Why are peripheral intravenous catheters removed in practice? A secondary analysis of a multi-site cluster randomised controlled trial

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HERSTON INFECTIOUS DISEASES INSTITUTE

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Wiser Wound Care

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AVATAR Alliance for Vascular Access Teaching and Research

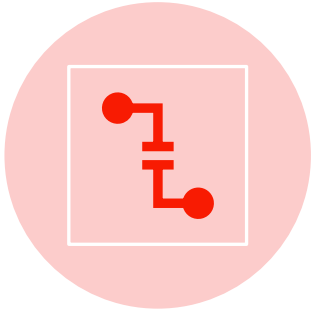
Background: Peripheral intravenous catheters (PIVCs)

Widely used in hospital practice but prone to complications[1-3]

Maintain patient safety = optimal PIVC care[4]

From PIVC insertion and maintenance to removal

Background: PIVC removal and replacement



All PIVCs: Remove as soon as no longer needed or when complication/malfunction develops

Removal/replacement 1: Routine, 72-hourly

Removal/replacement 2: Clinical indication > requires appropriate clinical assessment & decision making

What actually happens in practice??

A secondary analysis

To describe and explore reasons for PIVC removal in clinical practice for adults and paediatrics

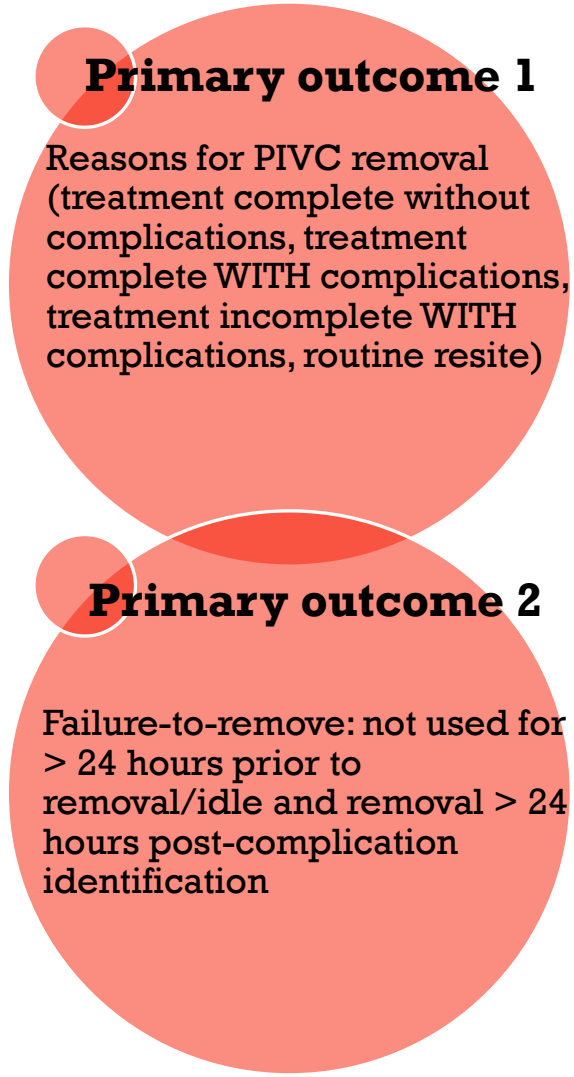
Identify reasons for PIVC removal in clinical practice
Identify proportions of PIVCs either idle or where left *in situ* with a complication (failure-to-remove)
Identify factors associated with reasons for PIVC removal or failure-to-remove PIVCs

