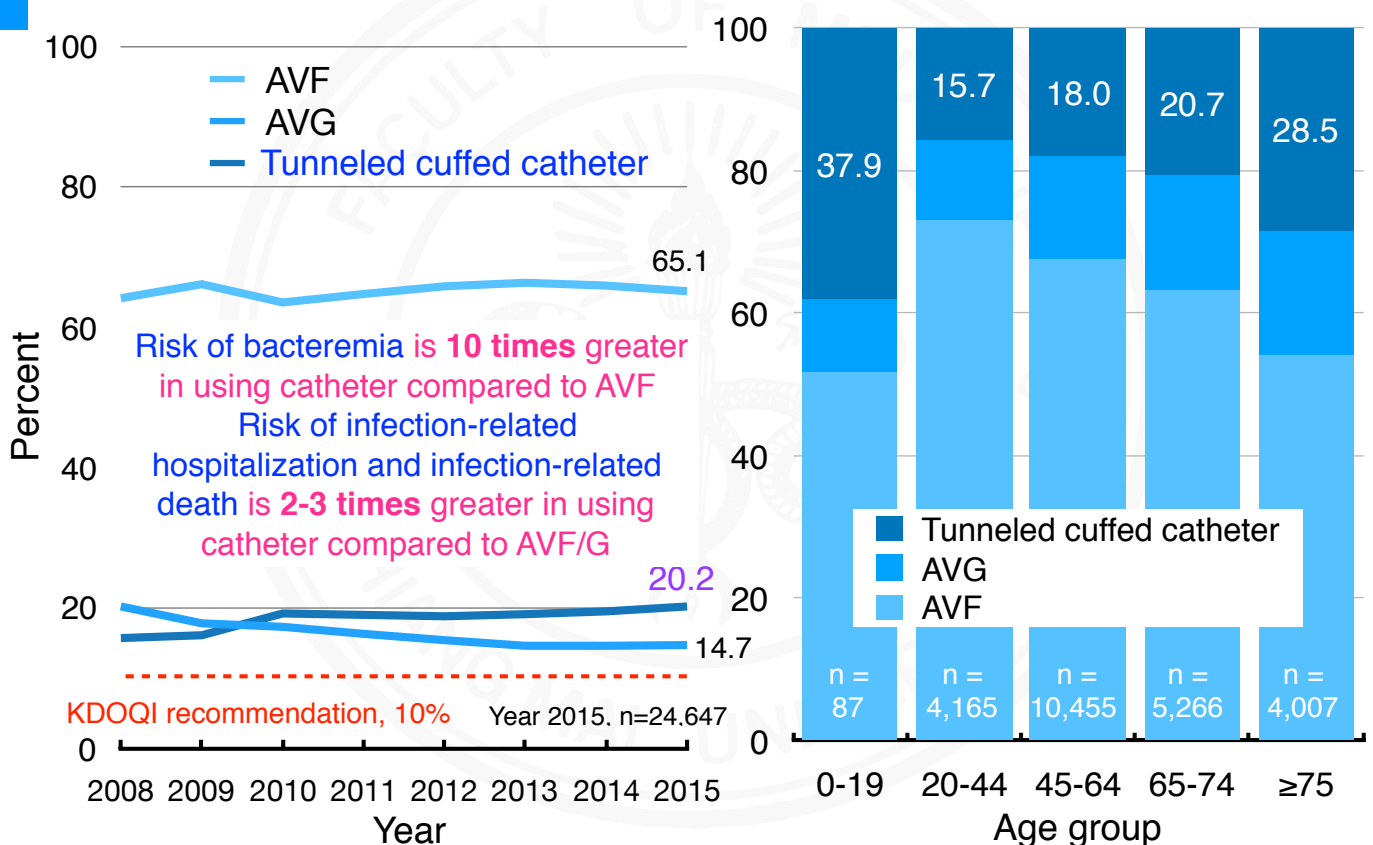


CVC infection: When to salvage the catheter?

