What is ECHO?

- **Extension for Community Healthcare Outcomes**
  - Started for lack of access to HCV expert care in rural New Mexico
- **Key concepts**
  - Amplification/Force multiplication
    - Limited access to experts → Train regular participants to be experts
    - Video conferencing for tele-mentoring → "move knowledge, not people"
  - Case-based presentation
    - Sharing knowledge and best practices
  - Tracking data for evaluation
    - Touching 1 billion lives by 2025
Stewardship ECHO Objectives

- Create a multi-state network of AS colleagues
- Evaluate/grow/improve ASPs
  - Facilitate and mentor
  - Tailor to local needs
- Discuss AS ideas and challenges
- Meet regulatory standards
- Keep up to date on AS literature
- Prevent/slow antibiotic resistance
The road so far was EASIE...

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/17/17</td>
<td>- Intro to EASIE</td>
</tr>
<tr>
<td></td>
<td>- Overview of ASP regulatory requirements (plus AFH survey experience)</td>
</tr>
<tr>
<td></td>
<td>- Site update/project example – American Fork meropenem MUE</td>
</tr>
<tr>
<td>11/28/17</td>
<td>- System stewardship update (pharmacy)</td>
</tr>
<tr>
<td>1/31/18</td>
<td>- Asymptomatic Bacteriuria - cases</td>
</tr>
<tr>
<td>2/28/18</td>
<td>- System stewardship update (physician), Intermountain restructure</td>
</tr>
<tr>
<td>3/28/18</td>
<td>- Update on C.diff diagnostics</td>
</tr>
<tr>
<td>4/25/18</td>
<td>- Role of front line nurses in antibiotic stewardship</td>
</tr>
<tr>
<td>5/23/18</td>
<td>- SSTI Care Process Model update</td>
</tr>
<tr>
<td>6/27/18</td>
<td>- Site update/project example – Cassia surgical prophylaxis audit</td>
</tr>
<tr>
<td>8/22/18</td>
<td>- Site update/project example – Logan rapid diagnostics protocol</td>
</tr>
<tr>
<td>9/26/18</td>
<td>- Site update/project example – Riverton ED culture call backs</td>
</tr>
<tr>
<td>10/24/18</td>
<td>- Pneumonia update – Duration, DRIP score, de-escalation</td>
</tr>
</tbody>
</table>

Transition to EASIE ECHO:

*We want to hear from you!!*

**Patient case presentations**

- Local sites present
  - Cases identified through daily AS activities → presented later for larger group
- Alternative – speakers present

**QI project presentations**

- Project identification (together with ID Tele ahead of time)
  - Identify goals/outcome measures, key barriers, data needs
- **Initial presentation**
  - Project logistics/design, feedback on baseline data, overcoming barriers, other ideas
- **Follow-up presentation**
  - Results/outcomes, lessons learned, future directions
EASIE ECHO Curriculum
We want to hear from you!!

• AS Overview
  • Regulatory requirements/updates
    • How to meet, experience with surveys
  • Updates on abx use/resistance data
• System communication/updates
  • iASC, corporate updates
  • CPMs
  • Dashboards
  • iCentra tools
  • Site updates

• “Case” presentations
  • Patient cases
  • QI projects
• Core ID topics
  • SSTI, PNA, UTI/ASB
  • C.diff
  • S.aureus bacteremia
• Core stewardship topics
  • Duration of therapy
  • Double anaerobic coverage
  • Abx allergies
  • PK/PD

Questions?
EASIE ECHO: November 2018

Blood Culture Interpretation and S. aureus bacteremia

*Infectious Diseases Telehealth Service*

Todd J. Vento, MD, MPH, FACP, FIDSA (Med Director)
John J. Veillette, PharmD, BCPS (ID Pharmacist)

Objectives

1. Review recent cases w/positive blood cultures at SCHs*
2. Review significance of positive blood culture results
3. Highlight important clinical issues associated with S.aureus-positive blood cultures/bacteremia

* SCH: Small Community Hospitals
Your nursing staff says to you:
“we have a new patient with sepsis in Room 1”
“we got 6 blood cultures for you already”

Q: What do you want to know about the blood cultures?

