Original Research Article

Neonatal and Pediatric Infusion: A Multidisciplinary Clinical Practice Approach to Vascular Access Preservation and Infusion Safety

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ABSTRACT

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Introduction: Peripheral intravenous (PIV) therapy is vital in pediatric and neonatal care, but maintaining access is difficult due to small, fragile veins and limited sites. Children also struggle to report pain or complications. Frequent re-cannulation and issues like infiltration, phlebitis, extravasation, dislodgement, and occlusion cause pain, interrupt care, and deplete vascular access. High-risk medications further elevate these complication risks. Present study aimed to improve the safety and quality of IV therapy, reduce repeated cannulation and IV-related complications, improve catheter dwell time, and preserve vascular access in neonatal and pediatric patients. **Materials and Methods:** A multidisciplinary clinical practice and quality-improvement initiative was implemented in the NICU, PICU and pediatric ward using the Plan–Do–Study–Act (PDSA) approach. Key interventions included a dedicated pediatric IV team and a standardized PIV care bundle covering appropriate catheter selection and securement, aseptic technique, regular site assessment, proper flushing and splinting, early recognition of complications, medication compatibility guidance, safe dilution and infusion rates, smart infusion pumps, and infiltration/extravasation management tools. Competency-based staff training and family involvement were also incorporated. Outcomes were compared across the pre-intervention (June– November 2025; 1,510 observations), implementation (December 2025; 211 observations) and postintervention (January–May 2026; 1,445 observations) periods. **Results:** Multiple cannulation attempts decreased from 3.96% to 1.73%, representing a 56.31% reduction. Phlebitis decreased from 7.53% to 3.11%, infiltration from 4.76% to 1.03%, and occlusion from 3.17% to 0.69%. Adherence to the pediatric IV protocol improved from 30.95% to 48.44%. **Conclusion:** A multidisciplinary pediatric approach with standardized, tech-driven care improves outcomes and preserves children's vascular access.

Keywords:
Pediatric infusion therapy, Neonatal infusion, Peripheral intravenous catheter, Vascular access, Infiltration, Phlebitis, Catheter dwell time.

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Introduction

"Every pediatric IV access is an opportunity to treat—and an opportunity to preserve."

For a child or newborn who needs IV therapy, obtaining and maintaining vascular access is often one of the first and most important clinical challenges. IV access may be required for fluids, medications and other essential treatments. However, the veins of neonates and young children are small and fragile, and there are fewer available sites for repeated cannulation compared with adults.

The challenges go beyond the size of the vein. Neonatal and pediatric patients may have delicate vessel walls, limited supporting tissue and a small vessel diameter. Even a relatively small amount of edema, hematoma, or catheter displacement can affect catheter function. The vascular endothelium may also be more vulnerable to mechanical injury and irritation from repeated cannulation or infused medications.

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Fluid administration also requires particular attention in this population. Neonates and small children have a relatively small circulating blood volume, so even a small error in fluid or medication administration can have important consequences. Immature renal and hepatic functions in neonates may further influence fluid and medication handling.

Another challenge is that infants cannot explain what they are experiencing. A newborn cannot say that an IV site is painful or burning, and a young child may not be able to describe symptoms accurately. Nurses therefore have to rely on careful assessment and early visual and behavioral cues to identify problems such as infiltration, extravasation, phlebitis or occlusion.

Repeated venipuncture can also be distressing for children and their families. More importantly, repeated attempts may gradually reduce the number of usable vascular sites. For this reason, every successful IV insertion should be viewed not only as a means of delivering treatment but also as an opportunity to preserve the child's future vascular access.

The concept of Vessel Health and Preservation (VHP) provides an appropriate framework for this approach. It emphasizes selecting appropriate vascular access, performing safe insertion, maintaining the catheter effectively, monitoring the site and protecting vascular health throughout therapy.

Within our clinical setting, a need was identified to strengthen pediatric IV practice through standardized procedures, improved equipment, better staff competency, early recognition of complications and multidisciplinary monitoring. The resulting initiative focused on improving the entire IV care process rather than addressing catheter insertion alone.

Objectives

Primary objective

To improve the safety and quality of IV therapy in neonatal and pediatric patients, reduce repeated cannulation and IV-related complications, improve catheter dwell time, and preserve available vascular access.

Secondary objectives

1. To reduce repeated peripheral IV cannulation attempts.
2. To reduce peripheral IV complications, particularly phlebitis, infiltration and occlusion.
3. To improve catheter dwell outcomes.
4. To standardize peripheral IV insertion, securement, flushing and assessment practices.
5. To strengthen nursing knowledge and competency in pediatric infusion care.
6. To improve early recognition of infiltration and extravasation.
7. To strengthen awareness of medication compatibility and high-risk electrolytes.
8. To promote safe use of smart infusion pumps.
9. To establish a dedicated pediatric IV team for difficult vascular access.
10. To involve parents and caregivers in maintaining IV safety.

Materials and Methods

Study design

An institutional clinical practice and quality-improvement initiative with a pre- and post-intervention design was conducted using the Plan–Do–Study–Act (PDSA) approach. The initiative did not include a separate control group.

