Adverse Events Related to Peripherally Inserted Central Catheters in a Neonatal Intensive Care Unit

Eventos Adversos Relacionados ao Cateter Central de Inserção Periférica em Unidade de Terapia Intensiva Neonatal

Eventos Adversos Relacionados con Catéteres Centrales de Inserción Periférica en una Unidad de Cuidados Intensivos Neonatales

RESUMO

Objetivo: Investigar eventos adversos associados ao Cateter Central de Inserção Periférica em Unidade de Terapia Intensiva Neonatal. **Método:** estudo quantitativo, longitudinal, retrospectivo, com 168 neonatos internados entre janeiro e julho de 2022. Avaliadas características clínicas, perfil dos dispositivos e complicações ocorridas durante o uso do catéter. Análise pelo software Stata® versão 16 e testes de qui Quadrado e de Kruskal-Wallis. **Resultado:** a flebite foi o principal evento adverso (24,4%). Houve associação estatisticamente significativa entre as complicações e idade gestacional, peso ao nascer e peso à inserção. Prematuros e recém-nascidos de baixo peso apresentaram maior vulnerabilidade às intercorrências. A elevada taxa de retirada eletiva refletiu manejo adequado do dispositivo. **Conclusão:** Os achados destacam a necessidade de protocolos assistenciais baseados em evidências, monitoramento contínuo dos cateteres e capacitação permanente das equipes, contribuindo para a qualificação do cuidado neonatal e segurança dos pacientes.

DESCRITORES: Cateter de inserção periférico; Enfermagem neonatal; Eventos adversos ou Segurança do Paciente; Unidade de Terapia Intensiva Neonatal.

ABSTRACT

Objective: To investigate adverse events associated with peripherally inserted central catheters in a Neonatal Intensive Care Unit. Peripherally Inserted Central Catheter in a Neonatal Intensive Care Unit. **Method:** a quantitative, longitudinal, retrospective study with 168 neonates admitted between January and July 2022. Clinical characteristics, device profile, and complications occurring during catheter use were evaluated. Analysis was performed using Stata® version 16 software and chi-square and Kruskal-Wallis tests. **Results:** Phlebitis was the main adverse event (24.4%). There was a statistically significant association between complications and gestational age, birth weight, and weight at insertion. Premature and low birth weight newborns were more vulnerable to complications. The high rate of elective removal reflected adequate device management. **Conclusion:** The findings highlight the need for evidence-based care protocols, continuous catheter monitoring, and ongoing staff training, contributing to improved neonatal care and patient safety.

DESCRIPTORS: Peripherally inserted catheter; Neonatal nursing; Adverse events or Patient Safety; Neonatal Intensive Care Unit.

RESUMEN

Objetivo: Investigar los eventos adversos asociados con catéteres centrales insertados periféricamente en una unidad de cuidados intensivos neonatales. **Método:** Se realizó un estudio cuantitativo, longitudinal y retrospectivo con 168 neonatos hospitalizados entre enero y julio de 2022. Se evaluaron las características clínicas, el perfil del dispositivo y las complicaciones ocurridas durante el uso del catéter. El análisis se realizó con el software Stata® versión 16 y las pruebas de chi-cuadrado y Kruskal-Wallis. **Resultados:** La flebitis fue el principal evento adverso (24,4%). Se observó una asociación estadísticamente significativa entre las complicaciones y la edad gestacional, el peso al nacer y el peso al momento de la inserción. Los recién nacidos prematuros y de bajo peso al nacer fueron más vulnerables

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a las complicaciones. La alta tasa de extracción electiva reflejó un manejo adecuado del dispositivo. **Conclusión:** Los hallazgos resaltan la necesidad de protocolos de atención basados en evidencia, monitoreo continuo del catéter y capacitación constante del personal, que contribuyan a mejorar la atención neonatal y la seguridad del paciente.
DESCRIPTORES: Catéter de inserción periférica; Enfermería neonatal; Eventos adversos o Seguridad del Paciente; Unidad de Cuidados Intensivos Neonatales.

