

Antimicrobial Lock Therapy and Prophylaxis Practice Patterns: An Emerging Infections Network Survey



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Abstract

Background: Instillation of an antimicrobial solution into a catheter lumen is used both to prevent and treat catheter-related bloodstream infections (CRBSI). Recent studies have shown that antimicrobial lock prophylaxis (ALP) reduces the risk of bloodstream infections in high-risk patient populations. Also, some evidence suggests that antimicrobial lock therapy (ALT) may be used to help clear CRBSI caused by certain organisms. However, limited clinical data from randomized studies are available, and little is known about how frequently antimicrobial locks are used. The purpose of this study was to gather data on clinical practices involving ALP/ALT use.

Methods: In September 2007, the IDSA EIN surveyed its 1084 members by fax or email to determine whether infectious diseases clinicians (IDCs) are using ALP, and, if so, what agents are used. Members were also asked if they attempted catheter salvage with tunneled or implanted CRBSI, and if so, whether they used ALT. Non responding members were sent two reminders in October.

Results: Six hundred six of the 1094 members (56%) who received this query responded. 81% of respondents have never used ALP. ALP was most commonly used for long-term catheters, e.g., cuffed/tunneled, hemodialysis or ports (10% use ALP routinely and 69% under special circumstances). ALP was infrequently used for short-term central venous and PICC lines (1% use routinely and 22% under special circumstances). Among IDCs who use ALP, the most frequently used agents included vancomycin + heparin (46%), vancomycin alone (22%) and ethanol (9%). 61% routinely used anticoagulant agents along with ALP. A majority of respondents have attempted salvage of catheters infected with coagulase-negative staphylococci (87%), and ALT was used along with systemic therapy by 45% of those members. Vancomycin alone for 10-14 days with a dwell time of 6-12 hours was the most common ALT regimen among the many reported for this setting. Catheter salvage and ALT was less frequently attempted for the following organisms: *S. aureus* (50%, 47%), *Enterococcus* spp. (50%, 39%), *Enterobacteriaceae* (48%, 35%), *Pseudomonas* spp. (32%, 32%) and *Acinetobacter* spp. (28%, 23%). Both catheter salvage and ALT were rarely attempted for *Candida* infections (11%, 36%). Barriers to ALT use mentioned by IDCs included: lack of formal guidance/protocols with specific agents, dosing and duration; concern about compatibility of agents; and conflicts with other uses of catheters.

Conclusions: ALP is practiced by a minority of respondents, who reported use of a wide variety of agents and concentrations. ALT is much more common, particularly for treatment of infections caused by coagulase-negative staphylococci, but little uniformity exists in the mechanics of therapy. Given the wide variation in clinical practice, the dearth of applicable data, and the urgency of the need to prevent and treat CRBSI, data from randomized controlled trials in a variety of patient populations are needed.

Introduction

Antimicrobial lock prophylaxis and treatment involve instillation of an antimicrobial ±anticoagulant solution into a catheter lumen (antimicrobial lock) and leaving the solution to dwell. Guidelines from 2002 do not recommend routinely using antimicrobial lock solutions to prevent catheter-related bloodstream infections (CRBSI). Nonetheless, two recent meta-analyses concluded that use of a vancomycin-heparin lock solution reduces the risk of bloodstream infections in high-risk patient populations.

2001 guidelines for treatment of CRBSI recommend antimicrobial lock therapy for salvage of hemodialysis and tunneled/implanted catheters along with systemic therapy. Antimicrobial lock therapy may be used to treat uncomplicated CRBSI due to coagulase-negative staphylococci, *S. aureus* and Gram-negative bacilli using agents tailored to the pathogen's known susceptibilities. More recent *in vitro* data suggest that vancomycin (and linezolid) lacks activity against biofilm-embedded organisms, and that a variety of other agents including minocycline, daptomycin, tigecycline, ethanol and EDTA may be more efficacious in this setting.

