Sláinte Leanaí Éireann

Children's Health Ireland

ABSTRACT NO.64

PERIPHERAL VENOUS CANNULATION IN THE NEONATAL UNIT: CAN WE DO BETTER?

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KEY MESSAGE:

When used by trained personnel, ultrasound (US) is a promising technology for decreasing the number of needle pricks needed to secure a peripheral IV cannula (PIVC) in neonatology patients.

BACKGROUND

- PIVC insertion in neonates has a 1st prick success rate of ~45%.[1]
- Multiple needle pricks are associated are associated with:
  - An increased risk of sepsis[2]
  - Altered pain sensation in later life[3]

AIMS

- To determine whether there is a need to improve the provision of peripheral vascular access to neonatology patients within CHI.
- To determine if assistive technologies can play a role in that project.

METHODS

- **Type:** prospective observational study
- **Period:** 1st March — 30th April 2023
- **Data collection:** form filled for any PIVC insertion attempt[4]
- **Setting:** neonatal HDU and neonatal ward, Temple Street hospital
- **Pop.**: mainly babies with surgical or complex medical conditions.
- **CHI policy:** if available, the IV team is the 1st line for anticipated difficult access, i.e., all neonatology patients.
- **Transilluminator:** available for use based on operator preference.
- **Ultrasound:** If the 1st operator failed, US was used depending on the availability of trained neonatology team members.[5] (Figure 1)

Figure 1. Vascular imaging was performed using a high frequency (10-22MHz) linear array probe. The most common insertion technique was the short-axis out-of-plane method.

RESULTS

- 57 PIVC insertion attempts on 15 patients were recorded.
- 44 (77%) attempts ended with a PIVC in place.
- The median number of PIVC-associated needle pricks per infant over the 2-month period was 4 (IQR: 2-12, max: 22).
- The median number of pricks per attempt was 2 (IQR: 1-3, max: 5). (Table 1)

Table 1. Success and abandonment rates divided according to needle prick number.[6]

Needle Prick	Success Rate	If failed, was attempt abandoned?
1st	19/55 (35%)	1/36 (3%)
2nd	19/34 (56%)	1/15 (7%)
≥3rd	4/18 (22%)	10/ 14 (71%)

- Without assistive technology, the 1st needle prick success rate was 26% (10/39). (Table 2)

Table 2. PIVC insertion success rates by technology used.[7]

Technology	Success per attempt	Success per needle prick
None	28/41 (68%)	26/81 (32%)
Transilluminator	8/8 (100%)	8/16 (50%)
Ultrasound	8/8 (100%)	8/10 (80%)

CONCLUSIONS AND FUTURE DIRECTION

- The 1st needle prick success rate was low. This population, i.e., babies with prolonged admissions for complex congenital/surgical conditions may have especially difficult IV access.
- After 2 unsuccessful needle pricks, further pricks by the same operator are usually not successful. Operators mostly proceeded to a 3rd try. A clear and accessible escalation pathway may empower operators to seek help after 2 unsuccessful pricks.
- When used by experienced personnel, US may be associated with fewer needle pricks being needed to secure a PIVC.
- Data from this study can be used to support and monitor a project to expand the use of ultrasound for vascular access within CHI.

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[1] Legemaat M, Carr PJ, van Rens RM, van Dijk M, Poslawsky IE, van den Hoogen A. Peripheral Intravenous Cannulation: Complication Rates in the Neonatal Population: A Multicenter Observational Study. The Journal of Vascular Access. 2016;17(4):360-5.

[2] Perlman SE, Saiman L, Larson EL. Risk factors for late-onset health care-associated bloodstream infections in patients in neonatal intensive care units. Am J Infect Control. 2007;35(3):177-82.

[3] Van Den Hoogen NJ, Patijn J, Tibboel D, Joosten BA, Fitzgerald M, Kwok CHT. Repeated touch and needle-prick stimulation in the neonatal period increases the baseline mechanical sensitivity and postinjury hypersensitivity of adult spinal sensory neurons. Pain. 2018;159(6):1166-75.

[4] An "attempt" was when an individual operator tried to insert a PIVC. Multiple pricks may have occurred in one "attempt".

[5] N = 2, both with over 20 successful prior insertions each.

[6] Data on number of needle pricks missing for 2 attempts.

[7] Fisher's exact test p-values for success per needle prick: No technology v. transilluminator: 0.25, no technology v. ultrasound: 0.005, transilluminator v. ultrasound: 0.22.