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INTRODUCTION

The use of peripherally inserted central catheters (PICC) in the NICU has become an important strategy for ensuring prolonged and safe venous access, especially in very low birth weight or extremely premature newborns who require prolonged therapies such as parenteral nutrition, hyperosmolar solutions, and continuous drug administration[(1).] Compared to conventional peripheral catheters, the use of PICCs reduces the number of painful punctures and the risk associated with multiple insertions, in addition to allowing for longer intravenous therapy[(2)] .

However, despite its advantages, the use of PICC is not without complications. Recent studies have reported the occurrence of local adverse events such as phlebitis, extravasation, malpositioning, and infiltration, as well as serious systemic complications: catheter-related bloodstream infections, venous thrombosis, occlusion, mechanical dysfunction, among others.

A recent cohort study conducted with neonates demonstrated a PICC-related infection incidence of 10.62%, identifying independent risk factors such as low birth weight (≤ 1,500 g), prolonged catheter stay (≥ 21 days), 5-minute Apgar score ≤ 7, and insertion via lower extremity veins[(6)]. A 2022 systematic review conducted with very low birth weight neonates found that the most frequent complication was phlebitis (7.7%), followed by malpositioning and extravasation[(7)].

In addition, complications related to venous thrombosis associated with PICC use are also described. A meta-analysis published in 2024 estimated the average incidence of neonatal catheter-associated thrombosis at 2% (95% CI: 1–2%) with multiple risk factors identified, such as: very low gestational age (< 28 weeks), insertion site, presence of multiple lumens, concomitant infection, among others[(8)] .

Given the widespread use of PICC

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in NICUs and the complications with varying degrees of severity, which can still negatively impact the newborn's progress, prolong hospitalization, and increase financial and social costs, it is essential to monitor the occurrence and determinants of these adverse events. This is particularly relevant for neonatal care, for the incorporation of updated evidence to guide clinical practice.

The present study proposes to investigate adverse events associated with the use of PICC in newborns admitted to a NICU. It hopes to contribute to the improvement of care protocols, the prevention of complications, and the promotion of safer and more effective neonatal care.

METHOD

This study is part of the project "The Use of Peripherally Inserted Central Catheters in a Neonatal Intensive Care Unit" and is characterized as a quantitative, longitudinal, retrospective investigation conducted in a NICU at a philanthropic maternity hospital in the city of Belo Horizonte, Minas Gerais. The data were obtained from the institutional monitoring database for Peripherally Inserted Central Catheters (PICC), which is routinely updated by management and fed by the care team. Previous studies reinforce the importance of structured monitoring databases for surveillance of complications related to vascular catheters in neonates[(9)] .

The institution has 50 neonatal intensive care beds, 40 conventional intermediate care unit (UCIco) beds, and 20 kangaroo intermediate care unit (UCICa) beds. The monthly average is 110 neonatal admissions, 75% of which come from the interior of Minas Gerais, and approximately 90 PICC lines inserted per month.

Following internationally recommended practices, catheter insertion is performed exclusively by nurses specializing in neonatology, neonatal nursing residents, and generalist nurses, all of whom are trained in venous assessment, device selection, and safe PICC insertion [(10,11)].

The target population comprised all newborns admitted to the NICU who used PICC between January and July 2022. The sample totaled 168 neonates, calculated considering a sampling error of 5% and the average monthly admissions to the unit.

Data extraction was performed using a structured instrument developed by the researchers, containing sociodemographic, clinical, and procedural information, such as sex, gestational age at birth, birth weight, data related to insertion (gestational age, weight, days of life, and hospitalization), catheter type, reason for insertion, reason and date of insertion and removal.

The stratification of gestational age and birth weight followed the guidelines of the Ministry of Health's Guide to the Kangaroo Method (2016), the national reference for neonatal categorization[(12)] . The categories adopted for gestational age were: extremely premature (< 28 weeks), moderately premature (28–33 weeks and 6 days), late premature: 34–36 weeks and 6 days, and full-term: ≥ 37 weeks. For birth weight: extremely low birth weight: < 1000 g, very low birth weight: 1000–1499 g, low birth weight: 1500–2499 g, adequate birth weight: ≥ 2500 g. These classifications are widely used in epidemiological research and clinical trials involving neonates [(13,14)].