The **primary goals of this survey** are to determine whether infectious diseases clinicians: use antimicrobial lock prophylaxis, and, if so, when and with what agents attempt catheter salvage with tunneled or implanted CRBSI, and, if so, whether antimicrobial lock therapy is used

Methods

EMERGING INFECTIONS NETWORK QUERY Antimicrobial Lock Prophylaxis and Treatment of Catheter-Related Bloodstream Infections

Name: _____

Prophylaxis

1. Do you use antimicrobial lock prophylaxis for prevention of catheter-related BSI?
Regularly Selectively Never [skip to Treatment section, question 5]

2. In which types of intravenous catheters do you use antimicrobial lock prophylaxis?
[Check all that apply] Routinely Under special circumstances
(e.g., hx of multiple bacteremias)

- Cuffed or tunneled catheters (e.g., Groshong)
- Hemodialysis catheters only (e.g., Permacath)
- Ports/implanted catheters
- Short-term central venous catheters
- PICC lines
- Other, _____

3a. Please indicate your most frequently used protocol for antimicrobial lock prophylaxis
(e.g., vancomycin + heparin qd to dwell for ≥60 min): _____

3b. Which antimicrobial(s) have you used for antimicrobial lock prophylaxis?
Concentration [leave blank if unknown]

- Vancomycin _____
- Gentamicin _____
- Ciprofloxacin _____
- Minocycline _____
- Tigecycline _____
- Daptomycin _____
- Rifampin _____
- Amphotericin B _____
- Ethanol, specify %: _____
- Other, specify: _____

3c. Do you routinely use anticoagulants in the prophylaxis solution? Yes / No
 EDTA or citrate
 Heparin

4. When you see breakthrough bacteremias after attempting antimicrobial lock prophylaxis, what are the most common organisms, in rank order?

1. _____
2. _____
3. _____

Treatment of Tunneled or Implanted Catheter-Related BSI

5. For the following organisms causing catheter-related BSI:
Do you attempt catheter salvage? If you attempt catheter salvage, do you usually treat with:

	Often	Rarely	Never	Systemic only	ALT only	Systemic+ALT
Coag-negative staph	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>S. aureus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Enterococcus</i> spp.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Pseudomonas</i> spp.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Enterobacteriaceae</i> (e.g., <i>E. coli</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Acinetobacter</i> spp.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Candida</i> spp.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. If you have used ALT for treatment of tunneled or implanted catheter-related BSI, please indicate the agents and mechanics of instillation you used most often for the following organisms:

	Agent(s)	Therapy duration, minimum dwell time
Coag-negative staph	_____	_____
<i>S. aureus</i>	_____	_____
<i>Pseudomonas</i> spp.	_____	_____
<i>Candida</i> spp.	_____	_____
Other1 [specify below]	_____	_____
Other2 [specify below]	_____	_____
Other3 [specify below]	_____	_____

7. All agree we need prospective controlled trials for both prophylaxis and treatment using lock solutions. In the meantime, please share critical incidents, data, and additional issues:

Thank you for completing this survey!

RESULTS

Overall response rate: 606/1084 (55.9%) physicians responded from 9/26/07 to 11/5/07

Section 1 Antimicrobial Lock Prophylaxis

Figure 1. Do you use antimicrobial prophylaxis?

