Top Curbside Consult Questions in Inpatient ID

Management of the Hospitalized Patient
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Disclosures

- I have no disclosures.
Learning Objectives

1. To know the situations in which formal bedside consultation is preferred over curbside consultation

2. To develop an approach to common ID questions that arise in the inpatient setting

Outline

- A Brief Word on Curbsides vs Formal Consults

- Top Curbside Consult Questions in ID
  - *S. aureus* bacteremia
  - Asymptomatic bacteriuria and candiduria
  - Oral options for ESBL UTI
  - Oral stepdown therapy/duration for pyelonephritis
  - Line management in CLABSI
Curbsides vs Formal Consults

- Recent study of 47 curbsides vs. formal consults
  - Medicine consult
  - Curbsided providers were not allowed to look in the chart

- Results:
  - Information in curbside was inaccurate or incomplete in 51%
  - Formal consult changed management in 60% (36% “major changes”)
  - If information was inaccurate/incomplete then a formal consult changed management in 92% (45% “major changes”)


Are Curbsides Okay?

- Yes, but we need to balance concerns re: efficiency, patient safety, and education

- ID gets many curbsides each day → may be impossible in most practices to convert all into formal consults

- See Bob Wachter’s blog on curbsides “The Dangers of Curbside Consults... and Why We Need Them” (http://goo.gl/fpJbJ3)

When Should a Curbside be a Consult?

- The Goldilocks of Curbside Consultation
  - Not too simple (i.e. the answer can be easily looked up)
  - Not too complicated (i.e. the answer requires nuanced clinical judgment or interpretation of a lot of data)
  - Just right: Hypothetical, straightforward question

- We tell our ID Fellows that it should probably be a consult if:
  - You need to look up the answer
  - It’s early in the year

Curbside #1

A 68 year old man with ESRD on HD is admitted with *Staphylococcus aureus* bacteremia that is thought due to his dialysis line because his blood cultures cleared within 2 days of antibiotics and line removal. TTE was negative. I can just treat for 2 weeks, right?
Can this Patient Be Treated For Just 2 weeks?

1. Yes
2. No
3. I need more information

What Information Do You Need?

1. MRSA vs MSSA
2. Vancomycin MIC
3. If the patient has any implanted prostheses
**ID Consults and *Staph aureus* Bacteremia**

- **Benefits of ID consultation (vs no consult):**
  - ↑ detection of metastatic foci of infection, endocarditis
  - ↑ removal of prosthetic devices
  - More likely to get echo and repeat blood cultures
  - Improved antibiotic choice and duration
  - ↓ risk of relapse
  - ↓ mortality (by ~20-30%)

- **All patients with SAB should have an ID Consult if possible**


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**Curbsides for *Staph aureus* Bacteremia?**

- **Curbside consult is associated with:**
  - Less identification of deep infectious foci (and fewer radiologic tests ordered)
  - Longer duration of fever
  - Less likely to receive the proper duration of therapy
  - ↑ mortality by > 2-fold compared to bedside consult

- **Consider formal ID consults for all cases of Staph bacteremia**

My Approach to Staph aureus Bacteremia

1. Look for metastatic foci of infection → source control
   - Exam: Brain, lungs, spleen/liver/kidneys, spine, skin, MSK
   - Low threshold for imaging

2. Evaluate for endocarditis (TTE vs TEE)

3. Decide appropriate ABx choice
   - Always IV
   - Beta-lactam for MSSA

4. Decide appropriate ABx duration (define bacteremia as complicated or uncomplicated)

Antibiotic Duration

<table>
<thead>
<tr>
<th>Uncomplicated Bacteremia</th>
<th>Complicated Bacteremia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No endocarditis</td>
<td>Does not meet criteria for uncomplicated disease</td>
</tr>
<tr>
<td>2. No metastatic foci of infection</td>
<td>Duration = 4-6 weeks</td>
</tr>
<tr>
<td>3. Repeat blood cultures negative at 2-4 days</td>
<td></td>
</tr>
<tr>
<td>4. Defervesce in &lt;3 days of ABx</td>
<td></td>
</tr>
<tr>
<td>5. No implanted prostheses (e.g., prosthetic valves, cardiac devices, joints)</td>
<td></td>
</tr>
</tbody>
</table>

Duration = minimum 2 weeks

Implanted Prostheses and Antibiotic Duration

- Presence of prosthetic implants in SAB → poor outcomes/complications
  - 2-4 fold ↑ risk of having death, stroke, recurrent infection, metastatic foci of infection
  - This is true even if prosthetic material is not the primary infection/source of bacteremia

- Implanted prostheses have high rates of being seeded hematogenously during unrelated SAB
  - 20-50% risk of seeding prosthetic heart valves/valve rings
  - 30% risk of seeding of prosthetic joints, cardiac devices


Curbside #1 Continued

- On further questioning, it turns out the patient has a prosthetic mitral valve.