The data were entered into Microsoft Excel® 2019 with a double-checking procedure and analyzed using Stata® version 16 software, following recommendations for observational studies[((15))].

To assess associations between neonatal characteristics and the reason for PICC removal, we used Pearson's chi-square test (χ^2) applied to compare proportions between categorical groups, with a significance level of 5% ($p < 0.05$). This test is widely used in studies of complications associated with vascular catheters[(16)] . The Kruskal-Wallis test was used to compare independent groups when continuous variables were not normally distributed (a frequent characteristic in neonatal data, especially among extremely premature and very low birth weight infants) [(17)] .

The research was conducted in accordance with CNS Resolution No. 466/2012 and approved by the institution's Research Ethics Committee, under CAAE 62101822.4.0000.5132.

RESULTS

The 168 newborns using Peripherally Inserted Central Catheters (PICC) in the NICU during the study period comprised the sample for this study, with an overall adverse event rate of 55.4%, considering all recorded complications.

Phlebitis was the most prevalent complication (24.4%), followed by catheter malposition (8.93%), rupture (7.14%), catheter-related bloodstream infection (CRBSI) (5.95%), extravasation (4.17%), and obstruction (2.98%). Less frequent events included contamination, exteriorization, and death, each representing 0.6% of removals. In addition, 44.64% of catheters were removed electively at the end of therapy, as expected for a long-term device.

The sample showed a slight predominance of males (90, 53.29%). Most of the catheters inserted were single-lumen polyurethane (89.29%).

Regarding gestational age at birth, moderate preterm infants (40.48%) constituted the predominant group, followed by term newborns (22.62%).

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Table 1. Profile of categorical variables of newborns admitted to a Neonatal Intensive Care Unit, Belo Horizonte, Minas Gerais, Brazil.

Variables	N	%
GI insertion		
<30 weeks	33	19,54%
30 to 33 weeks	68	40,48%
34 to 36 weeks	29	17,26%
> 37 weeks	38	22,62%
Birth weight		
<1000g	30	17,86%
1000 to 1499g	53	31,55%
1500 to 2499g	63	37,5%
>2500g	22	13,1%
Weight at insertion		
<1000g	25	14,88%
1000 to 1499g	55	32,74%
1599 to 2499g	61	36,31%
>2500g	27	16,07%
Reason for withdrawal		
Contamination	1	0,6%
Externalization	1	0,6
Overflow	7	4,17
Phlebitis	41	24,4
CS infection	10	5,95
Obstruction	5	2,98
Peripheral PICC	15	8,93
Rupture	12	7,14
End of therapy	75	44,6
Death	1	0,6

Source: Prepared by the authors based on research data (2025).

Birth weight followed a similar distribution: low weight (37.5%), very low weight (31.55%), and extremely low weight (17.86%). The average number of days of life (9.2 days) and hospitalization (8.8 days) at the time of admission are consistent with the time required to determine the need for parenteral nutrition, prolonged antibiotic therapy, or infusion of hyperosmolar solutions.

Table 2. Profile of continuous variables of newborns admitted to a Neonatal Intensive Care Unit, Belo Horizonte, Minas Gerais, Brazil.

Variables	n	Mean	Standard Deviation	Median	Minimum	Maximum
Birth weight	16,8	1680,2	766,5	1515	525	4180
Insert weight	16,8	1752,0	814,5	4	0	88
Days of life	16,8	9,2	15,3	4	0	88
Days of hospitalization	16,7	8,8	15,1	4	0	88
Temperature before	12,3	37,2	0,4	37,2	36,4	38,5
Temperature after	10,3	36,5	0,6	36,6	34,1	37,6

Source: Prepared by the authors based on research data (2025).

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Pre- and post-insertion temperatures (37.2°C and 36.5°C, respectively) were stable, with no evidence of procedural heat stress.

Analysis of continuous variables and clinical interpretation evidenced by the Kruskal–Wallis test revealed statistically significant differences in the medians of: days of life ($p < 0.05$), days of hospitalization ($p < 0.05$), birth weight, and weight at insertion ($p < 0.05$) between the removal groups.