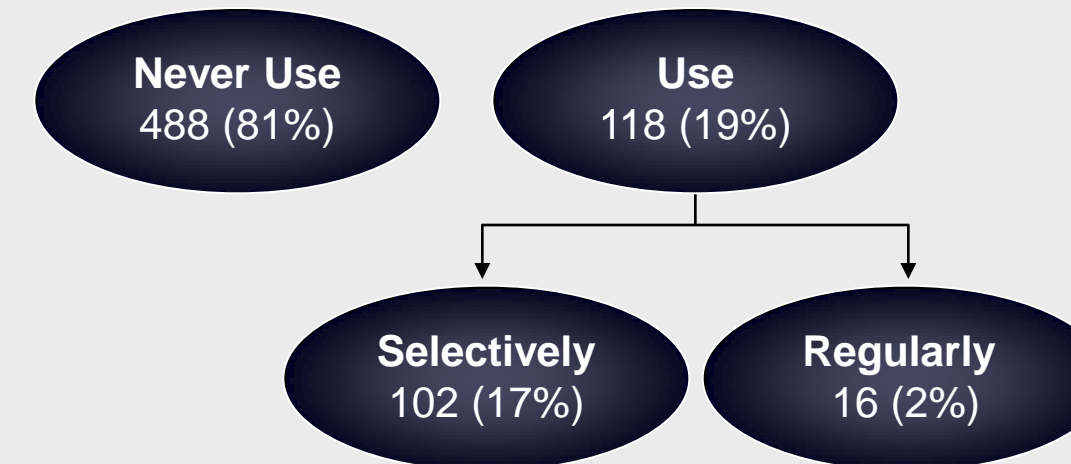


Figure 2. Most Frequently Used Agents for Antimicrobial Lock Prophylaxis

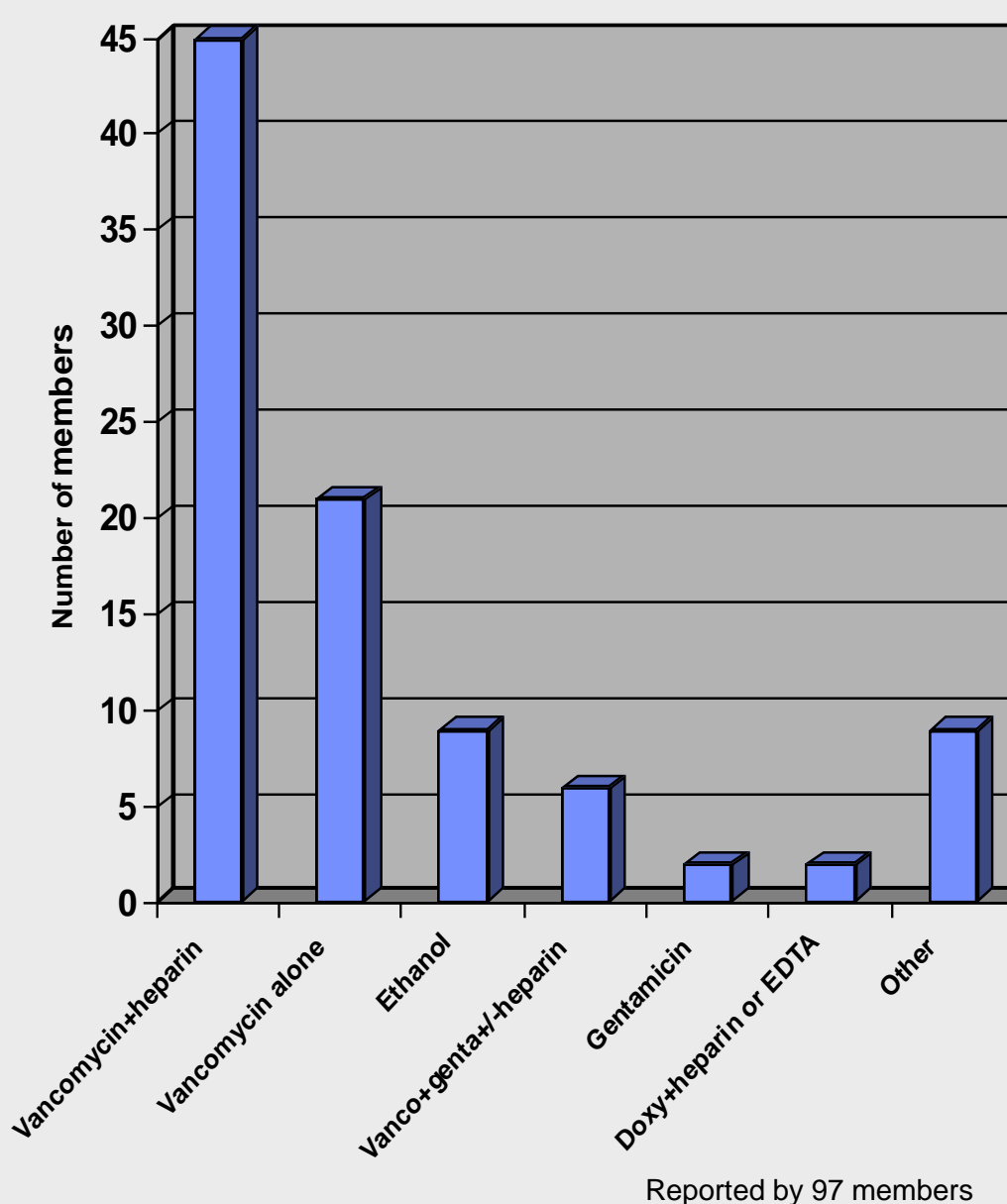


Figure 3. Do you routinely use anticoagulants?