- So he should get 4-6 weeks of antibiotics
Curbside #2

- Oh, about that prosthetic mitral valve... do I need a TEE?

- To remind you, this is a 68 year old man with ESRD on HD who is admitted with *S. aureus* bacteremia that is thought due to his dialysis line because his blood cultures cleared within 2 days of antibiotics and line removal. TTE was negative. He has a prosthetic mitral valve.

Curbside #2: Does This Patient Need a TEE?

1. Yes
2. No
3. Not sure
Echocardiography in SAB

- **Purpose of echo:**
  - At least 5-15% of patients with SAB have endocarditis
  - Echo serves to rule out endocarditis as an *etiology for or subsequent complication* of SAB

- **Needed for all?**
  - Although there is some debate, most experts agree that *all patients with Staph aureus bacteremia should undergo echocardiography*


Transesophageal Echocardiography (TEE)

- **Important points about TEE:**
  - More sensitive for vegetations (85-90% vs 75% for TTE)
  - Better to evaluate prosthetic valves, device leads
  - Better to evaluate for myocardial abscess
  - May be less sensitive for tricuspid lesions
  - Increased cost and risk compared to TTE

- **IDSA:** TEE is “preferred” because of higher sensitivity

- **In practice,** TEE is performed in only 15-80% of patients with SAB

What about TTE in “Low Risk” SAB?

- TTE may have good NPV in a subset of patients with low risk for endocarditis (low quality evidence, somewhat controversial)

- Some experts define low risk as meeting all of the following criteria:
  - Nosocomial-acquired bacteremia
  - Negative blood cultures within 4 days after initial set
  - Absence of prosthetic valve or cardiac device
  - No hemodialysis
  - No clinical signs of IE or secondary foci of infection

Holland et al, JAMA 2014; 312:1330.

A Real World Approach to Echo in SAB

Initial TTE

- Negative

Low Risk

- Low risk patient
- Low clinical suspicion
- Alternative source

Get TEE only if:

- Poor quality TTE
- Suspicion during course

High Risk

- High risk patient
  - Prosthetic Valve
  - Cardiac Device (Pacemaker, AICD)
  - Congenital Heart Disease
  - Prior IE
  - Hemodialysis patient

- Moderate-high clinical suspicion
  - Community-acquired bacteremia
  - New murmur
  - Multiple metastatic foci
  - Embolic lesions
  - Peripheral stigmata of IE
  - Prolonged bacteremia or fever
  - New conduction abnormalities

TEE
Other TEE Considerations

- May consider deferring TEE in:
  - Patients with significant co-morbidities
  - Patients whose GOC are to avoid invasive procedures
  - Patients getting 6 weeks of antibiotics for another reason (eg osteomyelitis) where:
    - There is no concern for intra-cardiac complications
    - ABx regimen would not change if the patient had endocarditis

- Important to use clinical judgment

- If defer TEE and give a short course of ABx, consider getting surveillance cultures after stopping

Take Home Points: Approach to Staph Bacteremia

1. Look for metastatic foci of infection → source control

2. Evaluate for endocarditis
   - TTE in all patients
   - TEE if
     - Low quality TTE
     - High risk patient
     - High clinical suspicion for endocarditis

3. Decide appropriate ABx choice (beta lactam for MSSA!)

4. Decide appropriate ABx duration (define bacteremia as complicated or uncomplicated)
A 70 y/o M with diabetes is admitted with a severe diabetic foot infection. He had no other symptoms. On admission he was febrile and his wound showed purulence and necrotic tissue. He was taken to the OR for wound debridement and culture grew MRSA. His admission blood cultures were negative, but urine culture grew *E. coli*. UA on admission showed 10-20 WBC/hpf. Do we need to treat this?

Do You Need to Treat the *E. coli*?