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Vascular access in Thai prevalent HD patients



SCOPE: CVC infection

- When to salvage the catheter?
 - When..... ever possible
- How to salvage the catheter?
- When is not possible salvage catheter?

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Exit site infection

- Hyperemia and induration ≤ 2 cm from exit site
- Obtain culture
- Non-tunneled catheter: systemic antibiotics (5-7 days) to cover Gram-positive organisms \pm catheter removal (if possible)
- Tunneled catheter: systemic antibiotics (5-7 days) to cover Gram-positive organisms
- Catheter removal: no resolution of the infection despite systemic antibiotics
 - In my practice: extend antibiotics to 2-3 weeks



Tunneled infection

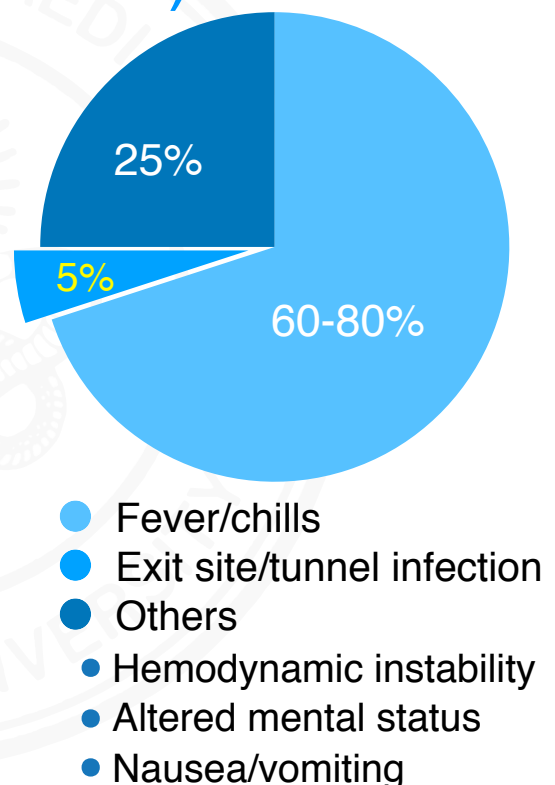
- Tenderness and hyperemia that extends **>2 cm from the exit site and along the subcutaneous tunnel**
- Obtain culture
- Systemic antibiotics to cover both **Gram-positive** and **Gram-negative organisms** (10-14 days)
- **Catheter removal:** always remove??
 - **In my practice:** try to salvage, not exchange over guide wire



Mermel LA, et al. Clin Infect Dis. 2009;49(1):1-45, Miller LM, et al. Can J Kidney Health Dis 2016;3:1-11.

Catheter-related blood stream infection (CRBSI)

- **2 blood cultures** from...
 - 1 (or 2) dialysis catheter and 1 peripheral site OR
 - 2 dialysis catheter 10-15 min apart
- **Diagnosis:** cultures from catheter with growth of microorganism...
 - **at least 3 times higher** number of colonies, OR
 - **at least 2 hr earlier**



Mermel LA, et al. Clin Infect Dis. 2009;49(1):1-45, Sychev D, et al. Semin Dial. 2011;24(2):239-241.

Epidemiology and microbiology of CRBSI

- **CRBSI:** 1.1 to 5.5 episodes per 1,000 catheter-days
= 1 case every 6 to 30 month
- **Microbiology:**
 - **Coagulase-negative staphylococci (including *Staphylococcus epidermidis*):** 32-45%
 - ***Staphylococcus aureus*:** 22-29%
 - **Gram-negative bacteria:** 21-30%
 - **Enterococci:** 9-13%

Dopirak M, et al. Hosp Epidemiol. 2002;23(12):721-724, Taylor G, et al. Am J Infect Control. 2004;32(3):155-160, Klevens RM, et al. Semin Dial. 2008;21(1):24-28, Hannah EL, et al. Infect Control Hosp Epidemiol. 2002;23(9):538-541.