Study setting

The initiative was conducted at Peerless Hospitex Hospital and Research Center Ltd., Kolkata, in three clinical areas:

- Neonatal Intensive Care Unit (NICU)
- Pediatric Intensive Care Unit (PICU)
- Pediatric ward

Identification and prioritization of the clinical problem

The need for focused improvement was first explored using a nominal group technique (NGT). Six members participated and scored identified patient-safety areas from 1 to 5. The area receiving the highest total score was considered the highest priority.

Pediatric peripheral IV infusion received the highest score of 25. Other areas included pressure injury prevention (21), hand hygiene compliance (20), healthcare-associated infection/central line-associated bloodstream infection (19), medication safety (18), fall prevention (17), needle-stick injury prevention (16), staff competency and training (15), and documentation/record keeping and effective communication and handover (14 each) (Table 1).

Table 1: Nominal group technique prioritization

Patient-safety area	Total score
Pediatric peripheral IV infusion	25
Pressure injury prevention	21
Hand hygiene compliance	20
Healthcare-associated infection/CLABSI	19
Medication safety	18
Fall prevention	17
Needle-stick injury prevention	16
Staff competency and training	15
Documentation and record keeping	14
Effective communication and handover	14

Note: *Six members participated in the nominal group technique. Each member assigned a score from 1–5, with higher total scores indicating higher priority.*

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The prioritization exercise highlighted pediatric peripheral IV therapy as an important area for improvement.

Participants and data collection

The initiative involved neonatal and pediatric patients receiving peripheral IV therapy in the three clinical areas. Data were collected over three phases. The pre-intervention period extended from June 2025 to November 2025 and included 1,510 observations. The implementation period was December 2025, with 211 observations. The post-intervention period extended from January 2026 to May 2026 and included 1,445 observations. Overall, 3,166 patient/IV therapy observations were included in the reported dataset (Table 2).

Table 2: Data collection phases

Phase	Period	Observations
Pre-intervention	June 2025–November 2025	1,510
Implementation	December 2025	211
Post-intervention	January 2026–May 2026	1,445
Total	**June 2025–May 2026**	**3,166**

Baseline assessment

Before introducing the new practice framework, a baseline assessment was carried out to understand the existing situation. The clinical outcomes reviewed included multiple cannulation attempts, phlebitis, infiltration, occlusion and catheter dwell time.

The process review covered catheter securement, connector and extension-set practices, flushing, recognition of infiltration and extravasation, staff knowledge and competency, drug incompatibility awareness, high-risk electrolyte knowledge, smart-pump practices, and family involvement.

The baseline review identified several practice gaps. These included outdated or inconsistent IV protocols, use of open ports and short connectors, repeated line manipulation, concerns regarding drug incompatibility, gaps in staff knowledge about high-risk electrolytes, and variation in the recognition of early infiltration and phlebitis. There were also opportunities to improve securement, flushing, site assessment and the use of infusion technology.

These observations suggested that the problem was not limited to the act of inserting a peripheral IV catheter. Safe pediatric infusion required a coordinated approach covering insertion, securement, connector management, flushing, medication administration, ongoing assessment, complication recognition, and family involvement.

The baseline averages were:

- **Multiple punctures:** 3.96%
- **Phlebitis**: 7.53%
- **Infiltration:** 4.76%
- **Occlusion:** 3.17%
- **Reported dwell-time measure:** 30.95%

These findings supported the need for a structured intervention addressing several aspects of IV care simultaneously.

Intervention and clinical practice framework

The intervention was implemented using the Plan–Do–Study–Act (PDSA) approach.

Plan

The planning stage focused on understanding recurrent IV complications and identifying areas where practice could be standardized. The team reviewed equipment and connector practices, flushing and securement practices, barriers associated with difficult cannulation, staff knowledge and recurrent IV complications. The baseline audit also helped identify areas where early recognition of infiltration and extravasation could be strengthened.

Do

A number of changes were introduced during the implementation phase.

