

BMJ Open Comparative performance of 24G and 26G short peripheral catheters in neonates: a single-centre retrospective cohort study in a tertiary neonatal intensive care unit

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ABSTRACT

Background Short peripheral catheters (SPCs) are the most frequently used vascular access devices in neonates but are associated with complications and limited dwell times. International guidelines recommend using the smallest appropriate catheter gauge, yet 24G SPCs remain the default choice in many neonatal intensive care units (NICUs) while 26G SPCs are less often used because of concerns about flow adequacy particularly during blood transfusions. Evidence directly comparing these gauges in neonates is limited.

Methods We conducted a retrospective cohort study in a tertiary NICU and national referral centre for high-risk neonatal care in Doha, Qatar. Data were collected between 1 August 2018 and 31 December 2023. Eligible participants were neonates (0–28 days) who received at least one SPC insertion. Data extracted included demographics, catheter characteristics, dwell time, complications and reasons for removal. Analyses were performed at the catheter episode level. Dwell times were analysed using Kaplan–Meier survival curves with log-rank testing, and group comparisons were performed with parametric or non-parametric tests as appropriate.

Results A total of 45 753 SPC episodes were analysed: 10 531 (23.0%) 24G and 35 222 (77.0%) 26G. Baseline characteristics were comparable between the groups. The mean dwell time was slightly longer for 26G than for 24G (35.1 vs 32.6 hours, $p<0.001$), although the absolute difference was small. Therapy completion rates were nearly identical (42.6% vs 42.0%, $p=0.286$). First-attempt success was higher with 26G (79% vs 74%, $p<0.001$), representing a clinically relevant improvement. The complication profile showed a trade-off: 26G SPCs had fewer leaks (11.9% vs 14.4%, $p<0.001$) and occlusions (4.0% vs 4.8%, $p<0.001$), but a slightly higher rate of phlebitis (4.6% vs 4.2%, $p<0.001$). Severe infiltration and extravasation rates were comparable. Overall complication rates were not significantly different between the groups. In the transfusion subgroup, 26G SPCs were used most frequently, and outcomes were not clinically different from those of 24G, with no excess complications observed, supporting their clinical feasibility for blood administration.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study is one of the largest neonatal cohorts directly comparing 24G and 26G short peripheral catheters.
- ⇒ Data were collected systematically from a high-volume tertiary neonatal intensive care unit, providing detailed information on catheter characteristics, complications and reasons for removal.
- ⇒ Data were derived from routine clinical practice, reflecting real-world neonatal vascular access management.
- ⇒ The single-centre retrospective design may limit the generalisability of the findings to other settings.
- ⇒ Analyses were performed at the catheter episode level and did not account for clustering of multiple catheters within individual patients.

Conclusion In this large neonatal cohort, 26G SPCs were associated with a statistically longer dwell time than 24G SPCs, although the absolute difference was small. Therapy completion and complication rates were comparable between the groups, whereas first-attempt insertion success rates were higher with 26G SPCs.

INTRODUCTION

Peripheral vascular access devices (PVADs) are the most frequently used invasive devices in neonatal intensive care.^{1–5} Although they are essential for the administration of fluids and medications, they are also associated with complications and limited dwell times.² Short peripheral catheters (SPCs) are commonly inserted to deliver fluids, medications, parenteral nutrition and blood products. However, maintaining reliable peripheral access in neonates is challenging because of small and fragile veins, immature skin integrity and the overall vulnerability of this patient population.^{1–5} As a result, SPC use is frequently associated with complications such

as infiltration, extravasation, phlebitis, occlusion and accidental dislodgement, often leading to premature catheter failure and repeated insertion attempts.^{1–5}

Repeated catheter insertions are clinically important in neonates because they increase procedural pain, stress for both infants and parents and workload for healthcare staff. Strategies that improve first-attempt success and prolong catheter dwell times are therefore highly relevant in neonatal vascular access practice.

