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Difficult Peripheral Venous Access in Children: An International Survey and Critical Appraisal of Assessment Tools and Escalation Pathways

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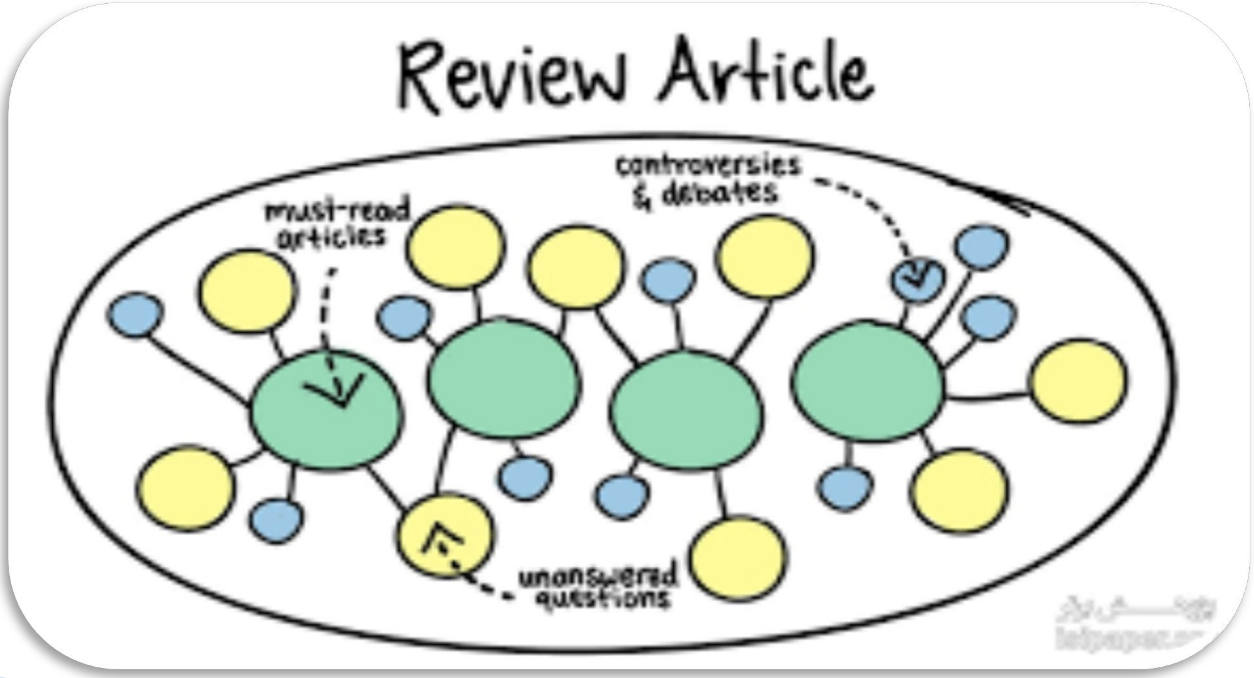
The objectives of the study :

- Describe current, international practice regarding the identification and management of children with DIVA
- Identify additional DIVA tools and systematically review clinical practice guidelines or clinical pathways for children with DIVA

Methods

- This was a two-phase study, involving an international, cross-sectional survey, followed by a systematic review and critical appraisal.



Phase 1: International Survey

- A purposive sample of multidisciplinary clinicians who currently insert PIVCs in children under 18 years of age were invited to participate in an online survey.

country	N = 148 (%)
- United States of America	69 (47)
- Australia	54 (37)
- United Kingdom	8 (5)
- Mexico	8 (5)
- Italy	4 (3)
- Brazil	2 (1)
- New Zealand	2 (1)
- Canada	1 (1)

- 20 survey items were generated and formatted as multiple-choice or 5-point Likert scale questions.
- Two open-ended response questions were included to capture clinicians' experiences with pediatric DIVA.
- Demographic questions were included to describe respondent characteristics.

Phase 2: Systematic Review and Critical Appraisal

- A systematic search was undertaken in the following electronic databases: Cochrane Library, U.S. National Library of Medicine, National Institutes of Health (PubMed), (CINAHL) and Embase.
- key words: peripheral intravenous catheters, peripheral vein assessment, difficult venous access, DVA, difficult intravenous access, DIVA, escalation pathways, clinical practice guidelines, clinical decision-making and pediatrics.

- A total of eight studies met the inclusion criteria and were included in the review.

Age[a] (years)	- 30–39 years	43 (29)
	- 40–49 years	37 (25)
	- 50–59 years	38 (26)
	- ≥ 60 years	14 (10)
Identifying gender	- Female	110 (74)
	- Male	36 (24)
	- Prefer not to say	2 (2)
Role		**Nursing (n=92 (62%))**
	- Registered Nurse	52 (35)
	- Clinical Nurse	8 (5)
	- CNC / Nurse Manager / Nurse Educator / Nurse Researcher	25 (17)
	- Nurse Practitioner	7 (5)
	Medical (n=52 (35%))	
	- Junior doctor / Resident	5 (3)
	- Senior doctor / Registrar	24 (16)
	- Staff specialist / Consultant	23 (16)
	Other (n= 4 (3%))	
	- Paramedic	2 (1)
	- Other	2 (1)