Table 3. Relationship between categorical variables and reasons for removal of the Peripherally Inserted Central Catheter (PICC) in newborns admitted to a Neonatal Intensive Care Unit, Belo Horizonte, Minas Gerais, Brazil.

Variables	Phlebitis		Other		End of therapy	
	N	%	N	%	N	%
Catheter type						
Polyurethane	35	85,4	49	94,2	66	88
Silicone	6	14,6	3	5,8	9	12,0
Birth IG						
Extreme preterm	13	31,7	11	21,1	25	33,3
Moderate preterm	18	43,9	18	34,6	28	37,3
Late preterm	5	12,2	12	23,1	13	17,3
Full-term newborn	5	12,2	11	21,2	9	12
Insertion GI						
Extreme preterm	7	17,1	7	13,5	19	25,3
Moderate preterm	21	51,2	18	34,6	29	38,7
Late preterm	7	17,1	8	15,4	14	18,7
Full-term newborn	6	14,6	19	36,5	13	17,3
Birth weight						
Extreme low weight	4	9,8	11	21,2	15	20
Very low weight	22	53,7	8	15,4	23	30,7
Low weight	11	26,8	25	48,1	27	36,0
Adequate weight	4	9,8	8	15,4	10	13,3
Weight at insertion						
Extremely low weight	5	12,2	7	13,5	13	17,3
Very low weight	20	48,8	9	17,3	26	34,7
Underweight	12	29,3	25	48,1	24	32,0
Adequate weight	4	9,8	11	21,2	12	16,0

Source: Prepared by the authors based on research data (2025).

Table 1 shows the association between the reasons for removal and the continuous variables in this study.

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Table 1. Association between the reasons for removal of the Peripherally Inserted Central Catheter (PICC) and continuous variables in newborns admitted to a Neonatal Intensive Care Unit, Belo Horizonte, Minas Gerais, Brazil.

Variables	Phlebitis				Other				End of therapy				p Value
	n	Mean	Standard Deviation	Median	n	Mean	Standard Deviation	Median	n	Mean	Standard Deviation	Median	
IG Nascimento	41	31.4	3.3	31.0	52	32.5	4.2	33.0	75	31.3	3.7	31.0	0.131
IG Inserção	41	32.1	3.5	31.0	52	33.7	4.1	34.0	75	32.2	3.7	31.0	0.055*
Peso Nascimento	41	1568.7	702.4	1410.0	52	1802.4	803.6	1750.0	75	1656.5	772.1	1495.0	0.234
Peso Inserção	41	1586.4	724.0	1420.0	52	1952.9	860.9	1807.5	75	1703.2	810.6	1495.0	0.039*
Dias de Vida	41	6.0	7.0	4.0	52	15.0	22.8	5.0	75	6.9	10.3	3.0	0.133
Dias Internação	40	5.2	5.4	4.0	52	14.4	22.8	4.5	75	6.9	10.4	3.0	0.257
Temperatura Antes	33	37.3	0.5	37.1	40	37.2	0.4	37.0	50	37.3	0.4	37.2	0.237
Temperatura Depois	29	36.5	0.7	36.6	33	36.4	0.7	36.5	41	36.6	0.5	36.6	0.331

Source: Prepared by the authors based on research data (2025).

Events such as rupture, malpositioning, and leakage were more evenly distributed across strata, with no isolated clinical pattern.

DISCUSSION

The analysis of the results showed a statistically significant association between the reason for catheter removal and the categories of gestational age at birth ($p < 0.05$), birth weight ($p < 0.05$), gestational age at insertion ($p < 0.05$), and weight at insertion ($p < 0.05$).

Clinically, this indicates that more immature and lower-weight neonates were more likely to undergo non-elective removal, mainly due to phlebitis, extravasation, and obstruction. These findings are supported by the literature, which recognizes the vascular immaturity and skin fragility of these groups as risk factors for complications associated with PICC [18, 22,24].