Antimicrobial therapy

- **Empirical therapy**
 - **Vancomycin** 0.5-1 gm IV during the last 30 min of dialysis session (or after dialysis) for **Gram-positive**
 - + **Ceftazidime** 2 gm IV after dialysis for **Gram-negative**
- **Negative culture** - stop antibiotics
- **Positive culture** - tailored therapy
 - **Methicillin-sensitive *Staphylococcus*** - **cefazolin** 2-3 gm IV after dialysis for 2-3 weeks (*S. epidermis*) and 4-6 weeks (*S. aureus*)
 - **Gram-negative** - continue **ceftazidime** for 2-3 weeks

Variable	Bivariable analysis		Multivariable analysis	
	OR (95% CI)	P	OR (95% CI)	P
Vancomycin as principal therapy	3.02 (1.13–8.08)	.02	3.53 (1.15–13.45)	.04
Retention of hemodialysis access ^a	5.08 (1.95–13.24)	<.01	4.99 (1.89–13.76)	.001

Barth RH, et al. Kidney Int. 1996;50(3):929, Mermel LA, et al. Clin Infect Dis. 2009;49(1):1, Marx MA, et al. Am J Kidney Dis. 1998;32(3):410, Stryjewski ME, et al. Clin Infect Dis. 2007;44(2):190.

