

Does catheter length matter?

A comparison of short versus long peripheral intravenous catheters for intravenous antimicrobial delivery in hospitalised adults



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Disclosures

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Antimicrobial delivery

One of the most common reasons for hospital admission in Australia
(ACSQHC, 2019)

Accounts for **959 of every 1,000 occupied bed days** (ACSQHC, 2019)

40% of antimicrobial doses are delivered via a short PIVC
(Larsen, 2022, Int J Antimicrob Agents)

Suboptimal drug delivery leads to:

- re-emergence of infectious diseases (Kardas, 2006, Adv Stud Med)
- antimicrobial resistance (Larsen, 2022, Int J Antimicrob Agents)
- patient distress from repeated insertions
- increased length of stay and healthcare costs (Marsh, 2018, J Hosp Med)

Short PIVC failure

=

1-in-4 doses
missed



Short PIVCs versus Long PIVCs

Short PIVCs

Often the default for IV antimicrobials

1 in 3 fail before therapy completion (Marsh, 2021)

Short peripheral intravenous catheter (short PIVC): an over-the-needle catheter with a hollow metal stylet (needle) positioned inside the catheter, **generally inserted in superficial veins.**

Long peripheral intravenous catheter (long PIVC): inserted in **either superficial or deep peripheral veins** and offers an option when a short PIVC is not long enough to adequately cannulate the available vein. A long PIVC can be inserted via traditional over-the-needle technique or with more advanced procedures, such as Seldinger and accelerated Seldinger techniques.

Midline peripheral catheter (midline): inserted into a peripheral vein of the upper arm via the basilic, cephalic, or brachial vein **with the terminal tip located at the level of the axilla** in children and adults; for neonates, in addition

More catheter in vein = ?less failure

(Pandurangadu, 2018, Emerg Med J)



Review

JVA | The Journal of Vascular Access

Long peripheral catheters for intravenous access in adults and children: A systematic review of the literature

American Journal of Emergency Medicine (2012) 30, 712–716



Kirby R Qi
Anna Engli

ELSEVIER

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Original Contribution

IMAGING/ORIGINAL RESEARCH

Standard
ultrasound

Fabrizio El
Giovanna I

Ultralong Versus Standard Long Peripheral Intravenous Catheters: A Randomized Controlled Trial of

Randomized Controlled Trial > Assist Inferm Ric. 2015 Jul-Sep;34(3):116-24.

doi: 10.1702/2038.22136.

[The assessment of the effectiveness of long vs standard-length catheters in reducing complications: a randomized controlled trial]

[Article in Italian]

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Methods

Design: Single-centre, two-arm, parallel group RCT with internal pilot @ n=70

Sample: 194 adult medical/surgical patients requiring a PIVC for ≥ 3 days of antimicrobial therapy

Intervention: Long PIVCs (4.5-6.4cm) were tested against short PIVCs (<4cm) for antimicrobial therapy

Randomisation: central, web-based service, with allocation concealment

Data collection: Daily data collection until 48 hours post-PIVC removal on REDCap



Long PIVC



Short PIVC

Internal pilot phase @ n = 70



Data Safety Monitoring Committee to assess:

1. Feasibility outcomes
2. Protocol safety - 2 unplanned ICU admissions + 2 US-confirmed thrombosis

Feasibility Criteria	Target Threshold	Feasibility Results
Eligibility	70%	57%
Consent rate	≥90%	90%
Withdrawals/ Loss to follow-up	≤5%	0%
Protocol adherence	≥90%	91%
Missing data	≤5%	0%
Patient satisfaction	≥80%	94%
Effect estimates	Within CIs	✓



Clinical outcome measures

Primary outcome

PIVC failure: unplanned PIVC removal during IV antibiotic therapy due to

- infiltration/extravasation
- blockage/occlusion (with/without leakage)
- phlebitis
- thrombosis (suspected or confirmed)
- dislodgement (partial/complete), or
- infection (laboratory confirmed local or bloodstream infection)

Secondary outcomes

- Individual complications
- First insertion success
- PIVC dwell time



Results – cohort characteristics



	Long-PIVCs N=97	Short-PIVCs N=97
Age, median (IQR)	63 (50 to 75)	64 (48 to 73)
Male	63 (65%)	72 (74%)
BMI \geq 25	70 (72%)	67 (69%)
Admission reason - Emergency Surgical	67 (69%)	59 (61%)
Co-morbidities \geq 4	40 (41%)	50 (52%)
Ultrasound guided insertion	92 (95%)	85 (88%)
Vein quality - poor	21 (22%)	11 (11%)

Outcome	Long PIVC n=97	Short PIVC n=97	Long vs Short	P-value
All-cause PIVC failure (n, %)	21 (22.7%)	22 (23.4%)	RR 0.91 (0.54, 1.53)	0.83
Incidence rate/1000 catheter days mean (95% CI)	72.8 (47.5, 111.6)	74.3 (49.4, 111.8)	IRR 0.97 (0.54, 1.76)	0.94
Infiltration , n (%)	8 (8.3%)	12 (12.4%)	RR 0.66 (0.28, 1.56)	0.35
Incidence rate/1000 catheter days mean (95% CI)	27.7 (13.4, 55.5)	38.8 (22, 68.3)	HR 0.69 (0.28, 1.49)	0.42
Thrombosis , n (%)	2 (2%)	0	-	-
Incidence rate/1,000 catheter days mean (95%CI)	6.7 (1.7, 26.8)	-	-	-
Dislodgement , n (%)	3 (3%)	0	-	-
Incidence rate/1,000 catheter days mean (95%CI)	10 (3.2, 31.1)	-	-	-
First insertion success , n (%)	93 (95.9%)	81 (83.5%)	OR 4.59 (1.47, 14.26)	0.009
PIVC dwell time (hrs, mean, SD)	71.4 (4.9)	76.6 (5.3)	MD -5.2 (-19.3, 9.1)	0.30