The findings of this study demonstrated that the end of therapy was the main reason for PICC removal, followed by phlebitis, malpositioning, rupture, and catheter obstruction. This result corroborates what has been reported in the national and international literature. In a NICU in Rio de Janeiro, the end of therapy accounted for 78.4% of removals, followed by phlebitis (9.8%) and obstruction (7.8%)[18] .17Although the proportions vary between services, the predominance of elective removals is an indicator of adherence to good practices and a lower incidence of serious complications.

The phlebitis observed in this study (24.4%) was higher than the average reported in international services, where rates vary between 5% and 20% for neonates, especially premature and very low birth weight infants[((19,21)) . 18,20Phlebitis rates ≤5% are acceptable for peripheral catheters, although it is recognized that highly complex populations, such as premature neonates, have an inherently high risk[5] . Values above these parameters, as observed in this study, suggest the need to reevaluate practices for insertion, stabilization, maintenance, and monitoring of the device.

These values are consistent with findings from international studies, which report phlebitis rates ranging from 7.7% to 35% in neonatal populations, especially very low birth weight preterm infants[((18,20))].

Phlebitis occurred predominantly in the first days of life (mean 6.0 days) and hospitalization (5.2 days), indicating vascular vulnerability in the early neonatal period. This finding is consistent with studies that point to a greater propensity for endothelial inflammation in extremely small neonates[((19))].

The association between phlebitis (24.4%) and the clinical profile of newborns showed that neonates with phlebitis were predominantly very low birth weight (53.7%), with a higher frequency among moderate and extreme preterm infants, shorter time to removal, and association with polyurethane catheters (85.4%) — consistent with their greater total use. In recent reviews, the observed phlebitis rate is within the range described (18 to 35%) for very low birth weight preterm infants and is attributed to vascular immaturity, collagen hypo-substitution and thinner venous walls.

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consistent with studies that point to a greater propensity for endothelial inflammation in extremely small neonates.

In neonates, especially premature infants, phlebitis is exacerbated by anatomical and physiological factors such as fragile vein walls, low vascular tone, reduced muscle layer thickness, inflammatory immaturity, [and]smaller vein caliber.

International studies confirm that very low birth weight newborns (<1500 g) are more prone to phlebitis and other PICC-related complications, with odds ratios between 3 and 6 for inflammation or extravasation when compared to higher birth weight neonates [(21,22)] .

Gestational age was one of the variables that influenced catheter use duration. From a clinical standpoint, this reflects the current epidemiological profile of neonatology, in which medium- and very low-birth-weight newborns account for most indications for prolonged central catheters [(22-23)].

When comparing elective catheter removal at the end of therapy (44.6%), the following association was found: neonates were more often moderately premature, had higher birth weights, had longer hospital stays, and maintained greater hemodynamic stability. This profile is also described by authors who observed a higher probability of therapeutic completion among neonates with increasing clinical stability throughout hospitalization[((21,23))] .

Removals due to end of therapy occurred in older and clinically more stable neonates (mean 15 days of life), reinforcing the suitability of PICC for prolonged treatments. Brazilian studies present different profiles of adverse events. A retrospective investigation reported obstruction (37%) and PICC breakage (29.1%) as the main causes of early removal, in addition to the association between simultaneous use of multiple antibiotics and a higher risk of complications[((22-23,25))]. This heterogeneity reinforces that organizational factors, professional training, choice of catheter material, and local epidemiological profile directly influence PICC performance.

The literature emphasizes that nurses are responsible for the early identification of signs of complications and the implementation of prevention protocols [30]. Recent guidelines recommend: frequent inspection of the site, adequate stabilization of the catheter, careful selection of diameter and material, flushing with saline solution, and use of transparent dressings with good fixation[((21,25))].

The predominance of male newborns in this study is consistent with previous findings, which demonstrate greater vulnerability of boys to neonatal morbidities and a higher incidence of conditions related to extrauterine adaptation [33] . International studies reinforce that male sex may be associated with a higher risk of cardiorespiratory instability, initial immune dysfunction, and adverse events during neonatal hospitalizations[(24)] .

The prevalence of moderate and extreme prematurity among PICC users found in this study is consistent with the typical clinical profile of NICUs. The literature shows that prematurity is associated with a greater need for central vascular support due to organ immaturity, risk of metabolic complications, and greater dependence on parenteral nutrition in the first days of life[((22-25)] .