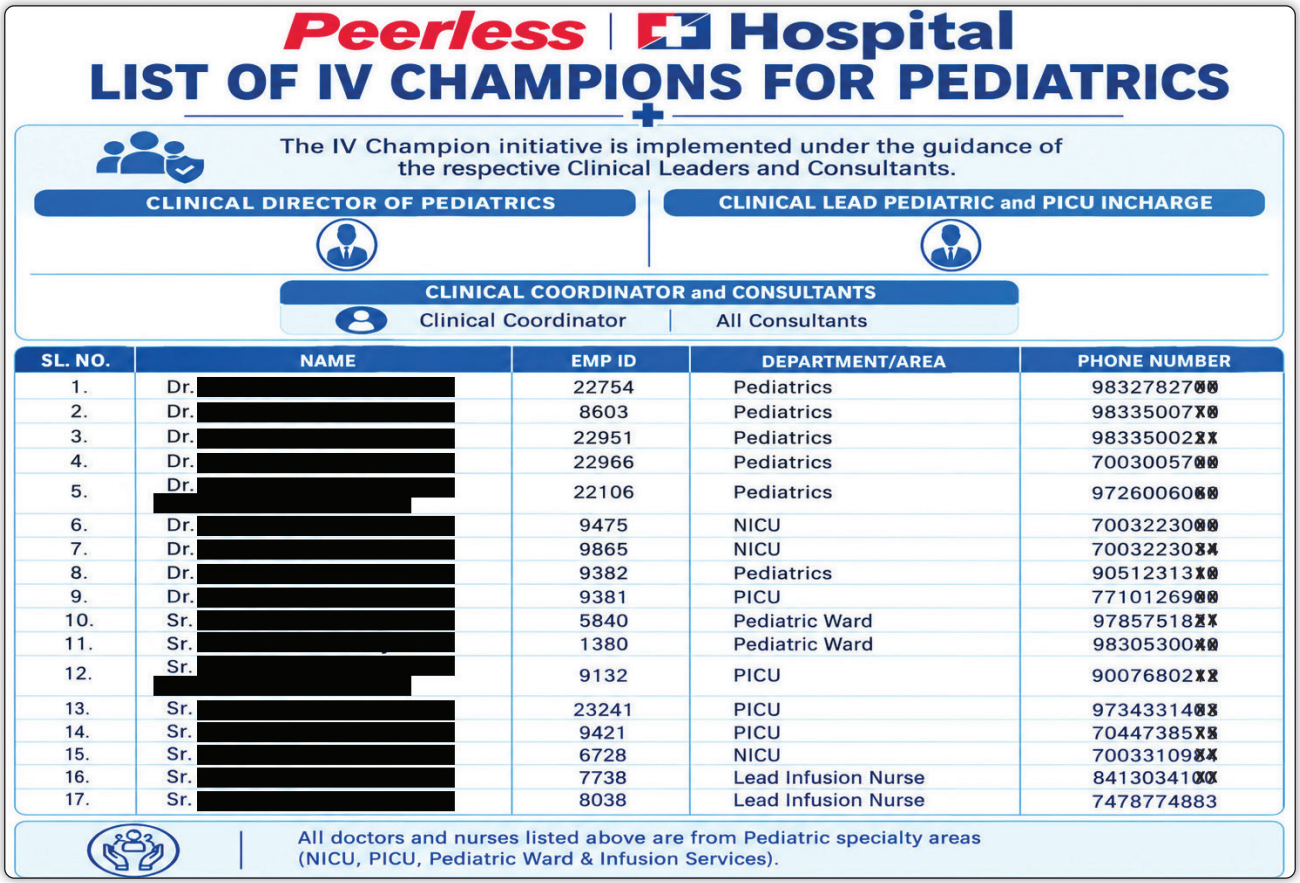
A dedicated pediatric IV team was established with participation from physicians, specialist nurses and clinical leads. The team provided support for difficult cannulation, monitored IV care practices and helped reduce repeated trial-and-error attempts.

The organization also moved from traditional open ports and short connectors to 10-cm closed-port long connectors, including single- and double-lumen options. The purpose was to reduce unnecessary manipulation and provide greater stability of the IV system during patient movement.

Smart infusion pumps with dose error reduction systems (DERS) were introduced to support more accurate fluid and medication administration. This was particularly relevant for neonates and small children, where relatively small differences in infusion volume or rate may have greater clinical significance.

A standardized peripheral IV care bundle was introduced. It included aseptic insertion practices, transparent semipermeable membrane dressings, standardized securement, splinting where appropriate and regular assessment of the IV site. Flushing practices were standardized, and prefilled flushes were implemented.

A pediatric drug incompatibility list was developed with guidance from pediatric heads of department. A bedside infiltration and extravasation reference chart, guided by Infusion Nurses Society principles, was also made available to support early recognition and management.



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LIST OF IV CHAMPIONS FOR PEDIATRICS

The IV Champion initiative is implemented under the guidance of the respective Clinical Leaders and Consultants.