International guidelines, including the Infusion Nurses Society Infusion Therapy Standards of Practice, recommend using the smallest-gauge catheter capable of safely delivering prescribed therapy to minimise vessel trauma and preserve venous access.^{6–8} In practice, however, 24G SPCs remain the most frequently used in neonatal care. The use of 26G SPCs is far less common, often limited by concerns regarding flow capacity or the belief that they are unsuitable for specific therapies such as blood transfusions.

These concerns are not supported by evidence. Manufacturer-reported flow rates range from 16 to 19 (≈960–1140) mL/hour for 24G SPCs and from 12 to 14 (≈720–840) mL/hour for 26G SPCs.⁹ By contrast, typical neonatal infusion requirements, including transfusions, rarely exceed 2–10 mL/hour. Both 24G and 26G SPCs, therefore, provide more than adequate flow performance in neonatal practice.

Despite the central role of SPCs, evidence directly comparing outcomes between 24G and 26G devices in neonates is limited. Clarifying whether smaller-gauge catheters perform comparably is clinically relevant, as this could support wider adoption of 26G SPCs and better alignment with evidence-based guidelines.⁸

The aim of this study was therefore to compare the performance of 24G and 26G SPCs in neonates in terms of catheter dwell time, complication rates, first-attempt success and reasons for removal in a large tertiary neonatal intensive care unit (NICU).

METHODS

Study design and setting

This retrospective cohort study was conducted in the 128-bed tertiary NICU of the Women's Wellness and Research Centre, Hamad Medical Corporation, Doha, Qatar. The unit serves as a major national referral centre for high-risk neonatal care and provides specialised neonatal transport services, receiving referrals from across Qatar and neighbouring countries. Data were extracted from routinely collected electronic medical records and institutional vascular access records maintained as part of standard clinical care for the period August 2018 to December 2023.

Participants

Eligible participants were neonates 0–28 days of age admitted to the NICU during the study period who

received at least one SPC insertion. Both preterm and term infants were included.

Episodes were excluded if the catheter gauge could not be identified or if insertion or removal data were incomplete because of death or transfer to another facility ('administrative censoring'). Analyses were performed at the level of individual catheter insertions.

Because a patient may have multiple catheter insertions during a single admission, observations were analysed as catheter-level episodes, reflecting routine vascular access practice in the NICU. This episode-based design allowed evaluation of catheter performance across a broad range of clinical situations but may introduce clustering of observations within individual patients, which was not specifically adjusted for in the analysis.

Variables and data collection

Data were obtained from routinely collected clinical documentation and institutional vascular access records maintained as part of standard care within the NICU. Variables extracted from the electronic medical records included demographic characteristics (sex, gestational age, birth weight and postnatal age at insertion), catheter characteristics (catheter gauge, insertion site and date and time of insertion) and therapy-related variables (indication for SPC placement and type of infusion therapy including intravenous fluids, medications, total parenteral nutrition and blood transfusion). Clinical outcome variables included catheter dwell time, documented complications and reason for catheter removal.

Catheter insertion and management

All SPC insertions were performed by a dedicated neonatal vascular access team of experienced neonatal nurses, who are trained to a consistent standard, maintain individual performance records and undergo regular (quarterly) performance evaluation. All vascular access procedures were performed in accordance with institutional protocols based on contemporary international vascular access guidelines and standardised unit practices.

Skin antisepsis was performed before insertion, and catheters were secured using transparent sterile dressings and appropriate fixation methods. Catheter gauge selection was based on clinical assessment of vessel size, anticipated therapy requirements and practitioner judgement in accordance with local practice. Catheter sites were assessed regularly during routine clinical observations for signs of infiltration, phlebitis, occlusion or dislodgement. Routine catheter surveillance and documentation formed part of standard nursing care throughout the catheter dwell period. Catheters were removed when therapy was completed, when complications occurred or when clinically indicated according to unit practice.

Definitions

In this study, vascular access terminology follows the standardised nomenclature for vascular access devices and distinguishes SPCs from other peripheral and central

vascular access devices. This terminology was used to ensure clarity and comparability with other vascular access studies.

Catheter dwell time was defined as the interval between catheter insertion and catheter removal. Complications included any documented occlusion, infiltration, phlebitis, extravasation, leaking or accidental dislodgement that required premature catheter removal.