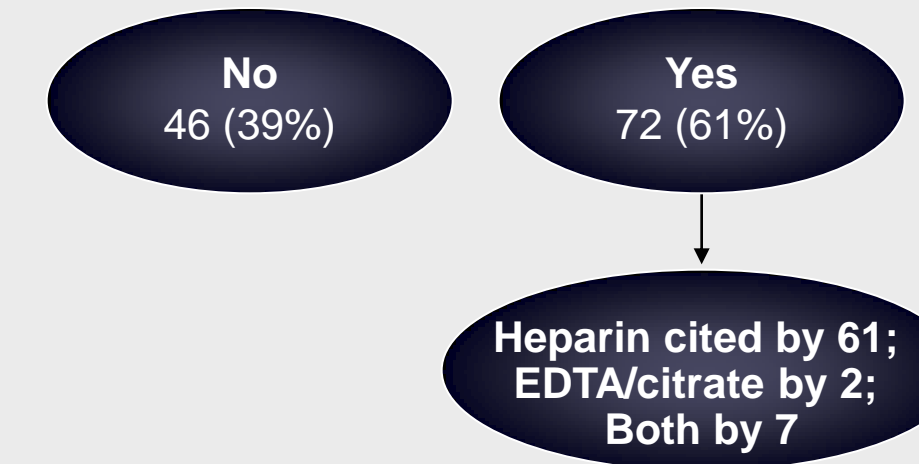
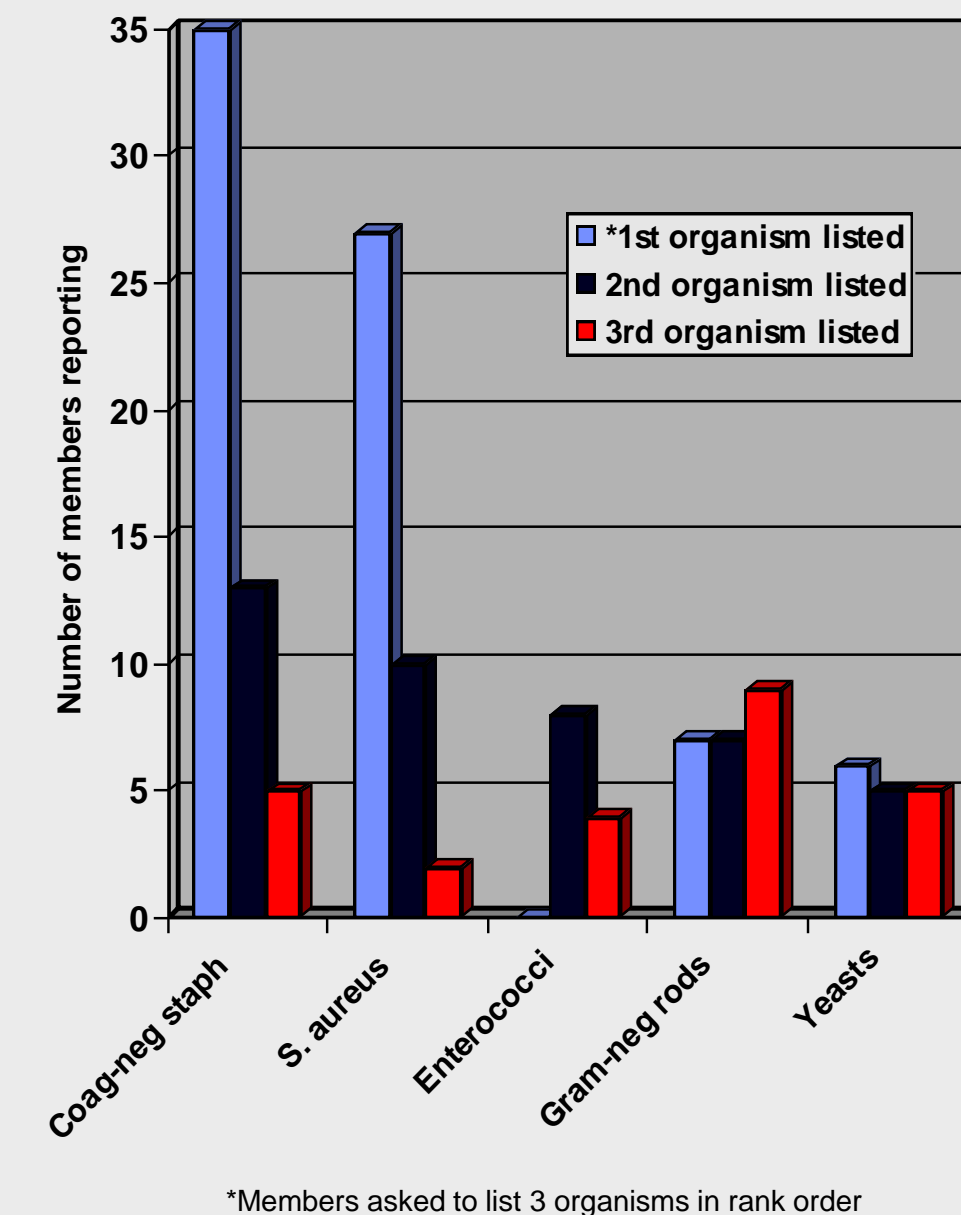


