTERIZACIÓN DEL USO DE CATÉTER VENOSO PERIFÉRICO EN UNA UNIDAD ESPECIALIZADA EN SALUD ADOLESCENTE

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#### ABSTRACT

**Objective:** evaluate peripheral venous catheterization in a specialized adolescent health unit and identify the correlation of reasons for withdrawals with the number of puncture attempts and caliber of the catheter over the needle. **Method:** descriptive study with a quantitative approach. **Results:** 13 (56,5%) were male, aged between 15 and 17 years (82,6%). Regarding medical diagnosis by systems, rheumatology stands out in 11 adolescents (47,8%). There were 67 venous punctures, with the 22 gauge predominating (76,1%). In terms of withdrawal, the elective form stands out in 44,8%, followed by accidental removal in 31,3%. Regarding complications, 43,7% were due to catheter obstruction. Also, the greater the number of attempts, the greater the chance of phlebitis, moderate positive correlation (0.494) with  $p < 0.001$  and the larger the caliber, the greater the chance of phlebitis, strong positive correlation (0.575) with  $p < 0.001$ . **Conclusion:** the need to implement good practices related to the maintenance of these devices, staff training and the creation of protocols and bundles aimed at clinical practice is reinforced.

**Descriptors:** Adolescent; Catheterization, Peripheral; Nursing; Phlebitis.

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## RESUMO

**Objetivo:** avaliar a cateterização venosa periférica em uma unidade especializada em saúde do adolescente e identificar a correlação dos motivos de retiradas com número de tentativas de punção e calibre do cateter sobre agulha. **Método:** estudo descritivo, de abordagem quantitativa. **Resultados:** Ocorreram 67 punções venosas, predominando o gauge 22 (76,1%). Nos motivos de retirada destacam-se a forma eletiva em 44,8%, seguido de remoção acidental em 31,3%. Quanto às complicações ocorridas 43,7% foram por obstrução do cateter. Quanto maior ao número de tentativas e maior chance de flebite, observou-se correlação moderada positiva (0,494) com  $p < 0,001$ , e com relação ao maior calibre e maior chance de flebite, identificou-se correlação forte positiva (0,575) com  $p < 0,001$ . **Conclusão:** reforça-se a necessidade da implementação das boas práticas relacionadas à manutenção desses dispositivos, capacitação da equipe e criação de protocolos e *bundles* voltados para a prática clínica.

**Descritores:** Adolescente; Cateterismo periférico; Enfermagem; Flebite.

## RESUMEN

**Objetivo:** evaluar el cateterismo venoso periférico en una unidad especializada de salud del adolescente y identificar la correlación de los motivos de los retiros con el número de intentos de punción y el calibre del catéter sobre la aguja. **Método:** estudio descriptivo con abordaje cuantitativo. **Resultados:** 13 (56,5%) eran hombres, con edades comprendidas entre 15 y 17 años (82,6%). En cuanto al diagnóstico médico por sistemas, destaca la reumatología en 11 adolescentes (47,8%). Se realizaron 67 punciones venosas, predominando el calibre 22 (76,1%). En cuanto a la baja, destaca la forma electiva en un 44,8%, seguida de la baja accidental en un 31,3%. En cuanto a las complicaciones, el 43,7% se debió a la obstrucción del catéter. Asimismo, a mayor número de intentos, mayor probabilidad de flebitis, correlación positiva moderada (0,494) con  $p < 0,001$  y a mayor calibre, mayor probabilidad de flebitis, fuerte correlación positiva (0,575) con  $p < 0,001$ . **Conclusión:** se refuerza la necesidad de implementar buenas prácticas relacionadas con el mantenimiento de estos dispositivos, la formación del personal y la creación de protocolos y paquetes dirigidos a la práctica clínica.

**Descriptorios:** Adolescente; Cateterismo Periférico; Enfermería; Flebitis.

## INTRODUCTION

Adolescence corresponds to a period of the life cycle located between the stages of childhood and adulthood, which is characterized by important biological, social and psychological changes. It is considered the healthiest stage of the life cycle, however, the World Health Organization (WHO) points to an increase in diseases in

this age group, mainly related to external factors, resulting from risky behavior, influences of the environment in which they are inserted, and lifestyle, which leads to an increase in hospitalizations.<sup>1</sup> During the hospitalization process, adolescents are conditioned to undergo several procedures, including the insertion of vascular devices for therapeutic purposes.