Catheter salvage or removal

Salvage

Complications from persistent infection: septic shock, metastatic infection



Removal

Risk of placement of new catheter

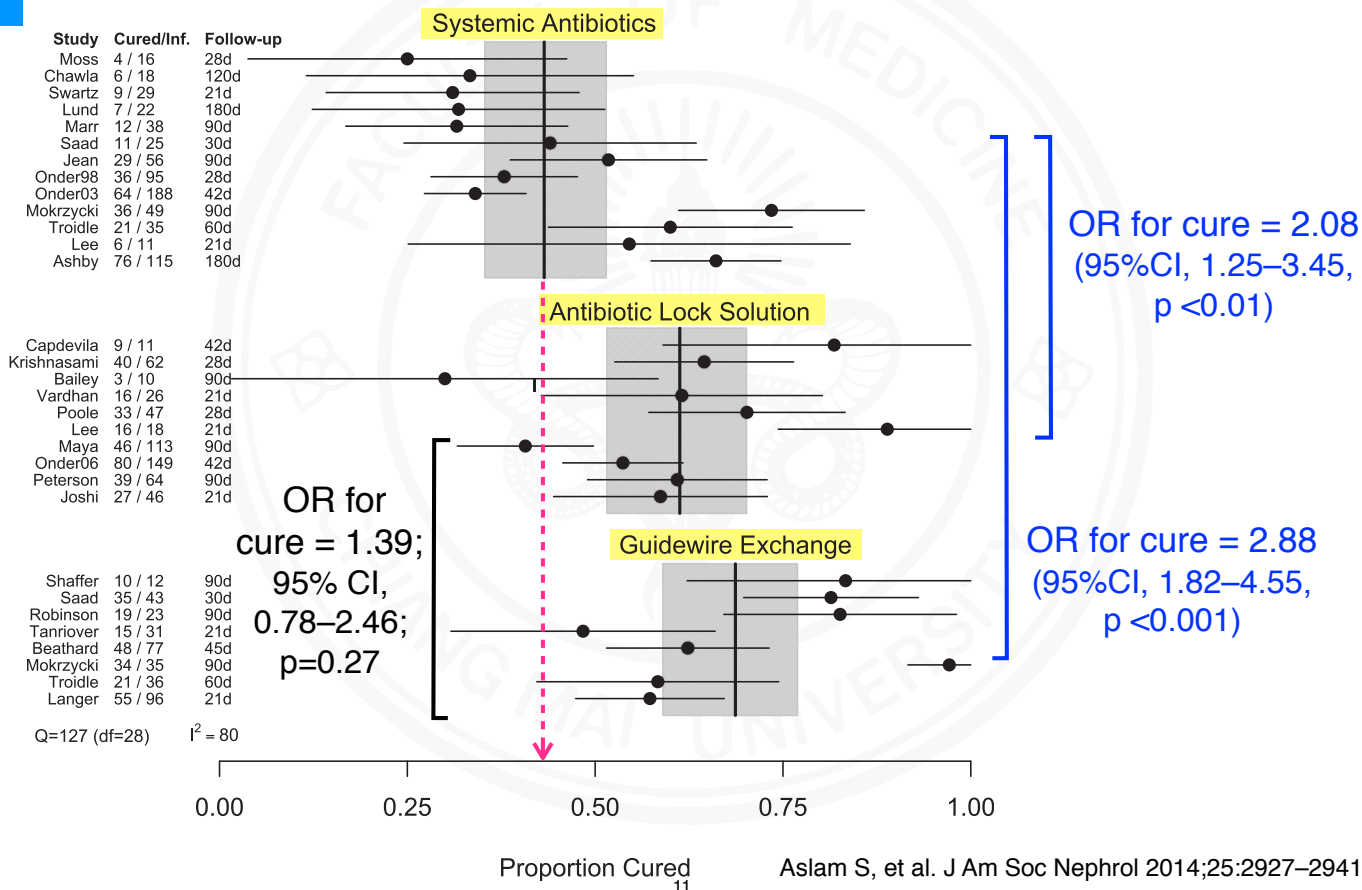
Cost of new catheter

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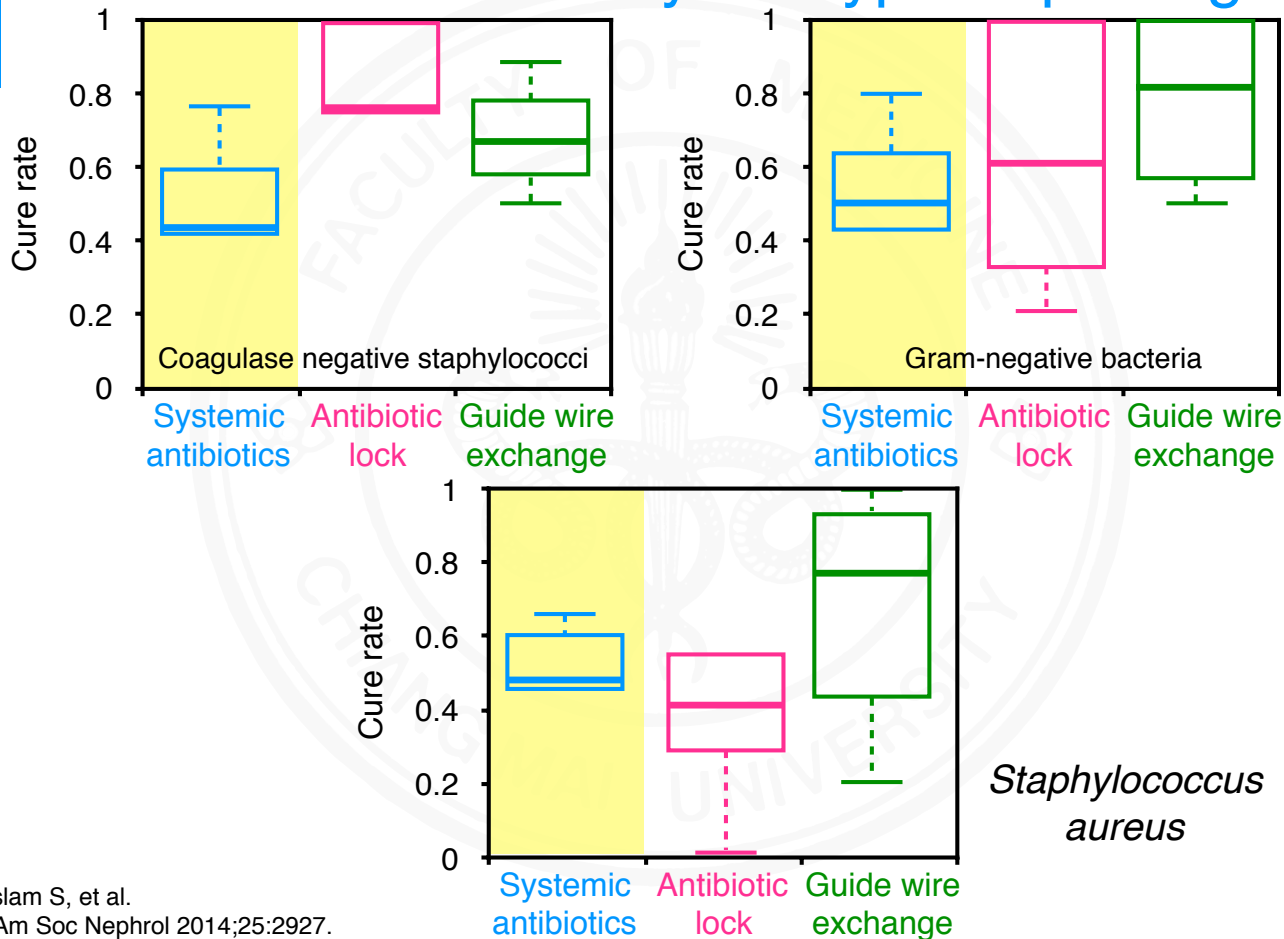
Catheter management