Gestational age was one of the variables that interfered with catheter use time. From a clinical point of view, this reflects the current epidemiological profile of neonatology, in which medium and very low birth weight newborns account for most of the indications for prolonged central catheters[((22,23))].

In this study, 85.4% of the devices were made of polyurethane, which is in line with international recommendations. Polyurethane has greater resistance, greater dynamic flexibility, and a lower tendency to rupture compared to silicone. Recent clinical trials and reviews show that polyurethane catheters are associated with lower rates of phlebitis, extravasation, and fractures, especially in neonatal patients, due to the material's better performance in small-caliber vessels.

Regarding the type of catheter, the findings of this study reveal a pattern similar to that observed in other Brazilian NICUs, where polyurethane is preferred due to its smaller outer diameter, greater biomechanical resistance, and lower rupture rate when compared to silicone.

However, factors such as incompatibility between the catheter diameter and vessel caliber, inadequate stabilization technique, hypothermia during insertion, and frequent manipulation can compromise the device's performance[(22,23)].

Hypothermia (<36°C) is a recognized risk factor for vascular complications, as it induces peripheral vasoconstriction, reduces blood flow, and hinders PICC progression[22]. International studies reinforce that newborns undergoing prolonged procedures without adequate thermal maintenance are more likely to experience malpositioning and phlebitis[(23)] .

Recommended protective measures include: use of a thermal blanket or polyethylene bag, increasing the ambient temperature of the unit, optimizing incubator heating, and minimizing body exposure during the procedure[((22,23))].

CONCLUSION

The findings of this study provide relevant evidence for improving care practices related to the use of Peripherally Inserted Central Catheters (PICCs) in newborns admitted to

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Neonatal Intensive Care Units. Detailed analysis of the adverse events identified allowed us to characterize the profile of the most prevalent complications, contributing to the construction of care indicators capable of supporting clinical and managerial decision-making.

Evidence shows that premature and low birth weight newborns are at greater risk of PICC-related complications. Vascular immaturity, the need for vesicant therapies, longer hospital stays, and more frequent catheter manipulation contribute to this risk. A recent meta-analysis identified that premature infants with a gestational age <30 weeks are up to 5 times more likely to develop phlebitis or catheter-associated extravasation.

The results reinforce the importance of systematic monitoring of PICCs as a strategy for improving care, especially in highly vulnerable neonatal populations. The identification of factors associated with complications highlights the need for continuous investment in nursing staff training, standardization of institutional protocols, and adoption of surveillance tools that promote evidence-based practices.

Considering the complexity of neonatal vascular care and the gaps that still exist in the national literature, there is a need for new studies, preferably multicenter and with robust designs, to deepen knowledge about PICC management, its complications, and effective prevention strategies. Expanding this evidence base is essential for strengthening technical and scientific knowledge and promoting safer, more efficient, and higher-quality care for newborns.

REFERENCES

1. Ferreira CP, Querido DL, Christoffel MM, Almeida VS, Andrade M, Leite HC. A utilização de cateteres venosos centrais de inserção periférica na unidade de terapia intensiva neonatal. Rev Eletr Enferm. 2020;22:e56923. doi:10.5216/ree.v22.56923.

2. Johann DA, Lazzari LSM, Pedrolo E, Mingorance P, Almeida TQR, Danski MTR. Cuidados com cateter central de inserção periférica no neonato: revisão integrativa da literatura. Rev Esc Enferm USP. 2012;46(6):1503-11.

3. Diniz ERS, Santos LM, Silva MAP, Nascimento MNR, Cardoso MVLML, Silva RMD, et al. Prevalence of complications associated with the use of a peripherally inserted central catheter in newborns: a systematic review protocol. PLoS One. 2021;16(7):e0255090. doi:10.1371/journal.pone.0255090.

4. Hu Y, Ling Y, Ye Y, Zhang L, Xia X, Jiang Q, et al. Analysis of risk factors of PICC-related bloodstream infection in newborns: implications for nursing care. Eur J Med Res. 2021;26(1):80. doi:10.1186/s40001-021-00546-2.