However, it is observed that some diseases and injuries that affect this population, when hospitalized, cause vascular fragility, and this ends up increasing the risk of adverse events in the context of intravenous therapy. It is estimated that 80% of patients receive at least one peripheral intravenous catheter (PIC) insertion during hospitalization, which is the most common device for performing intravenous therapies (IVT).<sup>2-3</sup>

To assertively perform IVT, nurses must demonstrate responsibility, self-confidence, attitude, communicability and technical-scientific knowledge, in addition to planning a line of care to monitor the effective progress of therapy. Training and knowledge in performing IVT are important; however, there are adverse events that are the main reasons related to this type of device such as phlebitis, infiltration, extravasation, obstruction and accidental displacement and are usually related to lack of nursing care before and after the puncture.<sup>4-5</sup> Thus, it is important to know the relationship between the main reasons for removing the catheter and aspects of the puncture and the catheter so that it is possible to subsidize clinical practice.

Given these considerations, it is worth noting that these devices will require special care, in the context of implementing good practices by the responsible institution, from

insertion to removal, including handling and maintenance. Regarding the exchange of these devices, they must be replaced every 96 hours, or according to clinical criteria, as long as good evaluation practices are ensured regarding the client's clinical condition, the puncture site, skin and vascular integrity, time and duration of prescribed therapy, catheter status, application of aseptic technique, use of recommended dressing and fixation.<sup>6</sup>

In addition, training to improve and update PIC handling and insertion techniques greatly contribute to avoiding or reducing complications related to these devices. A study even points out the importance of institutional protocols aimed at insertion and maintenance, in addition to institutional surveillance measures. The implementation of good nursing practices to avoid these adverse events, in addition to reducing multiple punctures, reduces material costs, improves safety and quality of care for patients undergoing peripheral venous access.<sup>4,7</sup>

Considering that nursing professionals are responsible for the insertion and maintenance of peripheral venous access, technical-scientific knowledge becomes the main factor for preventing complications with such devices.<sup>8-9</sup> Added to this, the fact that the catheter peripheral venous is the most used in intravenous therapy<sup>6</sup>; however,

it can compromise patient safety due to discontinuity in treatment, aspects that impose the need to produce knowledge about the main reasons for withdrawal, allowing, above all, the nurse to plan actions aimed at preventing complications.

In view of the above, the objective was to evaluate peripheral venous catheterization in a unit specialized in adolescent health and to identify the correlation between the reasons for removals and the number of puncture attempts and caliber of the catheter over the needle.

## METHOD

Descriptive, quantitative study, carried out in an inpatient unit specialized in adolescent health, linked to the clinical service, in a University Hospital, located in the city of Rio de Janeiro, RJ, Brazil, with a capacity of eight beds, four of which are female and four male. The unit assists adolescents between the ages of 12 and 18 years, according to the Child and Adolescent Statute (ECA), usually coming from the institution's outpatient clinic or referred from other hospital units.

The sample consisted of 23 hospitalizations of adolescents who underwent peripheral venous catheterization during hospitalization, following the inclusion criteria, namely: adolescents who

underwent PIC during hospitalization at the unit specialized in adolescent health. Exclusion criteria: adolescents using peripheral venous catheters from other sectors of the hospital or external.

In this sense, data collection took place between the months of December/2019 to September/2020, through an instrument developed by the authors, previously tested. However, it should be noted that the research presented a gap due to the pandemic caused by the new coronavirus (SARS-CoV-2), between mid-March/2020 and mid-June/2020, since the service underwent a reorganization with a decrease in the number of beds, to provide beds for the treatment of COVID-19, which prevented the collection from being carried out in the previously planned time frame.

For data collection, a direct observation at the venipuncture site was carried out and a form was applied. As this is a clinical ward, the observation of the PIC insertion site was performed twice within a 24-hour period, during the day and night shifts, as recommended in the literature. In addition, to assess phlebitis, the scale proposed by the Infusion Nurses Society (INS) was applied<sup>5,6,10</sup>, whose Manual, version 2016, is translated into Portuguese.

The evaluation of the catheter insertion ostium was carried out by previously trained nurses and nursing

residents, and the information was recorded, followed by the follow-up of the adolescent from insertion to removal. The Scale used evaluated phlebitis in degree, ranging from 0 to IV.<sup>6,10</sup>

The data collection instrument was structured containing the following variables: age, sex, diagnosis by systems, according to the International Classification of Diseases (ICD-10), number of punctures, date of device removal, reason for device removal, gauge of the catheter and type of device fixation.

The nursing team that provided direct care to the adolescents was trained to assess and classify adverse events related to PICs, in order to eliminate erroneous data filling, to maintain a line of information, in addition to avoiding the potential influence on the results .