CLINICAL DIRECTOR OF PEDIATRICS

CLINICAL LEAD PEDIATRIC and PICU INCHARGE

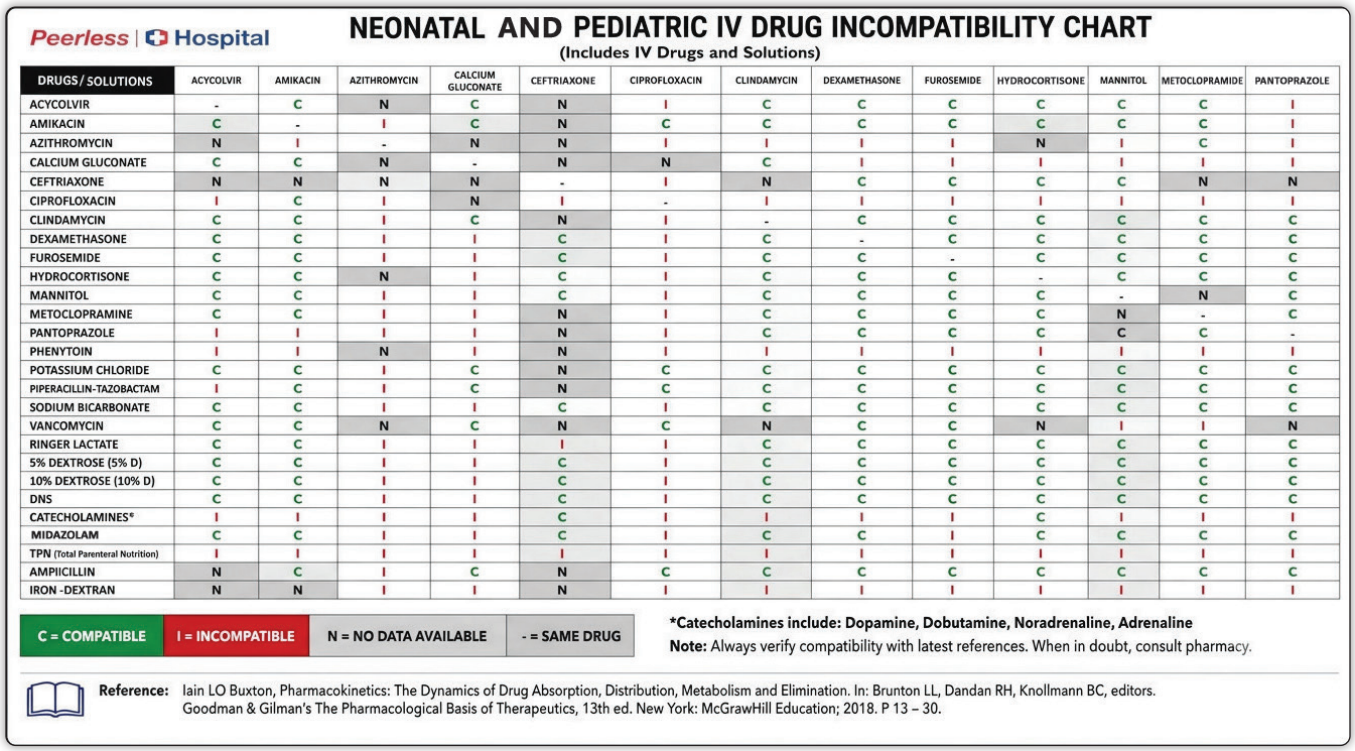
CLINICAL COORDINATOR and CONSULTANTS

Clinical Coordinator | All Consultants

SL. NO.	NAME	EMP ID	DEPARTMENT/AREA	PHONE NUMBER
1.	Dr. [redacted]	22754	Pediatrics	983278270[redacted]
2.	Dr. [redacted]	8603	Pediatrics	98335007[redacted]
3.	Dr. [redacted]	22951	Pediatrics	98335002[redacted]
4.	Dr. [redacted]	22966	Pediatrics	700300570[redacted]
5.	Dr. [redacted]	22106	Pediatrics	972600606[redacted]
6.	Dr. [redacted]	9475	NICU	700322300[redacted]
7.	Dr. [redacted]	9865	NICU	700322303[redacted]
8.	Dr. [redacted]	9382	Pediatrics	905123131[redacted]
9.	Dr. [redacted]	9381	PICU	771012690[redacted]
10.	Sr. [redacted]	5840	Pediatric Ward	978575182[redacted]
11.	Sr. [redacted]	1380	Pediatric Ward	983053004[redacted]
12.	Sr. [redacted]	9132	PICU	900768021[redacted]
13.	Sr. [redacted]	23241	PICU	973433140[redacted]
14.	Sr. [redacted]	9421	PICU	704473857[redacted]
15.	Sr. [redacted]	6728	NICU	700331098[redacted]
16.	Sr. [redacted]	7738	Lead Infusion Nurse	841303410[redacted]
17.	Sr. [redacted]	8038	Lead Infusion Nurse	7478774883

All doctors and nurses listed above are from Pediatric specialty areas (NICU, PICU, Pediatric Ward & Infusion Services).

Fig. 1: IV champion list for pediatrics



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NEONATAL AND PEDIATRIC IV DRUG INCOMPATIBILITY CHART

(Includes IV Drugs and Solutions)