Reasons for catheter removal were categorised as either therapy completion or catheter failure due to complications.

Sample size

No formal sample size calculation was performed because this retrospective cohort study used routinely collected clinical data. All eligible SPC insertions recorded in the institutional database between 1 August 2018 and 31 December 2023 were included. A consecutive inclusion approach was used, whereby all eligible catheter episodes during the study period were analysed. The resulting dataset provided a large sample, allowing precise estimation of dwell time and complication rates across catheter gauges.

Outcome measures

The primary outcome was catheter dwell time, defined as the time from catheter insertion to removal.

Secondary outcomes included therapy completion, first-attempt insertion success, catheter-related complications (including infiltration, extravasation, phlebitis, occlusion and leakage) and reasons for catheter removal.

All outcomes were assessed at the catheter episode level and compared between 24G and 26G SPCs. A predefined subgroup analysis evaluated catheter performance during blood transfusion episodes, including completion rates and dwell time following transfusion.

Statistical analysis

Continuous variables were summarised as mean $\pm$ SD or median with IQR, depending on the distribution of the data. Categorical variables were presented as absolute numbers and percentages. All analyses were performed at the catheter episode level. Because this was an observational retrospective study, no adjustment was made for repeated catheter episodes within individual patients.

To minimise selection bias, all eligible catheter events recorded during the study period were included. Catheter gauge selection was determined by routine clinical practice rather than random allocation, and therefore, potential confounding cannot be excluded. Owing to the retrospective nature of the study and available variables, no multivariable adjustment for confounding was performed. Catheter episodes with missing catheter gauge information or incomplete insertion or removal data were excluded from analysis, and no imputation of missing data was undertaken.

Comparisons between the 24G and 26G groups were performed using independent samples t-tests for

continuous variables, χ^2 tests for categorical variables. Associations between categorical variables were quantified using ORs with 95% CIs. Catheter dwell time was additionally analysed using Kaplan–Meier survival analysis, and survival curves were compared using the log-rank test. Statistical significance was defined as $p<0.05$. Analyses were performed using IBM SPSS Statistics V.29.0.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Review Board of Hamad Medical Corporation (Protocol Number: MRC-01-24-147). Owing to the retrospective design, the requirement for informed consent was waived.

Patient and public involvement

Patients and parents were not involved in the design, conduct, reporting or dissemination plans of this study.

RESULTS

Patient and catheter characteristics

A total of 45 753 SPCs were analysed, including 10 531 (23.0%) 24G and 35 222 (77.0%) 26G SPCs.

Baseline demographic characteristics of the neonates were comparable between groups (table 1). Mean gestational age was 34.5 $\pm$ 4.7 weeks in the 24G group and 34.6 $\pm$ 4.7 weeks in the 26G group. Birth weight and current weight were also similar.

Most catheters were inserted in the hand, accounting for 87.4% of 24G and 86.0% of 26G SPC insertions (table 1). Other insertion sites were used less frequently. The side of cannulation was evenly distributed between the left and right limbs.

The most common indication for SPC insertion was administration of intravenous fluids or medications, representing >80% of insertions in both groups (table 1).

Catheter dwell time

Mean catheter dwell times were 32.6 $\pm$ 28.9 hours for 24G SPCs and 35.1 $\pm$ 71.2 hours for 26G SPCs (table 2, $p<0.001$). Although statistically significant, the absolute difference was small (approximately 2.5 hours). Figure 1 shows the Kaplan–Meier survival curves for the catheter dwell times.

Catheter outcomes

Therapy completion rates were similar between catheter sizes (42.0% for 24G vs 42.6% for 26G, table 2). Premature catheter removal due to complications accounted for 56.5% of 24G and 56.1% of 26G SPC insertions, indicating no meaningful difference in overall failure rates between the groups.