Positive Blood Culture Interpretation:
Recent Small Community Hospital (SCH) Cases
**SCH Case 1**

30 y/o F with PMH gastroparesis with J-tube + Hickman catheter on home TPN presents to ED on Day 1 with N/V, abdominal pain
- WBC 10, T 37, HR 98, RR 20, BP 117/86; blood cultures drawn x 2 sets; discharged off abx

<table>
<thead>
<tr>
<th>Micro Data (date of result)</th>
<th>Results Callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 2</td>
<td></td>
</tr>
<tr>
<td>Set 1 (peripheral) – 1/2 GPC clusters</td>
<td>Day 2 “Please call patient - advise of positive cultures - if currently ill, have her return here - otherwise she must follow up with PCP tomorrow”</td>
</tr>
<tr>
<td>Set 2 (Hickman) – No growth</td>
<td>Day 3 “Patient followed up with PCP and is feeling better”</td>
</tr>
<tr>
<td>Day 5</td>
<td>Day 6 “Likely contamination. Please call and check on patient. Have her f/u with PCP or return if still symptomatic.”</td>
</tr>
<tr>
<td>Set 1 (peripheral) – 1/2 CoNS</td>
<td></td>
</tr>
<tr>
<td>Set 2 (Hickman) – No growth</td>
<td></td>
</tr>
</tbody>
</table>

**Question**

What percentage of time does Coagulase-Negative Staphylococcus (CoNS) represent TRUE bacteremia?

**Answer:** 10%

However,…a few thoughts about pre-test probability…

Pien et al., Am J Med 2010
**SCH Case 2**

60 y/o F with PMH: lymphoma, chemo-induced gastroparesis on TPN via **indwelling port** presents to outpatient clinic on Day 1 with subjective fevers
- T 37, HR 90, BP 113/71; WBC 6,
- blood cultures drawn x2 sets; sent home off abx

**Micro Data (date of result)**

<table>
<thead>
<tr>
<th>Day 2 (AM)</th>
<th>Interpretation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1 (L peripheral) – 1/2 GPC clusters</td>
<td>Continue to follow</td>
</tr>
<tr>
<td>Set 2 (R peripheral) – No growth</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 2 (PM)</th>
<th>Interpretation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1 (L peripheral) – 1/2 GPC clusters</td>
<td>Continue to follow…higher suspicion of true bacteremia</td>
</tr>
<tr>
<td>Set 2 (R peripheral) – 1/2 GPC clusters</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3</th>
<th>Interpretation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coagulase-negative Staph, 4/4 bottles</td>
<td>Bacteremia highly likely (or confirmed?); Admit patient for workup, repeat BCx</td>
</tr>
</tbody>
</table>

**Clinical course**
- Readmitted to hospital, found to have **persistent CoNS bacteremia** → port removal

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**SCH Case 3**

80 y/o F with COPD (3L O2 at baseline) presents to ED with dyspnea on Day 1
- T 37, HR 140, RR 26, BP 98/60; O2 sat increased > 90% on 4L; WBC 13,
- blood cultures drawn x2 sets; discharged on 5-day “Z-pak”

**Micro Data (date of result)**

<table>
<thead>
<tr>
<th>Day 2</th>
<th>Interpretation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1 – GPC in clusters 1/2 bottles</td>
<td></td>
</tr>
<tr>
<td>Set 2 – GPC in clusters 2/2 bottles</td>
<td></td>
</tr>
<tr>
<td>ED calls patient, who says they are feeling better on the z-pak</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3 and Day 4</th>
<th>Interpretation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sets MSSA, 4/4 bottles</td>
<td></td>
</tr>
</tbody>
</table>

**Clinical course**
- Day 7  Readmitted to hospital, found to have **persistent MSSA bacteremia** (D1, D4, D7, D8)
- Day 11 Decompensation → withdrawal of care
**Which one is the true KING?**

**Staphylococcus aureus**

**S.aureus bacteremia**

Highly virulent/invasive (10-40% mortality)

High risk of metastatic foci

- 1/3 of patients
- Especially if long-standing/community-onset
- Most common cause of endocarditis in U.S.