1. Yes
2. No
3. Not sure
Asymptomatic Bacteriuria

- Asymptomatic Bacteriuria (ASB) =
  - Isolation of bacteria from a urine sample (see criteria below) AND
  - No symptoms or signs related to UTI

- Criteria for ASB:

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
<th>Catheterized patients (men or women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥10^5 bacteria on 2 separate voided specimens</td>
<td>≥10^5 bacteria form a single voided specimen</td>
<td>≥10^2 bacteria from a single specimen</td>
</tr>
</tbody>
</table>


ASB is Common

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant Women</td>
<td>2-10%</td>
</tr>
<tr>
<td>Post-menopausal Women</td>
<td>3-9%</td>
</tr>
<tr>
<td>Diabetic patients</td>
<td>9-27%</td>
</tr>
<tr>
<td>Elderly patients</td>
<td>4-19%</td>
</tr>
<tr>
<td>Long term care patients</td>
<td>15-50%</td>
</tr>
<tr>
<td>Spinal cord patients</td>
<td>23-89%</td>
</tr>
<tr>
<td>HD patients</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Short term catheter (&lt;30d)</strong></td>
<td>9-23%</td>
</tr>
<tr>
<td><strong>Long term catheter (&gt;30d)</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Bacteriuria in the Hospital is Usually ASB

In *hospitalized* patients with a positive urine culture (with or without a catheter)

~90% of cultures are ASB


ASB Usually Does Not Require Treatment

- Why not to treat?
  - Treatment *does not* decrease the risk of UTI
  - Overtreatment is associated with adverse effects and development of resistant organisms

- This has been studied by RCT in many different populations

Exceptions: Who With ASB Should Be Treated?

- **Pregnant women**
  - ↓ risk of pyelo, premature delivery, low weight infants

- **Pts undergoing GU procedures with mucosal bleeding**
  - ↓ rate of post-procedure bacteremia and sepsis

- **Immunosuppressed/transplant patients?**
  - Little data, not addressed in most guidelines
  - Many treat ASB in renal transplant patients in the first 3 months
  - We also treat in neutropenic pts b/c of the risk of invasive disease


The Heart of the Problem

- **It’s Hard to Ignore a Positive Culture**

- **Proof of concept study:**
  - At Mount Sinai, ~90% of their inpatient urine cultures (after admission) were considered ASB, and almost 50% were treated with ABx
  - They stopped reporting the positive urine cultures on these patients (non-catheterized subgroup)
  - The % of ASB that was treated dropped from 48% to 12%
  - There were no untreated UTIs, no pts developed sepsis

The Million Dollar Question

How do I distinguish between ASB and UTI?

Does the UA Help?

- Pyuria is very common in patients with ASB
  - 30-75% of pts with short-term indwelling catheters (<30d)
  - 50-100% of pts with long-term indwelling catheters (>30d)

- PPV only 32-36% for catheterized patients!

- The absence of pyuria suggests an alternative diagnosis

- **Bottom line: The UA is helpful only if it is negative**
  - The presence of pyuria is not helpful
  - But the absence of pyuria suggests an alternative diagnosis

Does the Organism Help?

- Microbiology of ASB:
  - GNRs:
    - *E. coli* (most common organism isolated from women with ASB)
    - *Klebsiella*
  - Indwelling devices: *Proteus, Pseudomonas, Providencia, Morganella*
  - GPCs:
    - *Enterococcus* (55% ASB, 45% UTI)
    - Group B Strep
    - Coag negative Staph

- **Bottom line:** NO, the same bugs cause both ASB and UTI


How to Distinguish Between UTI and ASB

- Use clinical context – does the patient have signs/symptoms of UTI?

- But what if I can’t assess for “classic” UTI symptoms?
  1. The patient has a catheter (CA-UTI)
  2. The patient is altered or otherwise unable to communicate

What if I Can’t Assess Symptoms?

How to define UTI in these patients (CA-UTI, AMS)?

Symptoms or signs c/w UTI AND No other source of infection (i.e., diagnosis of exclusion)

• New or worsening fever, rigors, AMS, malaise
• Flank pain, CVAT, pelvic discomfort
• Acute hematuria
• Spinal cord injury: spasticity, autonomic dysreflexia, sense of unease


How to Interpret Urine Studies in a Patient With a Foley or AMS

Alternate Diagnosis Likely? (Signs/sx of other illness present)

Yes

Do not order U/A, urine cx

No

Send U/A, urine cx

U/A, urine cx (-)

Do not treat for UTI

U/A (-), urine cx (+)

Asymptomatic bacteriuria

U/A (+), urine cx (+)

Treat for UTI (if no alternate dx identified)

U/A (+), urine cx (-)

Do not treat

Slide courtesy of Catherine Liu.
ASB vs. UTI: Take-Home Points

- ASB and pyuria are common, especially in patients with catheters
- Pyuria ≠ UTI, but absence of pyuria strongly points to an alternative source
- ASB does not require therapy except for:
  - Pregnancy
  - Urologic procedures
  - Neutropenia, renal transplant <3 mo
- To diagnose a UTI in a patient with a catheter or who cannot report symptoms, the patient must have:
  - Signs and symptoms compatible with UTI
  - No other source for infection (i.e., diagnosis of exclusion)

Curbside #4

I can ignore Candida in the urine, right?
Can you ignore *Candida* in the urine?