The distribution of specific complications is shown in table 3. Phlebitis occurred more frequently with 26G SPCs (12.2% vs 7.5%), whereas occlusion (7.1% vs 8.5%) and leaking (21.2% vs 25.5%) were less common with 26G SPCs. Infiltration or extravasation rates were similar between the groups (54.5% vs 53.0%), as were accidental dislodgement rates (4.2% vs 4.5%).

Table 1 Baseline characteristics of neonates by catheter gauge

Characteristic	24G (n=10 531)	%	26G (n=35 222)		P value
Gestational age (weeks), mean±SD	34.5±4.7		34.6±4.7		0.228 (t=-1.205, F=0.70)
Birth weight (grams), mean±SD	2327±973		2329±978		0.853 (t=0.185, F=2.82)
Current weight (grams), mean±SD	2411±915		2405±984		0.559 (t=0.563, F=2.28)
Male sex, n (%)	6143	58.3%	19984	56.7%	0.015 (X ² =8.43, df=2)
Age at insertion (days), mean±SD	9.5±20.8		8.8±19.4		<0.001 (t=3.210, F=29.74)
Insertion site	2	<0.1%	17	<0.1%	<0.001 (X ² =60.63, df=10)
Ankle	6	0.1%	25	0.1%	
Antecubital fossa	867	8.2%	3406	9.7%	
Foot	9209	87.4%	30 306	86.0%	
Hand	0	–	3	<0.1%	
Knee	394	3.7%	1154	3.3%	
Forearm	10	0.1%	40	0.1%	
Lower leg	1	<0.1%	10	<0.1%	
Scalp	18	0.2%	41	0.1%	
Arm (upper)	5	<0.1%	9	<0.1%	
Thigh	19	0.2%	211	0.6%	
Wrist					
Side of cannulation	5620	53.4%	18 760	53.3%	0.020 (X ² =7.84, df=2)
Left	4903	46.6%	16 455	46.7%	
Right	8	0.1%	7	<0.1%	
Midline					
Indication for IV cannulation	1200	11.4%	3128	8.9%	<0.001 (X ² =78.24, df=3)
	402	3.8%	1351	3.8%	
Blood withdrawal	8730	82.9%	30 264	85.9%	
Blood transfusion	199	1.9%	479	1.4%	
Intravenous fluids/medication Procedure					

Demographic and clinical characteristics of neonates receiving 24G or 26G short peripheral catheters. Continuous variables compared using an independent samples *t*-test; categorical variables compared using the χ^2 test as appropriate. df, degree of freedom.

When analysed as the presence versus the absence of any complication, no significant difference was observed between the groups ($\chi^2=1.137$, df=1, *p*=0.286; OR 0.98, 95% CI 0.93 to 1.02). Overall, the complication profile

was comparable between the two catheter gauges. Figure 2 shows the complication rates by catheter gauge.

Table 2 Therapy success/failure by catheter gauge

Outcome	24G SPC (n=10 531)	%	26G SPC (n=35 222)	%	P value
Median dwell time, mean±SD	32.6±28.9		35.1±71.2		<0.001 (t=-3.49, F=10.20)
Therapy completion, n (%)	4422	42.0%	14 996	42.6%	0.286 (X ² =1.14, df=1)
Therapy failure, n (%)	5954	56.5%	19 778	56.2%	
Administrative censoring*	155	1.5%	448	1.3%	

*Administrative censoring: death or transfer out to another facility . SPC, short peripheral catheter.

