



ADULT GUIDELINE FOR ADMINISTRATION OF ANTIMICROBIALS VIA MIDLINE CATHETER

Purpose

The purpose of this guideline is to provide recommendations for antibiotics that can be infused via a midline catheter, specifically for those agents commonly started during inpatient admission and intended for outpatient antibiotic therapy (OPAT).

Background

Historically, peripherally inserted central catheters (PICC) have been widely used in patients who require long-term central venous access, particularly for those needing courses of outpatient antibiotics.^{1,4} Recently, there has been increased interest in the use of midline catheters, which present reduced risk of infection and central venous stenosis when compared to PICCs, and may lower overall IV therapy costs.^{2,3,4,25} Typically used for IV medications for up to 14 days, midlines do have some drawbacks, such as increased rates of mechanical complications and mixed rates of associated thrombosis.^{1,4} However, a review of 987 articles showed favorable comparisons of midlines against other types of catheters in terms of failure and infection rates.²⁶

Because midline tips do not reside in central circulation, they cannot be used for continuous vesicant therapy, parenteral nutrition, or infusates with an osmolarity greater than 900 mOsm/L.¹⁵ There is ongoing debate about the appropriate medications for midline use, The Infusion Nurses Society (INS) guidelines suggest facilities develop their own midline use protocols.¹² This guideline provides recommendations for use of specific antimicrobials planned to be administered as outpatient therapy via midline catheter. We primarily use pH 5-9, and secondarily, we use osmolarity of <900. However, there are antibiotics that are known irritants within these ranges. Thus, we evaluate primary literature for known adverse effects. In the absence of primary literature, we defer to known standard practice across the country, and if other hospitals are using these antibiotics via midline, then we assume the incidence of ADEs is low. It should also be noted that the tables listed in Exhibit B are not comprehensive, and the absence of a drug from the list does not imply that it is either safe or unsafe for use.

Considerations

- Duration of therapy:
 - Recommended duration of therapy via midline is 14 days; however, extended duration of therapy up to 28 days may be considered in certain clinical scenarios. Consider ID consult if an extended duration is required.
- Absolute exclusion criteria:
 - Known hypersensitivity/allergy to approved antibiotics
 - Prior phlebitis or vein injury to planned antibiotic via peripheral administration
 - Known contraindication to midline such as recent thrombosis within 30 days in same limb as planned midline placement, no available vein or decreased venous flow per assessment by VAST, or a vein preservation strategy.
 - Antibiotics requiring continuous infusion – contraindicated due to potential complications from traction on midline catheter⁶
- Relative exclusion criteria:
 - Recent infection or occlusion of midline
 - Age <18 years. Clinicians should reference pediatric literature. This guideline did not examine pediatric midline use.
 - History of thrombosis and hypercoagulability
 - Consideration should be made in terms of patient's anticoagulation status, clot history/timeline/location, and if previously provoked by line placement.

****Providers can further reference the Improve PICC Guidelines for vascular access queries; <https://www.improvepicc.com/>**

Exhibit B

Antimicrobials which may be administered via midline ^{17,18,20-22,24,29,33-37,40-41}		
Antimicrobial	pH	Osmolarity
Cefazolin	4.5-7.19	270-351
Cefepime	4-6	307
Ceftaroline	5-7	
Cefiderocol	5.1-5.3	572
Ceftazidime	5-8	---
Ceftazidime/avibactam	5.81	495
Ceftolozane/tazobactam	5.9-6.0	500
Ceftriaxone	6.6-6.7	270-423
Daptomycin	4.7-6.8	~323-364
Ertapenem	7.5	---
Meropenem	7.3-8.3	300
Meropenem/vaborbactam	7.9	429-432
Micafungin	5-7	---
Piperacillin/tazobactam	5.5-6.8	600-700
Tigecycline	4-6	240-320

Antimicrobials NOT recommended to be administered via midline (central line preferred for outpatient use, e.g. PICC) ^{1,5,13,38-41}			
Antimicrobial	pH	Osmolarity	Comments
Acyclovir	10.5-11.6	316	Irritant, vesicant
Amikacin	3.5-5.5	349	Vesicant
Ampicillin	8-10	400	Irritant
Ampicillin/sulbactam	8-10	400	Irritant
Amphotericin B liposomal	5-6	250-270	Irritant
Ganciclovir	11	310	Irritant, vesicant
Gentamicin	3-6	293-320	Irritant, vesicant
Nafcillin	6-9	295-406	Vesicant, case reports of tissue necrosis due to extravasation
Oxacillin	6-7	295-406	Potential vesicant
Sulfamethoxazole/trimethoprim	<5	750-800	Irritant
Tobramycin	3-7	260-320	Vesicant
Vancomycin	2-5	240-290	Irritant, vesicant

It should also be noted that the tables are not comprehensive, and the absence of a drug from the list does not imply that it is either safe or unsafe for use.

Requests to add additional antimicrobials to the included list should be sent to medusepolicy@med.umich.edu for consideration.

Administration & Monitoring

- Per Michigan Medicine [Nursing Assessment and Care of Venous Access Devices](#) policy Venous Access Devices: Assessment and Care (Venous Access Grid). Policy Stat ID: 12108415
- Per **Post-Acute Care Services HomeMed Midline and Peripherally Inserted Central Catheter (PICC) Dressing Change Guideline**. Policy Stat ID: 11934305

Restrictions

VAST approval and placement of midline catheter

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Exhibits:

[Nursing Assessment and Care of Venous Access Devices](#)

[Venous Access Grid](#)

[Infection Prevention for Intravenous Peripheral Short Catheters Policy](#)

[Nursing Midline Catheter Removal](#)

<https://www.improvepicc.com/key-guidelines.html>

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The recommendations in this guide are meant to serve as treatment guidelines for use at Michigan Medicine facilities. If you are an individual experiencing a medical emergency, call 911 immediately. These guidelines should not replace a provider’s professional medical advice based on clinical judgment, or be used in lieu of an Infectious Diseases consultation when necessary. As a result of ongoing research, practice guidelines may from time to time change. The authors of these guidelines have made all attempts to ensure the accuracy based on current information, however, due to ongoing research, users of these guidelines are strongly encouraged to confirm the information contained within them through an independent source.

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