1. Yes, in most cases

1. No, *Candida* is a frequent cause of UTI

Candiduria: Who Needs Treatment?

- Candiduria is very common in patients with catheters

- **Candiduria is usually asymptomatic**
  - In general, don’t treat!
  - Change the foley: can eliminate candiduria in 20-40%
  - Exceptions: Patients at high risk of dissemination
    - Neutropenia
    - Patients undergoing urologic procedures
    - (Pregnancy)

- **Symptomatic candiduria** (uncommon)
  - Same symptoms as bacterial UTI
  - Treat

Candida UTI: Treatment Options

- 1st line: **Fluconazole**
  - Excellent urine levels, 10-fold higher than serum levels
  - Can get concentrations in the urine that are higher than the MIC for organisms that are intermediate or resistant (like *C glabrata*)

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Fluconazole-Resistant Candida UTI

- Can try fluconazole and re-check Ucx (if not systemically ill)
- Other options all have poor efficacy or side effect profile:
  - Flucytosine
  - Amphotericin B (conventional formulation)
  - Amphi bladder washes: Resolve candiduria in >90% but high number of relapses
  - Other azoles?
    - Vori, posa, itra have poor urinary penetration
  - Echinocandins?
    - Poor urinary penetration, but use if suspect systemic disease

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Candiduria: Take-Home points

- Most often asymptomatic and does not require treatment
- Fluconazole is the drug of choice for *C. albicans*, and can often be used for non-albicans species as well
- Echinocandins and the other azoles have poor urinary penetration

Curbside #5

A 75 y/o F with neurogenic bladder and history of prior UTI is admitted with confusion and low-grade fever. Her daughter reports the patient had a 2 day history of suprapubic pain and dysuria. UA shows >50 WBC/hpf and urine culture grows *E. coli*. Blood cultures were negative. She improves on empiric ertapenem and is ready for discharge. Susceptibilities come back and the *E. coli* is an ESBL producer.

Do I need to send her home on ertapenem or are there any oral options?
Which Oral ABx Has the Best Data for ESBL UTI?

1. Fosfomycin
2. Nitrofurantoin
3. Minocycline

Oral Options for ESBL E. coli in the Urine

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>% Sensitive in vitro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>4-36</td>
</tr>
<tr>
<td>TMP-SMX</td>
<td>22-43</td>
</tr>
<tr>
<td>Amoxicillin/Clavulanate</td>
<td>11-70</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>58-94</td>
</tr>
<tr>
<td><strong>Fosfomycin</strong></td>
<td><strong>91-100</strong></td>
</tr>
</tbody>
</table>

- Susceptibilities for ESBL Klebsiella are lower for fosfomycin (~58-80%) and nitrofurantoin (14%)
- Susceptibilities are similar for community-acquired and hospital-acquired infections

Clinical Data for Oral ABx in *E.coli* ESBL Cystitis

- **Fosfomycin**
  - Several studies, mostly in outpatient cystitis
  - Course: either single dose or 3 doses qod
  - 94% clinical cure rate, 78% micro cure rate

- **Nitrofurantoin**
  - 1 study in outpatient cystitis
  - Course: 14 days
  - Clinical cure rate 69%, Micro cure rate 68%

- **Amoxicillin-clavulanate**
  - 1 study in outpatient cystitis
  - Course: 5-7 days
  - 93% clinical cure rate


Reminder About These Old “New” Antibiotics

- **Fosfomycin**
  - Does not achieve good renal/serum levels so cannot use for pyelonephritis/bacteremia
  - MIC not routinely done in most micro labs
  - Recommend dosing at 3gm PO qod x 3 doses (or until clinical improvement)

- **Nitrofurantoin**
  - Does not achieve good renal/serum levels so cannot use for pyelonephritis/bacteremia
  - Avoid in renal failure (CrCl<60) due to inadequate urinary levels and potential for toxic serum levels

What if the Patient has Pyelonephritis?

