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Are Midlines Safe for Outpatient Parenteral Antimicrobial Therapy with Vancomycin?

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Purpose/Background

- Intravenous vancomycin is often necessary beyond hospitalization
- Peripherally inserted central catheters (PICCs) are usually inserted for this indication
- Whether midline catheters are safe for outpatient parenteral antimicrobial therapy (OPAT) with vancomycin is unclear
- We compared outcomes of OPAT with vancomycin via midlines versus PICCs

Methods

- Between 12/2016 and 11/2023, midline & PICC placements at 69 hospitals participating in the Michigan Hospital Medicine Safety Consortium were sampled
- Study population: hospitalized adult medical patients prescribed vancomycin for OPAT
- Primary outcomes:
  - Major complications, i.e., catheter-related bloodstream infection (CRBSI) and catheter-related venous thromboembolism (CR-VTE)
- Secondary outcomes:
  - Minor complications , i.e., tip migration, catheter dislodgement, occlusion, infiltration, superficial thrombosis, exit site problems
  - Device failure – removal due to complications
- Statistical analysis:
  - Cox proportional hazards regression models to assess association between device type and outcomes of interest, adjusting for dwell time, age, sex, Charlson score, history of VTE, history of CLABSI, active cancer, single lumen, catheter thickness, current central venous catheter and receiving anticoagulants

Results

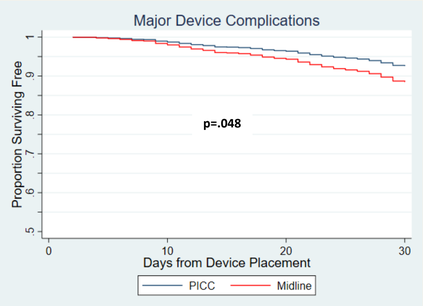
2,387 Devices Used for OPAT with Vancomycin

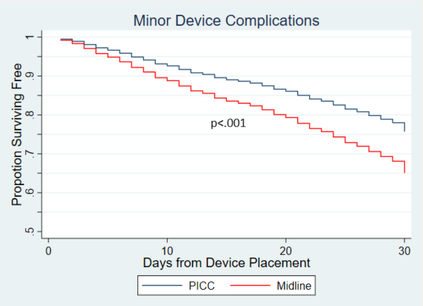
18% were midlines
median dwell, 13 days (IQR, 8 to 9 days)

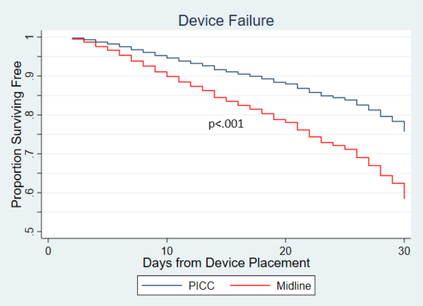
82% were PICCs
median dwell, 21 days (IQR, 13 to 30 days)

Hazards of Device Complications in OPAT with Vancomycin, by Device Type

Outcomes	Total (N=2,387)	Midline (N=429)	PICC (N=1,958)	Adjusted Hazard Ratio	95% Confidence Interval		p-value
	N (per 1,000 catheter-days)				Lower Limit	Upper Limit	
Any Major or Minor Complication	485 (10.76)	87 (15.31)	398 (10.1)	1.62	1.25	2.09	<.001
Any Major Complication	118 (2.62)	21 (3.7)	97 (2.46)	**1.70**	1.004	2.87	.048
Catheter-related BSI	77 (1.71)	12 (2.11)	65 (1.65)	1.54	0.76	3.09	.23
Catheter-related VTE	43 (0.95)	9 (1.58)	34 (0.86)	2.20	0.98	4.93	.06
Upper extremity DVT	35 (0.78)	7 (1.23)	28 (0.71)	1.92	0.82	4.50	.13
Pulmonary embolism	11 (0.24)	2 (0.35)	9 (0.23)	NA	NA	NA	NA
Any Minor Complication	399 (8.85)	75 (13.2)	324 (8.22)	**1.73**	1.31	2.27	<.001
Catheter dislodgement	156 (3.46)	22 (3.87)	134 (3.4)	1.19	0.71	1.99	.52
Catheter occlusion	121 (2.68)	19 (3.34)	102 (2.59)	1.48	0.82	2.66	.19
Catheter tip migration	110 (2.44)	8 (1.41)	102 (2.59)	0.54	0.25	1.18	.12
Infiltration	7 (0.16)	7 (1.23)	NA	NA	NA	NA	NA
Superficial thrombosis	30 (0.67)	5 (0.88)	25 (0.63)	1.49	0.55	4.03	.43
Exit site concerns	52 (1.15)	31 (5.46)	21 (0.53)	**15.85**	8.22	30.55	<.001
Device Failure	384 (8.52)	79 (13.91)	305 (7.74)	**2.17**	1.65	2.86	<.001







Limitations

- Patient-level data was retrospectively collected from medical records
- As an observational study, analysis may be limited by residual confounding

Conclusions

- When used for OPAT with vancomycin, midlines are associated with higher risks of serious device-related adverse events and device failure compared to PICCs
- Future studies should investigate practice variation across hospitals with regards to using midlines for OPAT with vancomycin

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