Figure 4. Organisms causing breakthrough bacteremias with antimicrobial lock prophylaxis



Section 2 Antimicrobial Lock Treatment (ALT)

Table 1. Summary for 387 members responding to Section 2 questions, No. (%)

	Attempt catheter salvage?	If yes, do you use ALT?*
Any organism	344 (89)	168 (49)
Coag-negative staph only	336 (87)	150 (45)
At least 1 other (non-CoNS) organism	270 (70)	127 (47)
<i>S. aureus</i>	194 (50)	91 (47)
<i>Enterococcus</i> spp.	195 (50)	76 (39)
<i>Enterobacteriaceae</i> (e.g., <i>E. coli</i>)	186 (48)	65 (35)
<i>Pseudomonas</i> spp.	123 (32)	39 (32)
<i>Acinetobacter</i> spp.	108 (28)	25 (23)
<i>Candida</i> spp.	44 (11)	16 (36)

*Denominator for this column is the number who attempt catheter salvage (1st column)

Table 2. Antimicrobial Lock Treatment (ALT) Agents used for Treatment

Coagulase-negative staphylococci [171 members responded]	
Vancomycin alone	133 (78%)
Vancomycin + heparin	13 (8%)
Vancomycin + another antimicrobial*	6 (4%)
Ethanol or ethanol + heparin	5 (3%)
Vancomycin +/- gentamicin	4 (2%)
Daptomycin	4 (2%)
Vancomycin or cefazolin	2 (1%)
Other (by 1 member each)	6 (4%)
*oral or IV rifampin, cefazolin, gentamicin, ethanol, minocycline	
<i>S. aureus</i> [99 members responded]	
Vancomycin	68 (68%)
Vancomycin or cefazolin	8 (8%)
Vancomycin + heparin	7 (7%)
Cefazolin	4 (4%)
Ethanol	3 (3%)
Beta lactams when possible, otherwise vancomycin	2 (2%)
Other (by 1 member each)	7 (7%)
<i>Pseudomonas</i> spp. [38 members responded]	
An aminoglycoside (primarily gentamicin)	19 (50%)
Cipro or gentamicin	5 (13%)
Ceftazidime	4 (11%)
Ethanol	2 (5%)
Ciprofloxacin	2 (5%)
Other (by 1 member each)	6 (16%)
<i>Candida</i> spp. [11 members responded]	
Amphotericin	7 (64%)
Ethanol	2 (18%)
Ambisome	1 (9%)
Fluconazole	1 (9%)

Summary

- ALP is practiced by a minority of respondents, who reported use of a wide variety of agents and concentrations.
- ALT is much more common, particularly for treatment of infections caused by coagulase-negative staphylococci, but little uniformity exists in the mechanics of therapy.
- Given the wide variation in clinical practice, the dearth of applicable data, and the urgency of the need to prevent and treat CRBSI, data from randomized controlled trials in a variety of patient populations are needed.