- Small study in community-acquired pyelonephritis showing that use of non-carbapenem was equivalent to a carbapenem:
  - But, non-carbapenems were an aminoglycoside or pip/tazo in most patients
  - Bacteremia 15% in non-carbapenem group c/w 50% in carbapenem group

- Bottom line: can consider in very select circumstances without bacteremia but there is limited data


Oral Options for ESBL UTI: Take-Home points

- Most data is for *E. coli* ESBL (limited data for *Klebsiella*)

- For mild-moderate cystitis:
  - Oral ABx choice dictated by susceptibilities
  - Consider susceptibility testing for fosfomycin if possible
  - Caution with nitrofurantoin given poor clinical cure rates

- Would not use orals if the patient is clinically ill, has bacteremia, or cannot be followed closely

- In very selective cases of mild pyelonephritis, can consider orals (but not fosfomycin or nitrofurantoin) if no bacteremia, but data is very limited
A 45 y/o woman with diabetes is admitted with pyelonephritis. Her urine and 2 blood cultures are positive for pan-sensitive *Klebsiella pneumoniae*. She was treated empirically with ceftriaxone and has improved (defervesced, normalized her WBC count, resolution of symptoms).

When can she change to PO therapy and how long do we need to treat for?

I want to use cephalaxin because this is the most narrow antibiotic – is this okay?

She Should Finish a Treatment Course With:

1. Ceftriaxone IV x 14 days
2. Ciprofloxacin IV x 7 days
3. Ciprofloxacin PO x 7 days
4. Cephalexin PO x 7 days
When is it Ok to Change to PO Therapy?

- Meta-analysis of early-switch (days 1-4) vs late switch (days 7-10) to PO therapy showed no difference in clinical outcome
  - Studies included beta-lactams, TMP-SMX, cipro
  - Caveat: 6 of the 8 studies were in children

- Bottom line: when is it ok to change to PO?
  - When susceptibilities are known
  - When patient has defervesced and clinically improved


RCTs on Short Course Therapy for Pyelonephritis

<table>
<thead>
<tr>
<th>Study</th>
<th>ABx Results</th>
<th>Patients</th>
<th>Bacteremia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talan et al 2000</td>
<td>Cipro 500mg PO bid x 7d superior to TMP-SMX 1 DS PO bid x 14d</td>
<td>Uncomplicated pyelo</td>
<td>5%</td>
</tr>
<tr>
<td>Peterson et al 2008</td>
<td>Levo 750mg PO qday x 5d = cipro 500mg PO bid x 10d</td>
<td>Uncomplicated and complicated pyelo</td>
<td>2%</td>
</tr>
<tr>
<td>Sandberg et al 2012</td>
<td>Cipro 500mg PO bid for 7d = cipro 500mg PO bid for 14d</td>
<td>Uncomplicated pyelo</td>
<td>27%</td>
</tr>
</tbody>
</table>

Short Course Therapy for Pyelonephritis

- Recent systematic review of short vs long course therapy for pyelonephritis

- Patients
  - 8 RCTs, 2515 patients
  - Uncomplicated and complicated pyelo
  - Most studies compared fluoroquinolones
  - 3-29% of patients bacteremic

- Results
  - Short course (≤7d) = long course (>7d)
  - Exception: Micro cure rates in short course were lower in pts w/urogenital abnormalities


Treatment Recommendations for Pyelonephritis

Uncomplicated Pyelo (IDSA)

- **Fluoroquinolones**
  - Cipro 500mg PO bid x 7 days (A-I)
  - Levo 750mg PO daily x 5 days (B-II)

- **TMP-SMX**
  - TMP-SMX 1 DS PO bid x 14 days (A-I)

- **Beta-lactams**
  - Oral beta lactam x 10-14 days (B-III)
  - Lower efficacy than other regimens
  - If bacteremia would be wary as serum levels will be lower than can be achieved with FQ or TMP-SMX

Complicated Pyelo

- No guidelines exist
- Most would treat for 7-14 days as per uncomplicated pyelo
- If urogenital abnormalities, consider treating for 14 days

PO Therapy for Pyelonephritis: Take-Home Points

- Ok to change to PO therapy once the patient is improving clinically

- First choice oral therapy is a fluoroquinolone

- Duration in most cases can be short (≤7 days) with a fluoroquinolone

- Duration should be longer with TMP-SMX (14 days) and beta-lactams (10-14 days) and the latter should be used with caution in patients with bacteremia

Curbside #7

A 55 y/o woman with ESRD on HD through a tunneled right IJ line is admitted with fever and abdominal pain and is found to be bacteremic on both line and peripheral cultures with *Klebsiella pneumoniae*. Do we have to take out the line?
Do You Need to Change the Line?