CI: confidence interval; HR: hazard ratio; IQR: interquartile range; IRR: incidence rate ratio; MD: mean difference; OR: odds ratio; RR: risk ratio; SD: standard deviation

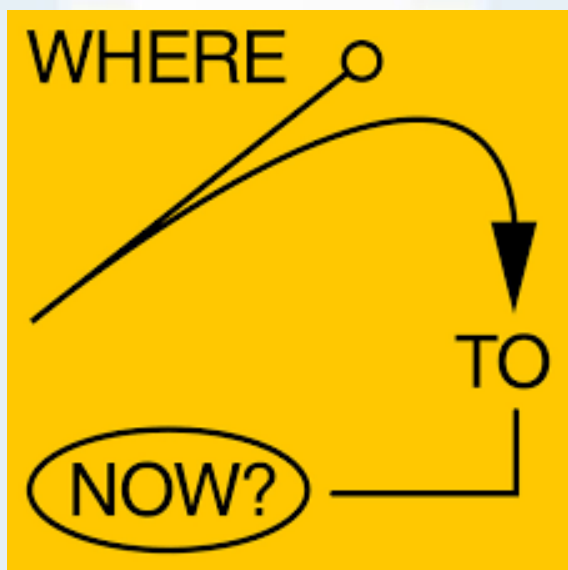


Length of PIVC alone did not reduce PIVC failure and complications

The benefit of ultrasound guided PIVC insertion was confirmed

More research is required, focusing on optimal device selection for antimicrobial delivery





- LOVE-DIVA
- EXTEND
- MIDLINE



Academic Emergency Medicine
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ORIGINAL ARTICLE | [Open Access](#) |

Long guidewire peripheral intravenous catheters in emergency departments for management of difficult intravenous access: A multicenter, pragmatic, randomized



Griffith & Metro North Collaborative Research Grants

NHMRC Investigator Grant scheme



Australian Government
National Health and
Medical Research Council



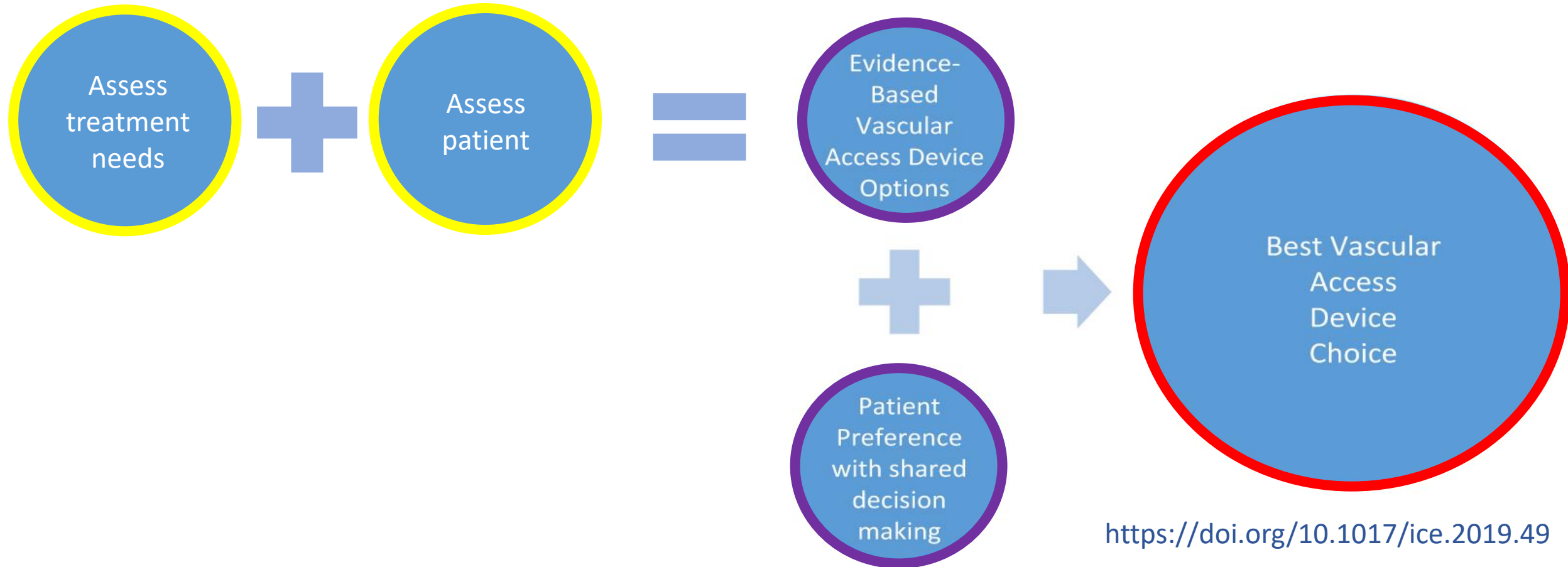
...ng treatment via long ultrasound-guided
...onal cohort study (the EXTEND Study)

...arsh PhD

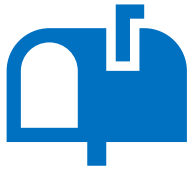


THE TAKE-HOME MESSAGE

A patient-centred approach is essential when choosing the correct device for our patients to optimise outcomes



THANK YOU!



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ANZ Clinical Trials Registry