DRUGS / SOLUTIONS	ACYCOLVIR	AMIKACIN	AZITHROMYCIN	CALCIUM GLUCONATE	CEFTRIAXONE	CIPROFLOXACIN	CLINDAMYCIN	DEXAMETHASONE	FUROSEMIDE	HYDROCORTISONE	MANNITOL	METOCLOPRAMIDE	PANTOPRAZOLE
ACYCOLVIR	-	C	N	C	N	I	C	C	C	C	C	C	I
AMIKACIN	C	-	I	C	N	C	C	C	C	C	C	C	I
AZITHROMYCIN	N	I	-	N	N	I	I	I	I	N	I	C	I
CALCIUM GLUCONATE	C	C	N	-	N	N	C	I	I	I	I	I	I
CEFTRIAXONE	N	N	N	N	-	I	N	C	C	C	C	N	N
CIPROFLOXACIN	I	C	I	N	I	-	I	I	I	I	I	I	I
CLINDAMYCIN	C	C	I	C	N	I	-	C	C	C	C	C	C
DEXAMETHASONE	C	C	I	I	C	I	C	-	C	C	C	C	C
FUROSEMIDE	C	C	I	I	C	I	C	C	-	C	C	C	C
HYDROCORTISONE	C	C	N	I	C	I	C	C	C	-	C	C	C
MANNITOL	C	C	I	I	C	I	C	C	C	C	-	N	C
METOCLOPRAMINE	C	C	I	I	N	I	C	C	C	C	N	-	C
PANTOPRAZOLE	I	I	I	I	N	I	C	C	C	C	C	C	-
PHENYTOIN	I	I	N	I	N	I	I	I	I	I	I	I	I
POTASSIUM CHLORIDE	C	C	I	C	N	C	C	C	C	C	C	C	C
PIPERACILLIN-TAZOBACTAM	I	C	I	C	N	C	C	C	C	C	C	C	C
SODIUM BICARBONATE	C	C	I	I	C	I	C	C	C	C	C	C	C
VANCOMYCIN	C	C	N	C	N	C	N	C	C	N	I	I	N
RINGER LACTATE	C	C	I	I	I	I	C	C	C	C	C	C	C
5% DEXTROSE (5% D)	C	C	I	I	C	I	C	C	C	C	C	C	C
10% DEXTROSE (10% D)	C	C	I	I	C	I	C	C	C	C	C	C	C
DNS	C	C	I	I	C	I	C	C	C	C	C	C	C
CATECHOLAMINES*	I	I	I	I	C	I	I	I	I	C	I	I	I
MIDAZOLAM	C	C	I	I	C	I	C	C	I	C	C	C	C
TPN (Total Parenteral Nutrition)	I	I	I	I	I	I	I	I	I	I	I	I	I
AMPIICILLIN	N	C	I	C	N	C	C	C	C	C	C	C	C
IRON -DEXTRAN	N	N	I	I	N	I	I	I	I	I	I	I	I

C = COMPATIBLE | I = INCOMPATIBLE | N = NO DATA AVAILABLE | - = SAME DRUG

***Catecholamines include: Dopamine, Dobutamine, Noradrenaline, Adrenaline**

Note: Always verify compatibility with latest references. When in doubt, consult pharmacy.

Reference: Iain LO Buxton, Pharmacokinetics: The Dynamics of Drug Absorption, Distribution, Metabolism and Elimination. In: Brunton LL, Dandan RH, Knollmann BC, editors. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 13th ed. New York: McGrawHill Education; 2018. P 13 – 30.

Fig. 2: Neonatal and pediatric IV drug incompatibility chart

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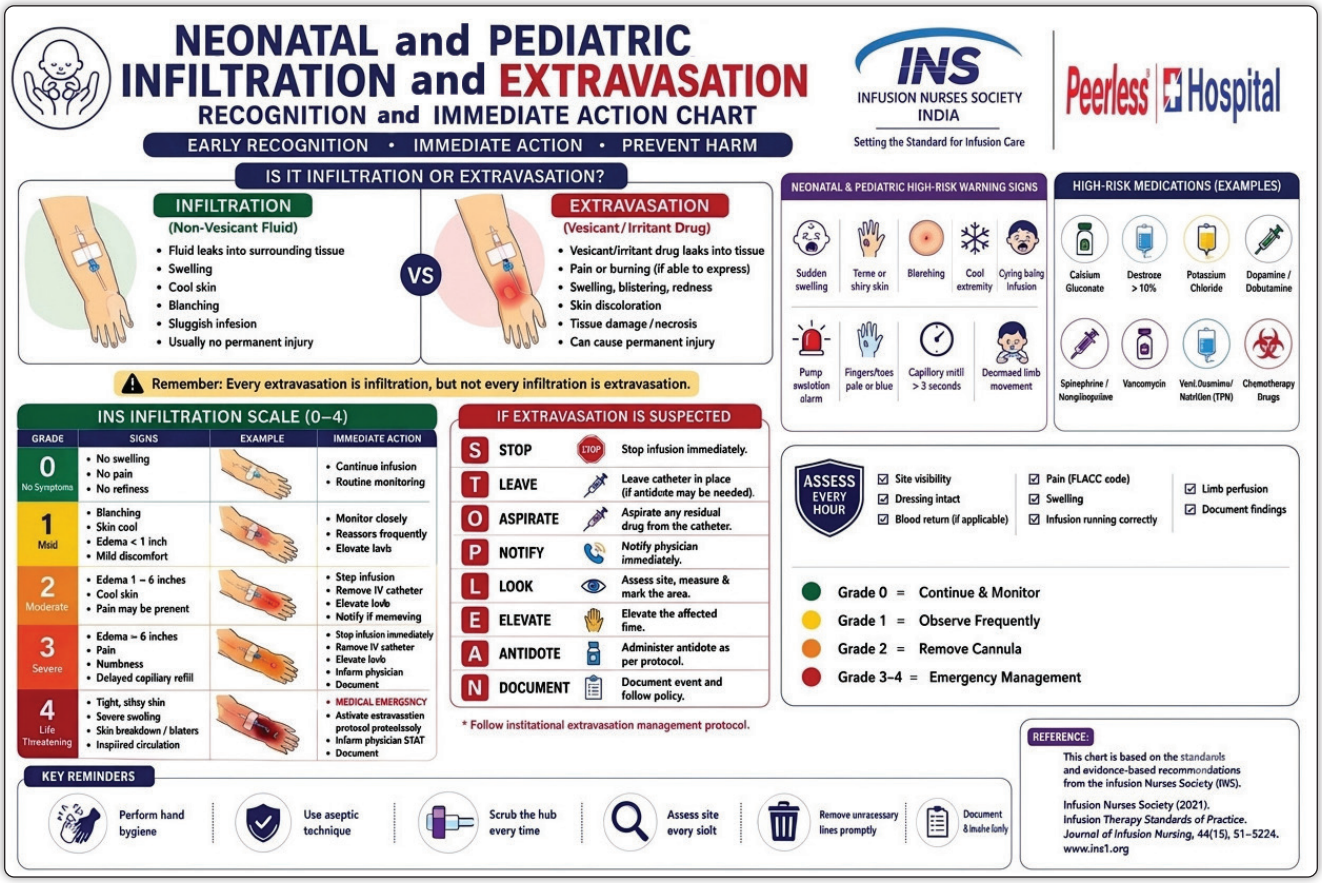