1. Yes
2. No
3. I need more information

What Information Would Be Most Helpful?

1. Abdominal CT scan
2. Differential time to positivity or line tip culture
3. Examine the exit site for inflammation
For Uncomplicated *Klebsiella* HD-line Infection:

1. You should always remove the line

2. You can consider line retention or guidewire exchange

CLABSI: Diagnosis

- **Clinical findings unreliable:**
  - Inflammation at the exit site is very insensitive (<3%)

- **Catheter tip culture:**
  - Positive peripheral bex and > 15 CFU/plate of same organism from catheter tip
  - 79% sensitive, 92% specific
  - But >80% of catheters withdrawn b/c of clinical suspicion of CLABSI are removed unnecessarily

CLABSI: Differential Time to Positivity

- Allows for diagnosis without removing the line
- Draw culture from line + peripheral blood at the same time
- CLABSI = blood culture drawn from central line turns positive at least 2 hrs before the peripheral culture
- Test characteristics
  - 85-95% sensitive
  - 83-90% specific


DTTP: Possible Scenarios

- Line (+) and peripheral (+)
  - DTTP ≥ 2 hrs: CLABSI
  - DTTP < 2 hrs: Look for another source

- Line (+) and peripheral (-)
  - Possibilities
    - Line colonization
    - Contaminant
    - Bacteremia from other source with 1/2 positive cultures
When to Remove the Line

### Complicated Infections
- Severe sepsis
- Persistent bacteremia (>72h of appropriate ABx)
- Septic thrombophlebitis
- Exit site or tunnel infection/abscess
- Evidence of metastatic infection: endocarditis, osteomyelitis

### Certain Organisms
- Virulent organisms
  - *Staphylococcus aureus*
  - *Pseudomonas*
  - *Candida*
- Difficult to eradicate (must r/o contamination)
  - *Microoccus*
  - *Bacillus*
  - *Propionobacteria*

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Mermel et al, Clin Infect Dis 2009, 49:1

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Line Management for Other Organisms

<table>
<thead>
<tr>
<th>Organism</th>
<th>PICC/Short-term CVC</th>
<th>Tunneled Cath/Port</th>
<th>HD Catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coag-negative staphylococci</td>
<td>Remove or retain</td>
<td>Remove or retain</td>
<td>Retain or guidewire exchange</td>
</tr>
<tr>
<td><em>Enterococcus</em></td>
<td>Remove</td>
<td>Remove or retain</td>
<td>Retain or guidewire exchange*</td>
</tr>
<tr>
<td>Other GNRs (not <em>Pseudomonas</em>)</td>
<td>Remove</td>
<td>Remove or retain</td>
<td>Retain or guidewire exchange*</td>
</tr>
</tbody>
</table>

*Assuming uncomplicated infections. Consider removal on a case-by-case basis.

Mermel et al, Clin Infect Dis 2009, 49:1
Line Salvage

- **General principles**
  - Studied primarily in long-term catheters
  - Treat with antibiotic lock therapy PLUS systemic ABx for 7-14 d
  - Get surveillance blood cultures 1 week after stopping ABx

- **Antibiotic Lock Therapy**
  - Goal is to fill the catheter with supra-therapeutic ABx concentrations to kill intra-luminal bacteria and penetrate biofilms
  - Success rate for line salvage is ~75% (depends on organism)
  - Cannot use if signs of exit site/tunnel infection (extra-luminal infection)

- **Give systemic ABx through the line?**
  - Good in theory but no data
  - It is recommended in IDSA guidelines if ABx lock is not an option

Mermel et al, Clin Infect Dis 2009, 49:1

Line Management: Take-Home Points

- Differential time to positivity (line positive ≥ 2 hours before peripheral) allows for diagnosis of CRBSI without line removal

- All lines should be removed for:
  - Any complicated infection
  - *Staph aureus, Pseudomonas, or Candida*
  - Difficult to eradicate organisms

- Line management for other organisms depends on line type (lower barrier to remove line for short term catheter > long-term catheter > HD catheter)
Top ID Curbsides

- *Staphylococcus aureus* bacteremia (duration of therapy, need for TEE)
- Asymptomatic bacteriuria and candiduria
- Oral options for ESBL UTI
- Oral stepdown therapy/duration for pyelonephritis
- Line management in CLABSI

Thank You!

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