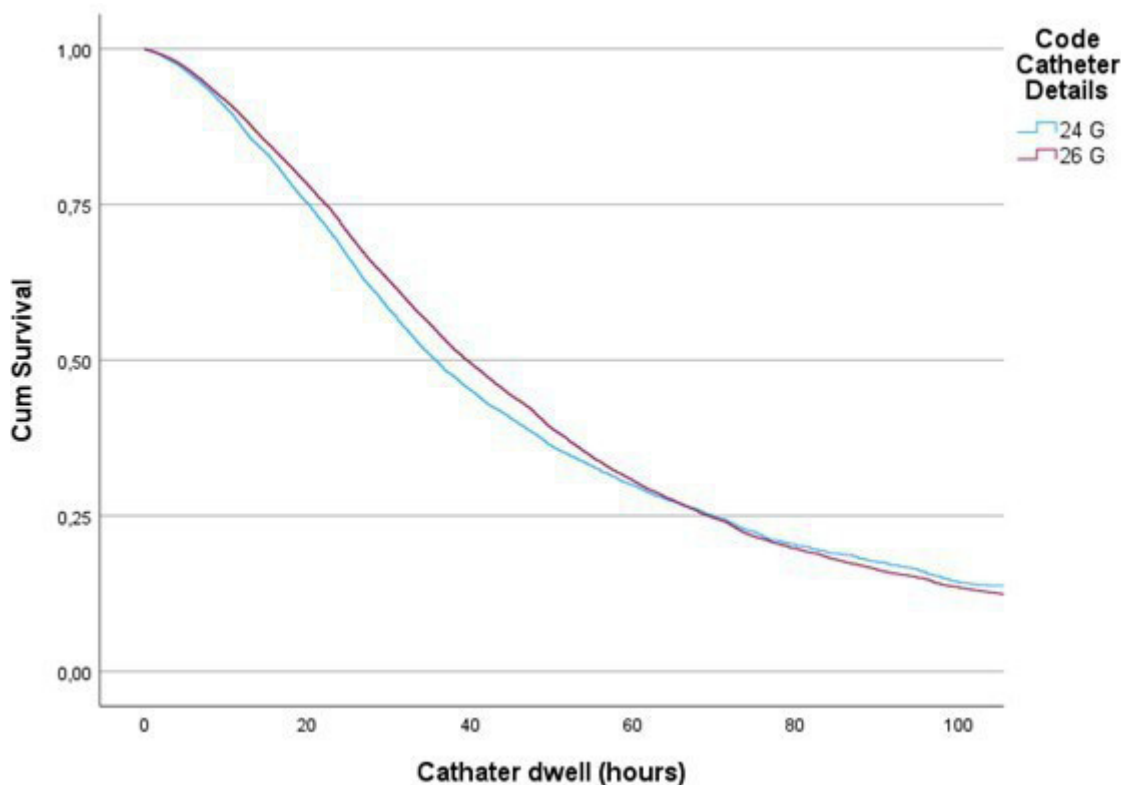


Figure 1 Kaplan–Meier survival curves for catheter dwell time.

Blood transfusion subgroup

Among 1753 transfusion episodes, most were administered through 26G SPCs (77.1%). Completion rates were slightly higher with 24G SPCs (63.7% vs 57.8%), and the mean dwell time following transfusion was 41.5 hours for 24G compared with 35.9 hours for 26G (table 4).

Although these differences were statistically significant, the absolute differences were small and not clinically meaningful. No excess complications were observed with 26G SPCs, supporting their suitability for blood administration.

Insertion success and number of attempts

The mean number of insertion attempts was slightly lower for 26G SPCs than for 24G SPCs (1.2 vs 1.3 attempts, $p<0.001$).

First-attempt success accounted for 79% of insertions with 26G SPCs compared with 74% for 24G SPCs. This represents a clinically relevant improvement in insertion success with 26G SPCs. The odds of first-attempt failure were 1.8 times higher with 24G (OR 1.8, 95% CI 1.7 to 1.9). The detailed distribution of insertion attempts is presented in table 5.

Table 3 Complication outcomes by catheter gauge

Complications	24G SPC (n=5954)	%	26G SC (n=19778)	%	P value
Occlusion	509	8.6%	1404	7.1%	<0.001 ($\chi^2=150.80$, df=7)
PIVIE	3157	53.0%	10785	54.5%	
Phlebitis	444	7.5%	2407	12.2%	
Accidental dislodgement	269	4.5%	821	4.2%	
Leaking	1518	25.5%	4188	21.2%	
Discolouration	57	1.0%	173	0.9%	

Continuous variables were compared using an independent samples t-test; categorical variables were compared using the χ^2 test as appropriate. The reported p-value ($\chi^2=150.80$, df=7, $p<0.001$) refers to the overall distribution of complication types between groups. When analysed as presence versus absence of any complication, no significant difference was observed ($\chi^2=1.137$, df=1, $p=0.286$; OR 0.98, 95% CI 0.93 to 1.02).