**Attributable costs**

- 10K-50K+ / hospitalization
- 4-12 days addl LOS

Clin Infect Dis 2009;48:S254-7

[www.sidp.org](http://www.sidp.org)
**S. aureus Bacteremia: Common sources/syndromes**

**Sources**
- Deep wounds/abscesses
- Catheter/device-associated infections
- IVDU
- Other primary sources: skin/lung

**Syndromes**
- Vertebral osteomyelitis/epidural abscesses
- Sepsis
- Infective endocarditis
- Embolic phenomenon
  (e.g. stroke, septic pulmonary emboli, kidneys*)

*S. aureus positive urine culture

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**SAB: treatment duration**

*It depends…*
- Uncomplicated: 2 weeks
- Complicated: at least 4 weeks
- Endocarditis: at least 6 weeks

**Duration start**
- Date of negative blood culture and…
- Removal/control of source

*Example:*
- 7/14 positive blood cultures
- 7/15 no blood cultures drawn
- 7/17 negative blood cultures

*Source: SIDPEC website  IDSA MRSA Guideline: Clin infect Dis 2011 52(3)e18-55*
SCH Case 4 – *S. aureus* in the Urine

- 60 y/o male seen in ED for fevers/chills/malaise/flank pain
  - Abnormal UA—sent home on levofloxacin
  - Urine Culture positive for MRSA (48 h later)
  - Pharmacist sees alert
    - Identifies bug-drug mismatch
    - Team asks for assistance w/ MRSA-UTI management

- What questions/concerns do you have?

- Clinical course
  - Pt contacted and found to have MS changes/clinical decline
  - Pt later admitted to IMC: positive MRSA-blood culture
  - Diagnosed with MRSA bacteremia secondary to empyema

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*S. aureus* in the Urine

Risk factors for urinary source:
- **Urinary catheterization** → Foley, suprapubic, intermittent cath
- Invasive urinary tract procedure

Other mechanisms:
- Hematogenous seeding of the kidneys (*S. aureus* bacteremia)
  - Associated with high mortality!

**Teaching point**
- *S. aureus* in the urine (without urinary catheter or prior surgery) should prompt evaluation for bloodstream infection with blood cultures, especially if systemic signs/symptoms of infection
SCH Case 5

• 60 yo WM presented with fevers, chills, and back pain.
• Blood and Urine cultures on admission were positive for MRSA.
• Diagnosis – MRSA bacteremia secondary to UTI
• Discharge regimen – oral Bactrim

Questions? Concerns?

Clinical course
• Returns 6 weeks later to another facility with persistent back pain and LE weakness, neurogenic bladder
• Diagnosed with epidural abscess, taken to OR for decompression

Factors that can affect blood culture interpretation

• Clinical pre-test probability of bloodstream infection
• Influence of blood culture contaminant rate at each facility
• Blood culture interpretation
  • Interpretation of S. aureus from single site
  • Interpretation of “GPCs” from single vs. multiple sites
• Patient showing clinical improvement despite not receiving IV antibiotics for S. aureus bacteremia
Teaching Points/Summary

- Significance of “GPCs” on blood culture result
  Depends on pre-test probability/number of positive cultures
- *S. aureus* rarely a contaminant
  - High morbidity/complication risk
  - Positive urine culture may represent hematogenous source
  - Document clearance of bacteremia
  - Typically requires minimum of 14 days of targeted IV ABX therapy
    [Longer duration (4-8 weeks) if other clinical factors]

Final Pop Quiz:
Which of the following is likely to be a contaminant in blood?

- *S. aureus*
- *Candida*
- *S. pneumoniae*
- *Pseudomonas*
- *Enterobacteriaceae* (e.g. *E.coli, K.pneumoniae*)
- *Mycobacteria*
## Predictive value of positive blood culture