Experience inserting	- 0–10	31 (21)
PIVCs[c] (years)	- 11–20	48 (32)
	- >21	49 (33)
Practice area	- Vascular access service	27 (18)
	- Medical	26 (18)
	- Emergency	24 (16)
	- Intensive Care	20 (14)
	- General pediatrics	16 (11)
	- Anaesthesia	13 (9)
	- Oncology and haematology	8 (5)
	- Other	5 (4)
	- Surgical	4 (3)
	- Radiology	4 (3)
Time spent in direct	- 25–50	12 (8)
patient care[d, e]	- 50 – 75	25 (17)
	- 75–100	58 (39)
	- 100	50 (34)
Number of PIVCs	- <10	67 (45)
inserted per week[f]	- 20	45 (30)
	- 30	12 (8)
	- >40	22 (15)

Factors[a]	Score (range 1–10)[b] Median (IQR)
PIVC indication	2 (1–5)
Severity of illness	4 (2–7)
Vein grade/assessment	4 (2–7)
Vein visibility	5 (3–8)
Vein palpability	6 (3–8)
Inserter experience	6 (4–8)
Age/prematurity	6 (4–8)
Child's compliance	7 (5–9)
Parent/child preferences	7 (5–9)
Skin colour	8 (6–10)

Five clinical pathways were identified from the survey and review:

1. Difficult intravenous guideline, Australia:

Unpublished 3-page , hospital procedure.

Purpose: to provide guidance on the escalation procedure for a child with DIVA. Includes flow chart. Process includes consideration of PIVC indication, expectation of DIVA (no tool), medical escalation and VAS referral including PICC if clinically indicated.

- Summary of recommendations: Yes, with modifications

2. Intravenous access escalation policy, United Kingdom

Unpublished 10-page hospital policy.

Purpose: To outline the process for assessment and escalation of children with DIVA. Comprehensive document including definitions, responsible clinicians, implementation process, monitoring arrangements and more. Focuses on the right person, right preparation and right procedure combined with pediatric venepuncture competency and training.

- Summary of recommendations: Yes, with modifications

3. Pathway for inpatient vascular access, United Sates of America

Clinical pathway from hospital, available online with associated resources including DIVA score. Delineates stable versus unstable pathway and the pathway for obtaining access including team huddle for IV escalation and considerations such as alternate to IV or consideration of central venous access.

- Summary of recommendations: Yes, with modifications

4. DiVA pathway and IV cannulation device selection (*Published pathways)*

A flow diagram which summarizes the process of contacting trained personnel during business hours and after hours for treating teams and includes a synopsis of vascular devices available. Includes removing redundant devices and placing the smallest cannula in the biggest vein.

Summary of recommendations: Yes, with modifications

5. Vessel health preservation framework

Comprehensive development convened by a working group from the IPS. The group sought to establish a standardized approach to vascular access to support practitioners undertaking vessel assessment and decision- making regarding suitable devices for vascular access and administration of medication and/or fluids. Includes a peripheral vein assessment tool, suitability of drugs guide, right line decision tool, secondary questions, re-evaluation of vascular access device and vessel health and preservation poster.

Summary of recommendations: Yes

IPS: Infection prevention society

Peripheral venous assessment tools

- Four tools were identified by the review

Variables assessed in the tool							
Vein grade	Vein palpability	Vein visibility	Skin colour	Age	Prematurity	Severity of illness	Inserter experience

- Twenty-three respondents (16%) reported using a DIVA tool, of which the DIVA Score was most common (n = 5;22%).

Peripheral venous assessment tools

- Of the four tools identified, there were published data on the psychometric properties only for one tool, the DIVA Score, which is a four-variable proportionally weighted score, ranging from 0 to 10

- The four items are vein palpability, vein visibility, age, and history of prematurity. A score of 4 or more indicates a 50% increase in the likelihood of first attempt failure.

- Respondents also listed technology aids such as ultrasound guidance (USG) as vessel assessment tools.

Vein Viewer	Australia	Emergency, General Hospital, Medical
Infrared vein finder	USA	Emergency, Oncology and Haematology, Hospital Wide
Transilluminator	Australia	Intensive Care, Medical
Ultrasound	Australia	Intensive and Critical Care

Results:

- A total of 82 qualitative comments were collected in response to two open-ended questions. Responses were categorized into two themes:

Results:

1. Recognition and support of a formal escalation pathway;

The importance of implementing a formalized escalation process was consistently identified by participants.

With participants describing the need for a “step-by-step or pathway” to avoid “multiple attempts at access.”

Results:

2. Competency, training, and resources

For many respondents, having the right person insert the right device using the appropriate technology and achieving first attempt success was the main aim of escalation pathways. The “goal is first attempt success on all children.”

The importance of having the right resources was also raised by participants .

Access to ultrasound technology was repeatedly discussed.

Results:

- Further, participants discussed the need for resources to help “encourage parental involvement,” and to reduce parent and child anxiety “we need education for family members” and techniques to minimize “parent and child emotional stress and nerves.” Solutions such as “play therapy” were proposed.

Conclusions:

- Resources for the identification and escalation of children with DIVA are not standardized or consistently used. Further work is needed to streamline processes for DIVA identification and escalation to the appropriate clinician, with technology-assisted insertion capability.
- This will enhance patient experiences and reduce harm from multiple insertion attempts.


THANKS