Methods: Primary trial

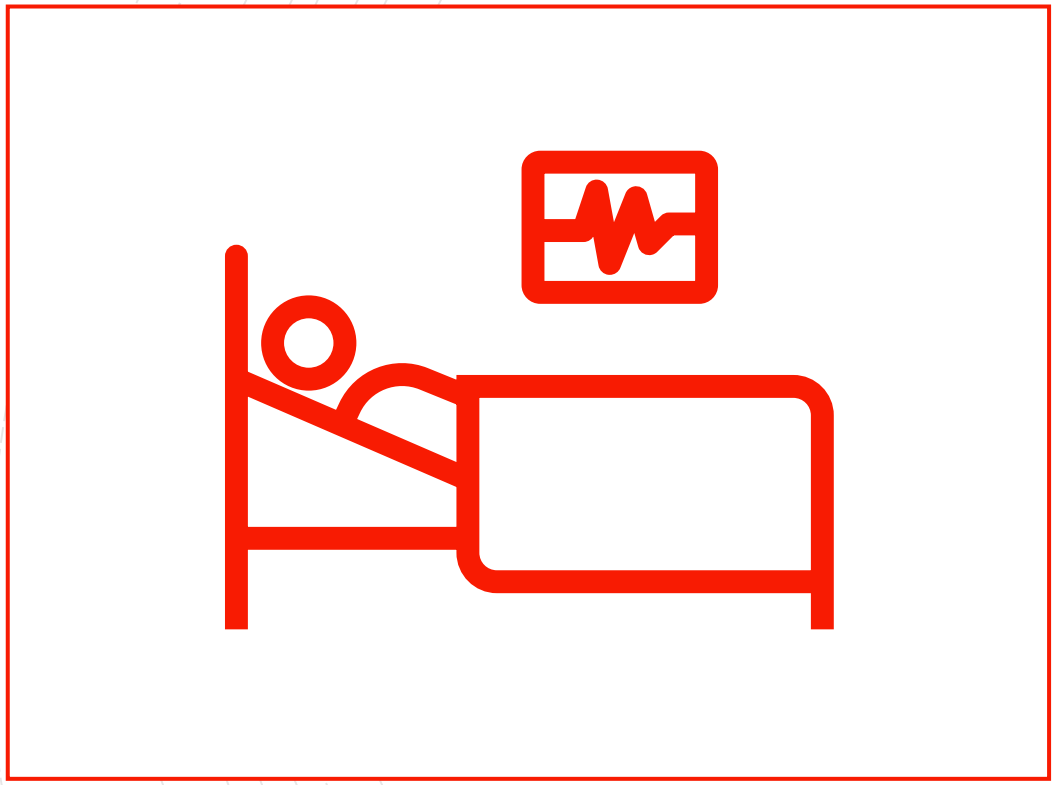
- Multi-site cluster RCT (3 hospitals, 4 ward clusters each), 3 phases
- Hospital policies: all removal when no longer needed, replacement largely routinely for adults, clinically indicated for paediatrics
- Any patients requiring a PIVC, except those needing emergent access (1 PIVC per patient/admission)
- Total sample = 1933
- February 2022 - July 2023
- Trained research nurses: screened, collected data (baseline, daily, to 48-horus post removal)

Methods: Secondary analysis

- Primary RCT dataset, de-identified, Microsoft Excel
- Excluded 95 (missing age, without PIVC removal); total included 1838
- Retained data related to secondary analysis outcomes
- Analysis: Descriptives, frequencies. Univariable binary and multinomial logistic regression. Adults/paediatrics separate.



Results: Patient characteristics



- **ADULTS n = 1137**
  - Median age 65 (18-101), male 55.1%
  - DIVA 45.9%
  - PIVC location: forearm 44.7%, ACF 30.1%, upper arm 10%, hand 8.3%, wrist 6.7%, foot/ankle/leg 0.2%
- **PAEDIATRICS n = 701**
  - Median age 1 (0-17), male 56.3%
  - DIVA 26.7%
  - PIVC location: forearm 30.5%, ACF 18.1%, upper arm 1.4%, hand 31.4%, wrist 3%, foot/ankle/leg 15.5%

Reason for removal	Adults n (%)	Paediatrics n (%)
Treatment complete WITHOUT complications	701 (62.0%)	391 (55.8%)
Treatment complete WITH complications	52 (4.6%)	102 (14.6%)
Treatment incomplete WITH complications	226 (20.0%)	191 (27.2%)
Routine resite	102 (9.0%)	6 (0.9%)
Other	49 (4.3%)	11 (1.6%)
Dwell time in hours		
Median (range)	44 (0-363)	56.50 (1-459)
In-situ ≤ 72 hours	839 (73.8%)	437 (62.3%)
In-situ 73 – 92 hours	96 (8.4%)	88 (12.6%)
In-situ > 92 hours	202 (17.8%)	176 (25.1%)

Results: Reasons for removal & dwell

Results: Key factors associated with reasons for removal - Adults

- DIVA: MORE likely PIVC removed with complications (treatment complete OR **2.18, 95%CI 1.22-3.88; treatment incomplete OR 1.62, 95%CI 1.20-2.20)** versus reference (treatment complete without complications)
- Insertion complications: MORE likely PIVC removed as treatment incomplete with complications versus reference (OR **2.60, 95%CI 1.01-6.68)**
- PIVCs in upper arm: MORE likely PIVC removed without treatment and complications present versus reference (OR **1.75, 95%CI1.08-2.85)**
- PIVCs in wrist: LESS likely to be routinely resited versus reference (OR, 95% CI **0.12, 0.02-.89)**
- PIVCs with no apparent primary use or procedures only: LESS likely to be removed with complications and incomplete treatment (OR **0.48, 95%CI 0.29-.81; OR 0.11, 95%CI 0.03-.44)** or routinely resited (OR **0.18, 95% CI 0.08-.42);OR 0.31 95%CI 0.12-.79)** versus reference