Fig. 3: Infiltration and extravasation: recognition and immediate action chart



Fig. 4: Neonatal and pediatric safe infusion practice bundle

Study

Following implementation, clinical and process outcomes were monitored through regular audits. Clinical outcomes included:

- Multiple cannulation attempts
- Infiltration
- Extravasation
- Phlebitis
- Catheter dislodgement
- Occlusion
- Premature catheter failure
- Functional catheter dwell time

Process outcomes included IV bundle compliance, securement compliance, site-assessment compliance, connector compliance, smart-pump compliance, drug compatibility-check compliance and staff competency.

Act

The final phase focused on maintaining the improvements. Regular audits, feedback to clinical teams, continuing competency assessment and periodic review of protocols were incorporated into the ongoing process.

Continuing Nursing Education (CNE) sessions and hands-on workshops were conducted. Education covered high-risk electrolytes, early recognition of infiltration and extravasation, smart-pump safety, syringe design, and safe flushing techniques.

Family-centered care

Parents and caregivers were included as partners in the IV safety process. They were educated about protecting the IV limb, avoiding unnecessary pulling or movement and informing staff if they noticed swelling, leakage, redness, or discoloration. They were also encouraged to report changes in the child's behavior that might indicate discomfort.

Parents were supported to participate during procedures where appropriate and age-appropriate distraction and comfort measures were used. Rather than viewing parents only as observers, the care team encouraged them to become an additional source of observation and communication regarding the child's IV site and comfort.

Outcome measures and calculations

Percentage reduction was calculated as:

Percentage reduction = [(Pre-intervention value – Post-intervention value) ÷ Pre-intervention value] × 100

The rate of each IV cannulation-related complication (phlebitis, multiple pricks, infiltration, occlusion, and extravasation) was calculated as:

Complication rate (%) = [Number of patients with the specific complication ÷ Total number of patients with IV cannulation] × 100

The numerator corresponds to the specific indicator being measured; for example, for the phlebitis rate, the number of patients with phlebitis is used.

Data analysis

Aggregated clinical audit data were summarized as percentages for each phase and month, and percentage reductions were calculated using the formula above. No inferential statistical testing was reported.

Ethical considerations

This article describes an institutional clinical practice and quality-improvement initiative using aggregated clinical audit data.

Results

A total of 3,166 patient/IV therapy observations were reported: 1,510 in the pre-intervention period, 211 in the implementation month and 1,445 in the post-intervention period.

Pre- and post-intervention clinical outcomes

The intervention was followed by improvement in the measured peripheral IV outcomes. The average multiple-puncture rate decreased from 3.96% during the pre-intervention period to 1.73% during the post-intervention period. Phlebitis decreased from 7.53% to 3.11%, while infiltration decreased from 4.76% to 1.03%. Occlusion also decreased, from 3.17% to 0.69%. The reported dwell-time measure increased from 30.95% before implementation to 48.44% after implementation (Table 3).

Table 3: Pre- and post-intervention clinical outcomes

Outcome	Pre-intervention average (June– November 2025)	Implementation month (December 2025)	Post-intervention average (January–May 2026)
Multiple punctures	3.96%	5.21%	1.73%
Phlebitis	7.53%	8.05%	3.11%
Infiltration	4.76%	6.16%	1.03%
Occlusion	3.17%	2.84%	0.69%
Dwell-time measure	30.95%	39.81%	48.44%

Month-wise trend

The month-wise data showed an overall downward trend in multiple punctures, phlebitis, infiltration and occlusion during the later months, while the reported dwell-time increased (Figure 5).

The implementation month of December 2025 showed higher values for multiple punctures, phlebitis and infiltration, compared with the pre-intervention average. This period represented the transition to the new system, during which staff were adapting to new equipment, processes, and responsibilities. The subsequent post-intervention period showed lower average complication rates.