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Total Isolates</th>
<th>True Bloodstream Infection</th>
<th>Contaminant</th>
<th>Unknown Clinical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>a</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Coagulase-negative staphylococci</td>
<td>1005</td>
<td>105</td>
<td>10</td>
<td>828</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>338</td>
<td>315</td>
<td>93</td>
<td>4</td>
</tr>
<tr>
<td>Enterococcus spp.*</td>
<td>293</td>
<td>128</td>
<td>63</td>
<td>23</td>
</tr>
<tr>
<td>Viridans group streptococci</td>
<td>98</td>
<td>29</td>
<td>30</td>
<td>54</td>
</tr>
<tr>
<td>Streptococcus pneumonia</td>
<td>28</td>
<td>2b</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>β-hemolytic streptococci</td>
<td>52</td>
<td>31</td>
<td>93</td>
<td>0</td>
</tr>
<tr>
<td>Corynebacterium spp.</td>
<td>86</td>
<td>7</td>
<td>8</td>
<td>76</td>
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<tr>
<td>Bacillus spp.</td>
<td>33</td>
<td>0</td>
<td>9</td>
<td>33</td>
</tr>
<tr>
<td>Micrococcus spp.</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Lactobacillus spp.</td>
<td>50</td>
<td>6</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>Other Gram-positive bacteria</td>
<td>12</td>
<td>3</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>175</td>
<td>170</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>118</td>
<td>112</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>Enterobacter cloacae</td>
<td>66</td>
<td>43</td>
<td>93</td>
<td>0</td>
</tr>
<tr>
<td>Serratia marcescens</td>
<td>42</td>
<td>39</td>
<td>93</td>
<td>0</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>25</td>
<td>25</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Other Enterobacteriaceae</td>
<td>62</td>
<td>62</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>52</td>
<td>50</td>
<td>96</td>
<td>2</td>
</tr>
<tr>
<td>Stenotrophomonas maltophilia</td>
<td>11</td>
<td>8</td>
<td>73</td>
<td>0</td>
</tr>
<tr>
<td>Acinetobacter baumannii</td>
<td>15</td>
<td>10</td>
<td>67</td>
<td>0</td>
</tr>
<tr>
<td>Other Gram-negative bacteria</td>
<td>22</td>
<td>12</td>
<td>55</td>
<td>5</td>
</tr>
<tr>
<td>Clostridium spp.</td>
<td>25</td>
<td>16</td>
<td>64</td>
<td>6</td>
</tr>
<tr>
<td>Propionibacterium spp.</td>
<td>35</td>
<td>1</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Peptostreptococcus spp.</td>
<td>13</td>
<td>5</td>
<td>38</td>
<td>4</td>
</tr>
<tr>
<td>Other Gram-positive anaerobic bacteria</td>
<td>4</td>
<td>3</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>Bacteroides spp.</td>
<td>35</td>
<td>34</td>
<td>97</td>
<td>0</td>
</tr>
<tr>
<td>Other Gram-negative anaerobic bacteria</td>
<td>8</td>
<td>7</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>46</td>
<td>45</td>
<td>98</td>
<td>0</td>
</tr>
<tr>
<td>Candida glabrata</td>
<td>32</td>
<td>32</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Other Candida spp.*</td>
<td>30</td>
<td>30</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Other fungi</td>
<td>7</td>
<td>5</td>
<td>71</td>
<td>1</td>
</tr>
<tr>
<td>Microaerobacter spp.*</td>
<td>7</td>
<td>7</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>All microorganisms</td>
<td>2668</td>
<td>1364</td>
<td>51</td>
<td>1101</td>
</tr>
</tbody>
</table>

*Am J Med 2010;123:819*

### Questions?

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**Intermountain Healthcare**
Contact information: (ID Telehealth Service)

Infectious Diseases On-Call* (SCORE) Line:
• 801.50.SCORE (801.507.2673)
• (24/7/365 availability)

Todd Vento (Medical Director)
• Cell: 210.589.5418
• Desk: 801.507.9344
• todd.vento@imail.org

John Veillette (ID Tele-Pharmacist)
• Cell: 385.228.9549
• Desk: 801.507.9340
• john.veillette@imail.org

*On Call for all Intermountain Small Community Hospitals;
Separate on-call services for Medical Centers: IMC/LDSH/McKay-Dee/Utah Valley/Dixie

SCH Case 2

20 y/o M (chronic neuro condition requiring leg braces) presents to ED on 5/22 with bilateral foot ulcers draining purulent material and surrounding cellulitis
- T 37, HR 106, RR 16, BP 161/87; WBC 13,
- blood cultures drawn x2 sets + abscess culture;
- discharged on Augmentin (amoxicillin/clavulanate)

Micro Data (date of result)
5/22 Abscess cx – 4+ MSSA
Blood cx drawn
5/22
Set 1 – GPC clusters, 1/2 bottles
Set 2 – GPC clusters, 1/2 bottles
5/23 and 5/24
MSSA, 3/4 total bottles

Clinical course
- 5/25 Readmitted to hospital for IV abx