PIVIE, peripheral intravenous infiltration extravasation; SPC, short peripheral catheter.

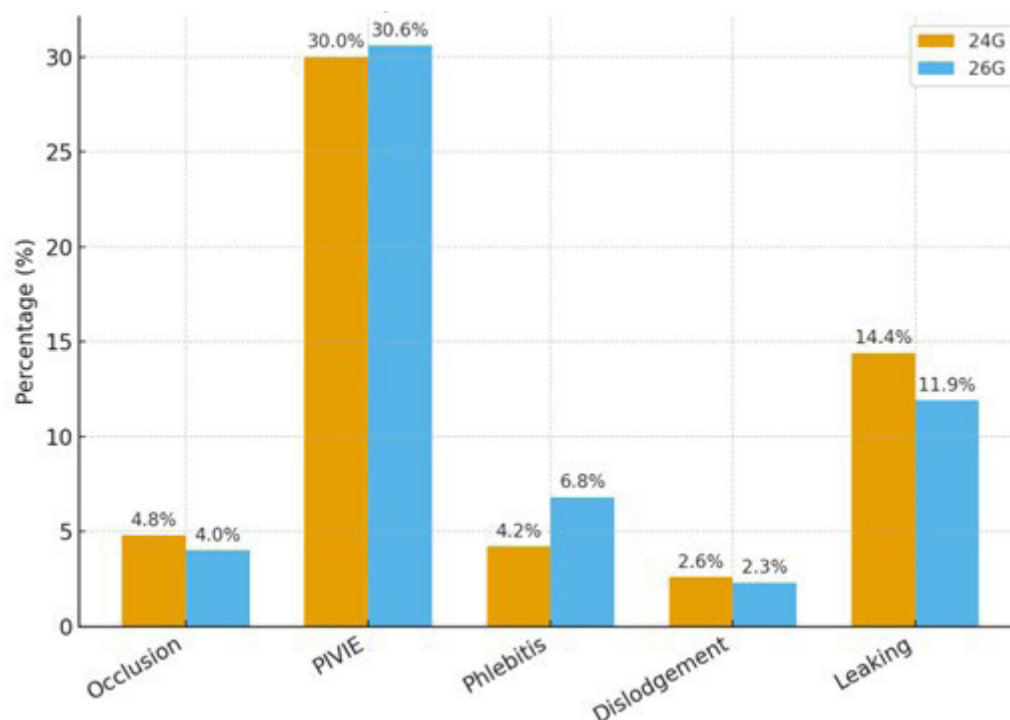


Figure 2 Complication rates by catheter gauge. PIVIE, peripheral intravenous infiltration extravasation.

Insertion attempts by catheter gauge

DISCUSSION

Summary of findings

In this large retrospective cohort study of 45 753 SPC insertions in a tertiary NICU, the clinical performance of 26G SPCs was broadly similar to that of 24G SPCs across most outcomes, with a statistically longer dwell time and higher first-attempt insertion success rates in the 26G group.

The mean catheter dwell time was slightly longer with 26G SPCs, although the absolute difference was modest. Despite statistical significance, this difference was small and unlikely to be clinically meaningful. Therapy completion rates were nearly identical between the two catheter gauges, indicating that both catheters provided similar reliability for maintaining peripheral intravenous therapy.

One of the most clinically relevant findings was the higher first-attempt insertion success rates observed with 26G SPCs. Achieving peripheral access on the first attempt is particularly important in neonatal care, where

repeated punctures increase procedural pain, stress for both infants and parents and workload for healthcare staff. This improvement in first-attempt success represents a clinically meaningful advantage. The higher first-attempt success rates associated with 26G SPCs suggest that smaller-gauge devices may facilitate vascular access in fragile neonatal veins while maintaining comparable catheter performance.

Although both differences regarding the blood transfusion reached statistical significance, the absolute variations were small and not clinically meaningful. Importantly, 26G SPCs demonstrated adequate performance for transfusion without evidence of compromised safety.