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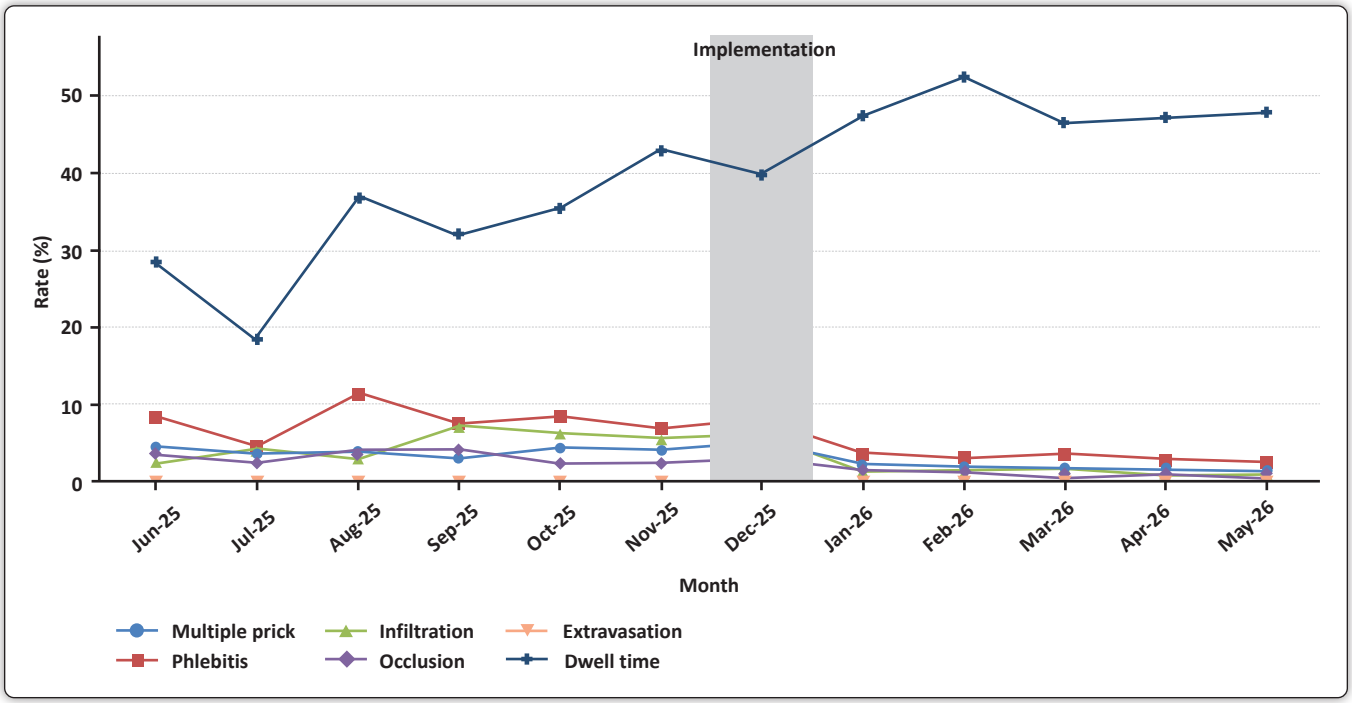


Fig. 5: Month-wise trend of IV complications (%) across the baseline, implementation and post-intervention periods

Before and after transformation

Table 4: Care processes before and after transformation (June 2025 – May 2026)

Before	After
Open/short connectors	Pediatric IV team
Variable practices	Standardized IV bundle
Repeated manipulation	Closed-port long connectors
Multiple cannulation attempts	Smart infusion technology
Infiltration/extravasation/phlebitis	Standardized securement/flushing
Premature catheter failure	Early complication recognition
Loss of vascular access sites	Family participation
	Vascular preservation and safer infusion therapy

Discussion

The experience described in this clinical practice initiative highlights the importance of taking a comprehensive approach to neonatal and pediatric vascular access.

In this population, preserving the vein is as important as successfully inserting the catheter. A catheter that remains technically patent but causes repeated trauma, infiltration, or phlebitis may still result in an undesirable clinical experience for the child.

The reduction in multiple punctures after implementation is particularly relevant. Repeated cannulation can cause distress and may reduce the number of available vascular sites. The dedicated pediatric IV team provided specialist support for difficult access and helped reduce repeated attempts.

The intervention also focused on the mechanical stability of the IV system. Longer closed-port connectors, standardized securement and splinting were introduced to reduce unnecessary movement and manipulation around the catheter. This was especially relevant for infants and young children, who may move frequently or unintentionally disturb the IV line.

The reduction in infiltration, phlebitis and occlusion during the post-intervention period suggests that the standardized approach was associated with better peripheral IV outcomes in the participating units. However, because this was a clinical practice initiative without a separate control group, the findings should be interpreted as an institutional quality-improvement experience rather than proof that the intervention alone caused the observed changes.

Smart infusion pumps were another important part of the intervention. In neonatal and pediatric patients, accurate control of infusion rates and volumes is particularly important. DERS technology provided an additional safety layer for infusion administration.

Technology, however, was only one part of the change. Staff education and competency development were equally important. CNE sessions, bedside teaching, demonstrations, return demonstrations, competency checklists and visual reference tools were used to reinforce the new practices.