Data were tabulated using Microsoft Office Excel 2013® and analysis was performed using simple descriptive statistics, with a description of relative and absolute frequency, and inferential statistics. Inferential statistics were performed using Jamovi® 1.2.27 software. The Kolmogorov-Smirnov normality test applied identified that the variables were parametric. The Pearson correlation test was then used for the outcome variable: reason for removal (phlebitis and other causes) and the explanatory variables: number of puncture

attempts and caliber of the catheter over the needle. These variables were chosen because, according to the INS, they are the aspects that most cause trauma to vessels that can trigger phlebitis.

It is noteworthy that the study is linked to the project entitled: "Systematization of Nursing Care from the Perspective of Technological Innovation in Health Units: Clinical Research", approved by the Research Ethics Committee, under opinion No. 3,443,800, being in agreement with the Resolution of the National Health Council (CNS) n° 466/12.

## RESULTS

The sample consisted of 23 admissions of hospitalized adolescents, 13 (56.5%) of whom were male, aged between 15 and 17 years (82.6%). As for the medical diagnosis by systems, the rheumatological disease present in 11 hospitalized adolescents (47.8%) stands out, 90.9% of them, Systemic Lupus Erythematosus (SLE). It is also noteworthy the hematological diseases present in 5 hospitalized adolescents (21.7%), the diseases of the gastrointestinal system in 2 (8.7%), the diagnostic investigation in 2 (8.7%), and by others such as abscess dental, chronic renal failure and

Down syndrome, corresponding to 1 (4.3%) each.

Regarding peripheral vascular devices, 67 venipunctures were performed. The average number of punctures was 2.9 punctures per adolescent, with catheter permanence time ranging from less than 24 hours to 12 days, which corresponded to an average of 03 days.

With regard to the distribution of variables related to peripheral venous catheterization, such as catheter size in gauges, reasons for removal and complications of the intravenous device, Table 1 presents the descriptive analysis of the data.

Table 1 - Distribution of variables related to peripheral venous catheterization, catheter gauge, reasons for removal, and complications. Brazil, Rio de Janeiro, RJ, 2020 (N=67)

Variable	No	%
<b>Gauges</b>		
22G	51	76.1
24G	11	16.4
20G	5	7.5
<b>Withdrawal reason</b>		
Elective*	30	44.8
Accidental	21	31.3
Complications	16	23.9
<b>Main complications**</b>		
Obstruction	7	43.7
Infiltration	5	31.3
Phlebitis	4	25.0
<b>Total</b>	<b>67</b>	<b>100</b>

note:

\*is considered elective due to the end of treatment, discharge or replacement of the device > 96h

\*\* complications (n=16)

Source: Prepared by the authors themselves.

Regarding the characteristics of the intravenous devices regarding caliber in gauges, it is observed that 51 catheters (76.1%) corresponded to 22 gauges and 11 (16.4%) to 24 gauges.

The main complications identified in the punctures were obstruction, infiltration and phlebitis. In this study, it was observed that the greater the number of attempts, the greater the chance of complications (phlebitis and other causes), since a

moderate positive correlation (0.494) with  $p < 0.001$  was identified, and in relation to the greater caliber and greater chance of complications ( phlebitis and other causes), a strong positive correlation was identified (0.575) with  $p < 0.001$ .

## DISCUSSION

It is observed in the study that among the causes of hospitalization in adolescence,

chronic diseases such as SLE can be highlighted. An autoimmune disease that can affect several organs, causing a variety of complications, such as increased vascular fragility and vasculitis.<sup>11,12</sup> In addition, it is noteworthy that the pharmacological therapeutic plan includes high intravenous doses of glucocorticoids, which requires care in relation to peripheral vascular access.<sup>12,13</sup>

In addition, a study that evaluated the types of venous catheters used by adolescents hospitalized in a specialized inpatient unit observed a predominance of PIC. As for the underlying disease, SLE, ALL and sickle cell anemia stood out, and among the reasons for hospitalization, there was a predominance of activation of the chronic disease, treatment of malnutrition, pericarditis and pulse therapy.<sup>14</sup>

In this context, diseases of hematological origin are also evident, such as Acute Lymphocytic Leukemia (ALL) and sickle cell anemia, both leading to important vascular alterations and a propensity for infection.<sup>15,16,17</sup> In All, the therapeutic protocol consists of administering of antineoplastic chemotherapy<sup>16,17</sup> requiring the establishment of a long-term central venous access.<sup>5-6,17</sup> However, the patient may be hospitalized due to infectious conditions due to febrile neutropenia and other situations<sup>16,17</sup>, and in the absence of a

central access, the administration of certain antibiotics, hydration, blood transfusion, and others can occur through the peripheral route, provided that the control and evaluation measures are established.