The overall complication profile was also broadly similar between groups. While phlebitis occurred slightly more frequently with 26G SPCs, occlusion and leakage rates were lower, and infiltration or extravasation rates were comparable. Importantly, when analysed as overall complication risk, no meaningful difference was observed between the groups. Taken together, these findings

Table 4 Catheter outcomes by catheter gauge during blood transfusion

Parameter	24G SPC	%	26G SPC	%	P value
No. of transfusions	n=402		n=1351		
Completion rate (n + %)	256	63.7%	781	57.8%	0.035
Mean dwell time (h)	41.52±35.87		35.94±29.48		0.002

Differences reached statistical significance but were small in absolute terms and not clinically meaningful; transfusions via 26G were safe and adequate, confirming their suitability for blood administration.
SPC, short peripheral catheter.

Table 5 Number of insertion attempts required for successful insertion of 24G and 26G SPCs

Total pricks	24G SPC		26G SPC		Total		P value
	n=10521	%	n=27 035	%	n=37 556	%	
1	7766	73.8%	21 265	78.7%	29 031	77.3%	<0.001
2	2311	22.0%	4430	16.84%	6741	17.9%	<0.001
3	382	3.6%	1057	3.9%	1439	3.8%	0.207
4	46	0.4%	184	0.7%	230	0.6%	0.007
5	13	0.1%	74	0.3%	87	0.2%	0.009
6	3	<0.1%	25	<0.1%	28	0.1%	0.041

SPC, short peripheral catheter.

suggest that 26G SPCs perform at least as well as 24G SPCs in routine neonatal clinical practice.⁶

Clinical implications of catheter gauge selection

International infusion therapy guidelines recommend selecting the smallest catheter gauge capable of safely delivering the prescribed therapy to minimise vascular trauma and preserve venous access.⁷ Despite these recommendations, 24G SPCs remain the default choice in many NICUs, whereas 26G SPCs are used less frequently, often because of concerns regarding flow capacity.^{5,8}

The findings of this study suggest that such concerns may be overstated. In this large neonatal cohort, 26G SPCs were associated with a statistically longer dwell time, although the absolute difference was small, while therapy completion rates and complication profiles were comparable to those of 24G SPCs. In addition, 26G SPCs achieved higher first-attempt insertion success rates. These results support the concept that smaller-gauge catheters can provide effective peripheral access while potentially reducing the need for repeated punctures. This may contribute to reduced procedural burden and improved vascular preservation in neonates. Direct neonatal comparisons of catheter gauge are scarce, but available evidence suggests that smaller-gauge catheters provide adequate flow capacity and may reduce vascular trauma.^{7,8}

Another commonly cited concern is whether 26G SPCs are suitable for blood transfusion. In the present study, most transfusions were administered via 26G SPCs, and outcomes were not clinically different from those observed with 24G SPCs. These findings support the clinical feasibility of transfusion through 26G SPCs and suggest that reluctance to use smaller-gauge catheters for this purpose may be driven more by perception than by evidence.⁹

Overall, the results of this study align with current guideline recommendations and support the broader use of 26G SPCs in neonatal vascular access practice, particularly in patients with small or fragile veins.

Strengths and limitations

This study represents one of the largest reported datasets evaluating catheter gauge performance in neonatal

peripheral vascular access, including more than 45 000 catheter insertions in a high-volume tertiary NICU. The large sample size enabled detailed evaluation of catheter dwell time, insertion success and a broad range of complications. The use of a specialised vascular access team may have reduced operator-related variability, although this was not formally analysed. The use of standardised vascular access terminology also improves the clarity and comparability of those of other studies in this field.

However, several limitations should be considered. The retrospective single-centre design limits causal inference and may reduce generalisability to other neonatal units with different clinical practices or patient populations. Furthermore, the study was conducted in a high-volume tertiary NICU with a dedicated neonatal vascular access team, and outcomes may therefore not be directly generalisable to centres with different staffing models, levels of expertise or vascular access practices. In addition, analyses were performed at the catheter episode level, meaning that some neonates may have contributed more than one catheter insertion. Although this approach reflects real-world vascular access practice, it may introduce clustering effects that were not fully accounted for in the analysis. Moreover, catheter gauge selection was determined by routine clinical practice rather than random allocation and may therefore be subject to residual confounding.