- (1) Leave the catheter in place without either replacing or instilling antibiotic lock — some expert think this is “not recommended”??
- (2) Catheter removal, followed by placement of a temporary non-tunneled catheter
 - Non-tunneled catheter - immediately remove (if possible)
 - Tunneled catheter - fever \pm bacteremia persist 48-72 hr after initiation of antibiotics, evidence of metastatic infection, infection with difficult-to-cure pathogens, such as *S. aureus*, *Pseudomonas*
- (3) Exchange over guide wire
- (4) Antibiotic lock

Meta-analysis on management of hemodialysis catheter-related bacteremia



Cure rates stratified by the type of pathogen



Catheter management

- Exchange over guide wire
 - Afebrile after 48 hr of antibiotic therapy
 - Clinically stable
 - No evidence of tunnel involvement
- Antibiotic lock
 - Cefazolin 1 ml of 10 mg/ml in NSS + heparin 1 ml (1,000 units/ml)
 - Ceftazidime 1 ml of 10 mg/ml in NSS + heparin 1 ml (1,000 units/ml)
 - Vancomycin 1 ml of 5 mg/ml in NSS + heparin 1 ml (1,000 units/ml)
 - Mixing solutions used for systemic administration

Poole CV, et al. Nephrol Dial Transplant. 2004;19(5):1237,
Robinson D, et al. Kidney Int. 1998;53(6):1792, Allon M. Am J Kidney Dis. 2009;54(1):13.
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When to salvage the catheter?

- Whenever possible; however, depends on catheter type and infection type
- Non-tunneled catheter
 - Exit site infection — remove if possible depending on severity, can try to salvage with systemic antibiotics cover Gram-positive organisms for 7 days
 - CRBSI — remove if possible (not try to salvage)
- Tunneled catheter
 - Exit site infection — try to salvage with systemic antibiotics cover Gram-positive organisms for 7 days
 - Tunnel infection — try to salvage with systemic antibiotics cover Gram-positive and Gram-negative organisms for 10-14 days
 - CRBSI — try to salvage with systemic antibiotics ± antibiotic lock according to organisms for 2-3 weeks for *S. epidermidis* and Gram-negative and 4-6 weeks for *S. epidermidis*
 - *S. aureus* and *Pseudomonas* — usually, but not always, fail with salvage therapy
 - Exchange over guide wire — afebrile, clinically stable, no tunnel infection
 - Catheter removal — fever persists 48-72 hr or metastatic infection



Thank you for your attention