With regard to the permanence time of the device, studies corroborate the evidenced data by pointing out that the variation in the permanence time of vascular devices in clinical units, from less than 24 hours to seven days, with an average of three days<sup>18</sup> and 1.5 punctures per patient, with catheter permanence time ranging from one to nine days, also with an average of three days.<sup>19</sup>

It is noteworthy that for pediatric patients the catheter should not be routinely changed, however the service should ensure the implementation of good practices recommended in the literature. In the context of clinical units, it is emphasized that there is no need to change in a period of less than 96 hours, and the decision to maintain longer periods or when clinically indicated will also depend on adherence to good practices.<sup>5</sup>

As for the size in gauges, the literature recommends choosing smaller gauges, as it is directly linked to the incidence of mechanical phlebitis.<sup>5</sup> Also, studies confirm this information and demonstrate that the larger the catheter gauge, the greater the risk of phlebitis.<sup>19</sup> A Infusion Nurses Society (INS) also relates the wrong choice of

catheter size to the appearance of intravascular injury, leading to the occurrence of phlebitis. It can be inferred that smaller gauges corroborate for a lower occurrence of phlebitis (5.9%), compared to other studies with higher values.<sup>9,18-20</sup> However, it is reinforced that, according to the INS, the expected phlebitis rate in the services corresponds to  $\leq 5\%$ .<sup>6,10</sup>

With regard to the reasons for removal of the 67 venipunctures performed, the elective form stands out as the main reason, which corresponded to 30 of the catheters removed (44.8%), followed by accidental removal in 21 (31.3 %). As for complications, 7 (43.7%) were due to catheter obstruction.

Obstruction is an occurrence that requires accurate nursing care, given that there are recommendations such as pulsatile flushing with 0.9% saline solution before and after the administration of drugs and solutions, so as to prevent residues from adhering to the lumen of the catheter, in addition to the positive pressure technique when clamping the device to prevent blood backflow.<sup>5</sup>

It should be noted that a correlation was identified between greater number of attempts and caliber and greater chance of complications. A study conducted in Portugal demonstrated the incidence of obstruction of 27.7% in peripheral venous

catheters, correlating the results with professional practice in relation to the handling of devices.<sup>4</sup> Corroborates with this result, study conducted in clinical units of a university hospital showing obstruction of the order of 74.2%, as the main complication related to peripheral vascular devices.<sup>18</sup>

It was observed that although the main reported reason for PIC removal was the end of treatment, discharge, time or clinical indication, characterizing elective replacement, the main complication was obstruction. It should be noted that the number of attempts and the gauge of the needle may have influenced these complications, thus highlighting the need for careful choice by the nurse of both the vein and the needle.

In this sense, by identifying strong correlation of complications and needle caliber and number of attempts, it is expected that the study will contribute to qualify the clinical practice of nursing professionals, especially because of the importance of the appropriate choice of needle and the appropriate choice of vein to be punctured. In addition, it is worth mentioning the need for post-puncture care for the maintenance of the access, such as Flushing before and after administering the medications and preventive character.



Among the limitations of the study, we highlight the fact that it was a single center, carried out in a public hospital unit of the Unified Health System (SUS), at a time of great turmoil due to the COVID-19 pandemic. However, the evidenced data are related to other studies carried out in clinical hospitalization units and with the evidenced clinical epidemiological profile of hospitalization, adolescents with complex chronic diseases. It is expected that the results obtained will support the institution in the implementation of educational actions and in the surveillance of adverse events related to IVT.

Therefore, the study contributes to nursing research focused on the use of PIC, especially with regard to the reasons for removal, clinical conditions and aspects involved in the insertion, maintenance and removal of these devices in the adolescent population. It is understood that the nurse has a fundamental role in the prevention of undesirable health events, such as phlebitis, obstruction, infiltration, among others, in order to guarantee patient safety.

## CONCLUSION

It was found that most adolescents undergoing peripheral venous catheterization were male, whose main medical diagnoses were diseases of the

rheumatological, hematological and gastrointestinal systems. Regarding the use of peripheral venous catheters, there were 67 punctures, with an average of 2.9 punctures per adolescent. The permanence time of the catheters ranged from less than 24 hours to twelve days, with an average of three days, and the most used caliber in gauges was the 22G.

Regarding the main reasons for removing the peripheral intravenous catheter, it was elective, and among the complications, there was a predominance of obstruction. Also noteworthy is the relationship between the number of attempts and the size of the caliber of the catheter with the occurrence of phlebitis.

Therefore, it reinforces the need to implement good practices for maintaining these devices, training the nursing team, and creating protocols and bundles aimed at clinical practice with PIC. Based on this study, the development of methodological research is suggested to assist in the preparation of didactic-instructional material for the training of the nursing team.

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