Potential confounding factors such as operator experience, insertion technique, catheter material, securement practices and infusion characteristics were not controlled for and may have influenced outcomes independently of catheter gauge. In addition, several potentially relevant clinical variables were not available within the retrospective dataset and therefore could not be incorporated into the analysis.

Finally, although the difference in dwell time between catheter gauges reached statistical significance, the absolute difference was modest and likely of limited clinical relevance.

Future directions

Future research should focus on prospective multicentre studies, ideally including randomised designs, to confirm whether the use of smaller-gauge peripheral catheters

improves vascular preservation and patient comfort without compromising clinical performance.⁸

Further investigation could also evaluate outcomes stratified by gestational age, birth weight and therapy characteristics, helping identify neonatal subgroups that may benefit most from specific catheter gauges.^{6,7} In addition, studies exploring strategies to optimise catheter-to-vein ratios, infusion characteristics and site management practices may help further improve peripheral vascular access outcomes in neonatal care. Future studies should also consider analytical approaches that account for repeated measures within patients to better address clustering effects inherent to episode-based designs.

CONCLUSION

In this large neonatal cohort, 26G SPCs were associated with a statistically longer dwell time than 24G SPCs, although the absolute difference was small and likely of limited clinical relevance. Therapy completion and complication rates were comparable between the groups, whereas first-attempt insertion success rates were higher with 26G SPCs, a clinically meaningful finding that may reduce repeated venipuncture attempts and associated procedural burden.

These findings suggest that 26G SPCs can provide effective peripheral vascular access in neonates and may be suitable for blood transfusion where clinically indicated. Given the retrospective single-centre design, prospective multicentre studies are needed to confirm these findings and further evaluate the role of catheter gauge selection in neonatal vascular access practice.

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Patient consent for publication Not applicable.

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Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The datasets generated for this study are available on reasonable request to the corresponding author. Data requests should be made to Dr Mohammad A. A. Bayoumi at moh.abdelwahab@hotmail.com.

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REFERENCES

- Pettit J. Assessment of the infant with a peripheral intravenous device. *Adv Neonatal Care* 2003;3:230–40.
- van Rens MFPT, Hugill K, Mahmah MA, et al. Evaluation of unmodifiable and potentially modifiable factors affecting peripheral intravenous device-related complications in neonates: a retrospective observational study. *BMJ Open* 2021;11:e047788.
- Legemaat M, Carr PJ, van Rens RM, et al. Peripheral intravenous cannulation: complication rates in the neonatal population: a multicenter observational study. *J Vasc Access* 2016;17:360–5.
- van Rens MFPT, Bayoumi MAA, van de Hoogen A, et al. The ABBA project (Assess Better Before Access): A retrospective cohort study of neonatal intravascular device outcomes. *Front Pediatr* 2022;10:980725.
- van Rens MR, van der Lee R, Spencer TR, et al. The NAVIGATE project: A GloVANet-WoCoVA position statement on the nomenclature for vascular access devices. *J Vasc Access* 2025;26:1439–46.
- Spencer TR. Vascular access – an evidence-based approach. cvr calc 2.0 – catheter to vessel ratio. 2025. Available: <https://vascularaccess.com.au/catheter-vessel-ratio>
- Nickel B, Gorski L, Kleidon T, et al. Infusion Therapy Standards of Practice, 9th Edition. *J Infus Nurs* 2024;47:S1–285.
- van Rens MFPT, Hugill K, van der Lee R, et al. Short versus long peripheral intravenous catheters in neonates: a retrospective cohort study. *Sci Rep* 2025;15:15373.
- Becton D. Pro iv catheter – product brochure. KMT Medical; 2022. Available: <https://www.kmtmed.com/wp-content/uploads/2022/06/BD-Neoflon-Pro-Brochure.pdf>