Results: Key factors associated with reasons for removal - Paediatrics

Intensive care: MORE likely PIVC removed with complications versus reference (treatment complete OR **2.04, 95%CI 1.26-3.32; treatment incomplete OR 2.49, 95%CI 1.69-3.67)**

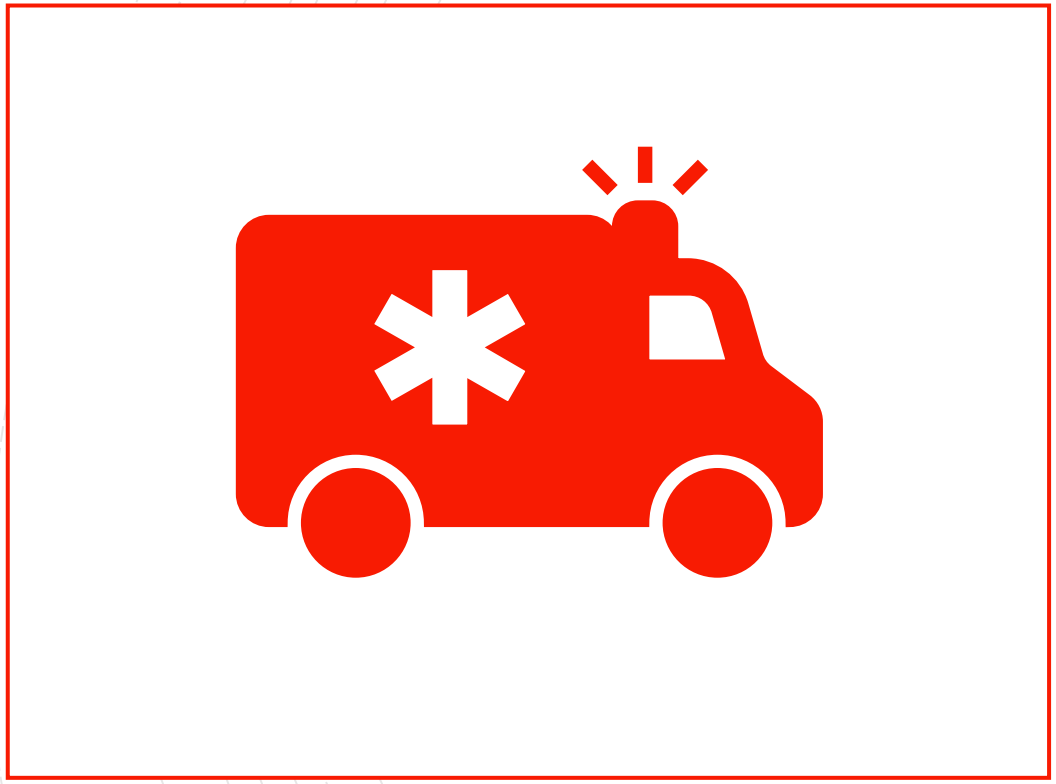
DIVA: MORE likely PIVC removed with treatment complete AND compications (OR **1.62, 95%CI 1.11-2.37)**

PIVCs in ankle/foot/leg: MORE likely PIVC removed with complications versus reference (treatment complete OR **3.45, 95%CI 1.79-6.66; treatment incomplete OR 2.56, 95%CI 1.50-4.37)**

	Adults	Paediatrics
Idle > 24 hours prior to removal	**232 (23.5%)**	**136 (22.0%)**
Significant associations: Emergency/trauma specialty	OR 0.54, 95% CI 0.36-0.82	-
PIVC location: ACF	OR 0.68, 95% CI 0.48-0.98	-
PIVC location: Hand	OR 0.47 95% CI 0.25-0.90	OR 3.99, 95% CI 1.03-15.47
In situ > 24 hours post-complication identification	**116 (53.2%)**	**78 (53.8%)**
Significant associations: None	-	*

Results: Failure-to-remove

Conclusions



- Most PIVCs removed as clinically indicated even under hospital policy for routine removal - although most in situ < 72 hours
- Failure-to-remove results demonstrate clinical assessment and decision making requires improvement to support clinically indicated removal and maintain patient safety
- Strategies for improvement: education focused on appropriate decision making and complications, implementation of decision-making tools, surveillance targeting process of care

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