The initiative also recognized the importance of early identification of complications. Because infants and young children may not be able to describe pain or discomfort, nurses need to identify subtle changes in the IV site and the child's behavior.

Family involvement added another layer of observation. Parents are often continuously present with their children and may notice changes between routine nursing assessments. Educating them to report swelling, leakage, discoloration, or behavioral changes may support earlier recognition of problems.

The multidisciplinary nature of the initiative was another important component. Pediatric clinicians, nursing leaders, specialist nurses, and clinical leads contributed to the implementation process. Compliance with the new practices was reported to improve to above 92% following education, leadership support and continued feedback. As the audit denominator and detailed calculation method are not provided, this figure should be interpreted as an institutional audit finding.

The implementation experience also showed that introducing a new clinical process requires time and reinforcement. Staff hesitation was addressed through peer-led CNE sessions, practical workshops, leadership support, and regular feedback. This combination helped embed the new practices into routine care.

Implications for Nursing Practice

- Peripheral IV access should be considered part of vascular preservation rather than simply a route for administering treatment.
- Patients with difficult vascular access may benefit from early involvement of a dedicated pediatric IV or vascular-access team.
- Standardized care bundles can reduce variation in insertion, securement, flushing, and assessment practices.
- Early recognition of infiltration, extravasation, phlebitis, and occlusion is particularly important in infants and young children who may not be able to communicate symptoms clearly.
- Drug compatibility information and guidance regarding high-risk electrolytes should be readily available to clinical staff.
- Smart infusion technology may provide an additional safety measure when appropriately implemented and supported by staff competency training.
- Parents and caregivers can also contribute to IV safety when they are given clear information about what to observe and when to alert the healthcare team.
- Regular monitoring and feedback are necessary to determine whether improvements are maintained over time.

Limitations

- The initiative was conducted in a single institutional setting.
- No separate control group was included; therefore, the observed improvement cannot be attributed solely to the intervention.
- This article also describes an approximately 69% reduction in complications and an approximately 57% improvement in dwell time.
- Outcomes are based on aggregated audit data rather than patient-level data.

Recommendations

Based on the experience of this initiative, neonatal and pediatric infusion services may consider:

1. Developing and maintaining standardized pediatric peripheral IV insertion and maintenance protocols.
2. Establishing a dedicated pediatric IV or vascular-access team where resources permit.
3. Standardizing catheter securement, flushing and site-assessment practices.
4. Strengthening early recognition and management of infiltration, extravasation, phlebitis, and occlusion.
5. Maintaining accessible pediatric drug compatibility guidance.
6. Providing regular CNE and hands-on competency assessment.
7. Using smart infusion pumps and DERS where appropriate.
8. Conducting regular audits of IV complications and catheter dwell outcomes.
9. Providing structured education to parents and caregivers.
10. Reviewing and updating pediatric infusion policies periodically based on audit findings and current evidence.

Future Research

- Evaluate outcomes using patient-level data.
- Use standardized denominators for complication and dwell-time indicators.
- Report the mean/median dwell time in hours or the percentage of catheters meeting a defined dwell-time target.
- Undertake longer follow-up to assess the sustainability of the observed improvements.

Conclusion

Safe IV therapy in neonates and children requires more than successful catheter insertion. Because vascular access is limited and veins are fragile, each IV catheter should be managed with the aim of providing effective treatment while preserving the child's vascular health.

In this clinical practice initiative, a combination of a dedicated pediatric IV team, standardized peripheral IV care, closed-port long connectors, smart infusion technology, staff competency development, drug compatibility guidance and family involvement was introduced across neonatal and pediatric units.

Across 3,166 reported patient/IV therapy observations, the post-intervention period showed lower average rates of multiple punctures, phlebitis, infiltration and occlusion compared with the pre-intervention period. The reported dwell-time measure also increased.

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The experience suggests that pediatric infusion safety is best approached as a multidisciplinary process involving people, equipment, standardized practices, education and continuous monitoring. A structured vascular-preservation approach may help reduce avoidable IV complications and support safer, more reliable infusion therapy for neonates and children.

Declarations

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- **Conflict of interest:** The authors declare no conflict of interest.
- **Acknowledgements:** The authors acknowledge the pediatric medical team, nursing leadership, pediatric IV team, nursing staff, and parents/caregivers who contributed to the implementation and monitoring of the neonatal and pediatric infusion safety initiative.
- **AI-assisted writing disclosure:** AI-based tools were used during the preparation of this manuscript to support language editing and improve wording. The AI tool was not used to create or alter the clinical data, results, references, or scientific findings. The authors carefully reviewed and verified the manuscript and take full responsibility for its accuracy, originality, interpretation, and final content.

Abbreviations

CNE–Continuing Nursing Education; CUES–Color (redness, pallor), Unusual sensation (burning, discomfort), Edema, and Skin changes; DERS–Dose Error Reduction System; IV–Intravenous; NGT–Nominal Group Technique; NICU–Neonatal Intensive Care Unit; PDSA– Plan–Do–Study–Act; PICU–Pediatric Intensive Care Unit; PIV–Peripheral Intravenous; VHP–Vessel Health and Preservation

Guided By:

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