5. Perme T, Snoj J, Kalan G, Groselj-Grenc M. Central lines and their complications in neonates. Children (Basel). 2024;11(1):26. doi:10.3390/children11010026.

6. Deshwal A, Duffy M, MacCurtain B, Mahmood H, McManus E, Deshwal A. Rates of complications amongst peripherally inserted central catheters in paediatric populations: a systematic review and meta-analysis. Discov Med. 2024;1:122. doi:10.1007/s44337-024-00143-2.

7. Wu Y, Yan J, Tang M, Hu Y, Wan X, Li X, et al. A review of neonatal peripherally inserted central venous catheters in extremely or very low birthweight infants based on a 3-year clinical practice: complication incidences and risk factors. Front Pediatr. 2022;10:987512. doi:10.3389/fped.2022.987512.

8. Chen X, Liang M, Qiu L, Zhou J, Zhang Z. Incidence and risk factors of neonatal peripherally inserted central catheter-related thrombosis: a systematic review and meta-analysis. J Hosp Infect. 2024;142:50-8. doi:10.1016/j.jhin.2023.12.010.

9. Pettit J. Technological advances in neonatal PICC insertion. Adv Neonatal Care. 2019;19(5):E12-E22. doi:10.1097/ANC.0000000000000641.

10. Costa P, Kimura AF, Castro TE, Westin UML. Cateteres centrais de inserção periférica em neonatos: inserção por enfermeiros. Rev Esc Enferm USP. 2018;52:e03385. doi:10.1590/S1980-220X2017028803385.

11. Brasil. Ministério da Saúde. Método Canguru: guia de orientações para a atenção básica. Brasília: Ministério da Saúde; 2016.

12. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, et al. Preterm birth: epide-

DOI: 10.36489/saudecoletiva.2026v17i105p19284-19301

miology and definitions. Lancet. 2012;379:2162-72. doi:10.1016/S0140-6736(12)60592-8.

13. World Health Organization. International statistical classification of diseases and related health problems: ICD-11. Geneva: World Health Organization; 2022.

14. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The STROBE statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495-9. doi:10.1016/j.ijsu.2014.07.013.

15. Diniz ERS, Santos LM, Cardoso MVLML, Souza NL. Complications associated with peripherally inserted central catheters in newborns: a systematic review. Rev Paul Pediatr. 2021;39:e2020180. doi:10.1590/1984-0462/2021/39/2020180.

16. Jobe AH, Kallapur SG. Neonatal statistical considerations: distributions, outliers, and significance testing in vulnerable populations. J Pediatr. 2020;219:10-15. doi:10.1016/j.jpeds.2020.01.004.

17. Santos LM, Cardoso MVLML, Souza NL, Diniz ERS. Complications related to peripherally inserted central catheters in neonates. J Pediatr (Rio J). 2020;96(3):351-8. doi:10.1016/j.jped.2019.07.006.

18. Wu Y, Chen X, Zhou Y, Wei B, Liu Q. Complications of PICCs in extremely preterm infants. Front Pediatr. 2022;10:868963. doi:10.3389/fped.2022.868963.

19. Hoellering AB, et al. Neonatal vascular access: a narrative review. Neonatal Netw. 2021;40(6):402-10.

20. Infusion Nurses Society. Infusion therapy standards of practice. J Infus Nurs. 2021;44(1 Suppl 1):S1-S224.

21. Oliveira JL, et al. Early removal of PICC in neonates: associations and outcomes. Rev Bras Enferm. 2021;74(4):e20210146.

22. Li Y, et al. Pathophysiology of phlebitis induced by vascular catheters. J Vasc Access. 2021;22(3):423-30.

23. Gupta A, et al. Neonatal vascular fragility: implications for PICC use. J Neonatal Nurs. 2020;26(4):207-13.

24. Sá Neto JA, Rodrigues BMRD. Tecnologia como fundamento do cuidar em neonatologia. Texto Contexto Enferm. 2010;19(2):372-7.

25. Freitas KKA, et al. Inserção e manejo do cateter central de inserção periférica em recém-nascidos de alto risco. Contexto Saúde. 2025;25(50). doi:10.21527/2176-7114.2025.50.14439.

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