Secondary BSI Attribution: A Tale of Two Scenarios

LaTasha R. Powell RN, BSN, MPH, CIC
Infection Prevention Consultant

March 26, 2019
Common Misconceptions about Secondary BSI Attribution # 1

“If I have a positive site-specific culture and matching blood culture, the blood culture is automatically secondary.”
Common Misconceptions about Secondary BSI Attribution # 2

“If a physician documents that the positive blood culture is secondary to an infection, the positive blood culture can be deemed secondary.”
"I can deem a positive blood culture secondary to a present on admission (POA) infection even if the patient did not meet an NHSN criteria. "
Common Misconceptions about Secondary BSI Attribution # 4

“If I meet any NHSN site-specific infection, I can deem the positive blood culture secondary to this criterion.”
Objectives

- Apply foundational concepts from Chapter 2 and 4 regarding primary and secondary bloodstream infections (BSI’s)
- Identify the relationship between site-specific infections and secondary bloodstream infections
- Utilize Appendix B Secondary BSI Guide and reference table (Chapter 4)
- Apply the two Scenarios for secondary BSI attribution to case studies
Resources
Where to Locate Chapter 2 and Chapter 4?

Surveillance for Bloodstream Infections

Central Line-Associated Bloodstream Infection (CLABSI) and non-central line-associated Bloodstream Infection

Resources for NHSN Users Already Enrolled

Training

Protocols

For full details on protocol definitions and the application of these definitions, please review the applicable protocol and Chapter 2, Identifying Healthcare-associated Infection (HAI) for NHSN Surveillance in the NHSN Module.

- Bloodstream Infection (BSI) Event, January 2019 [PDF – 2 MB]
- NHSN Overview January, 2019 [PDF – 350 KB]
- Identifying Healthcare-associated Infections (HAIs) in NHSN, January 2019 [PDF – 1 MB]
- Patient Safety Monthly Reporting Plan, January 2019 [PDF – 250 KB]
### Misconception #4

### Table B1: Secondary BSI Guide: List of all NSBN primary site-specific definitions available for making secondary BSI determinations using Scenario 1 or Scenario 2

<table>
<thead>
<tr>
<th>Site</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>BONE</td>
<td>3</td>
</tr>
<tr>
<td>DR</td>
<td>2</td>
</tr>
<tr>
<td>CARD</td>
<td>3</td>
</tr>
<tr>
<td>CIRC</td>
<td>2 or 3</td>
</tr>
<tr>
<td>CONU</td>
<td>3</td>
</tr>
<tr>
<td>DECU</td>
<td>3</td>
</tr>
<tr>
<td>DISC</td>
<td>3</td>
</tr>
<tr>
<td>ESR</td>
<td>1, 3, 5, or 7</td>
</tr>
<tr>
<td>EMT</td>
<td>2</td>
</tr>
<tr>
<td>ENDO</td>
<td>3</td>
</tr>
<tr>
<td>EYE</td>
<td>1</td>
</tr>
<tr>
<td>GE</td>
<td>1</td>
</tr>
<tr>
<td>GIT</td>
<td>2, 29 (only yeast)</td>
</tr>
<tr>
<td>IAB</td>
<td>1 or 3a</td>
</tr>
<tr>
<td>IC</td>
<td>1</td>
</tr>
<tr>
<td>INT</td>
<td>1</td>
</tr>
<tr>
<td>LUNG</td>
<td>1</td>
</tr>
<tr>
<td>MED</td>
<td>3</td>
</tr>
<tr>
<td>MEN</td>
<td>1</td>
</tr>
<tr>
<td>ORL</td>
<td>1 or 3b</td>
</tr>
<tr>
<td>ORIP</td>
<td>3</td>
</tr>
<tr>
<td>PR</td>
<td>1</td>
</tr>
<tr>
<td>PTHU</td>
<td>2 or 3</td>
</tr>
<tr>
<td>SA</td>
<td>1</td>
</tr>
<tr>
<td>SIKU</td>
<td>1</td>
</tr>
<tr>
<td>SIS</td>
<td>5, 14 or OS</td>
</tr>
<tr>
<td>SKIN</td>
<td>2a</td>
</tr>
<tr>
<td>SS</td>
<td>2</td>
</tr>
<tr>
<td>SY</td>
<td>3</td>
</tr>
<tr>
<td>UMB</td>
<td>1a</td>
</tr>
<tr>
<td>UR</td>
<td>1a or 3a</td>
</tr>
<tr>
<td>USI</td>
<td>2</td>
</tr>
<tr>
<td>SUTI</td>
<td>15, 1b, or 2</td>
</tr>
<tr>
<td>VASC</td>
<td>3</td>
</tr>
<tr>
<td>VCUR</td>
<td>3</td>
</tr>
</tbody>
</table>

**Scenario 1**

A positive blood specimen must contain at least one eligible matching organism to the site-specific definition.

And the blood specimen is collected in the site-specific secondary BSI attribution period.

And an eligible organism identified from the site-specific specimen is used as an element to meet the site-specific definition.

**Scenario 2**

Positive blood specimen must be an element of the site-specific definition.

And blood specimen is collected in the site-specific infection window period.

And an eligible organism identified in a blood specimen is used as an element to meet the site-specific definition.
Figure B1: Secondary BSI Guide for eligible organisms*
(Not applicable to Ventilator-associated Events [VAE]. See Figure B2)

Positive blood specimen: Site-specific infection suspected as source

- Is the positive site-specific specimen used as an element to meet the infection site criteria?*

  - Yes
    - Positive blood specimen and site-specific specimen, which is collected during the secondary BSI attribution period, meet at least 1 organism?
      - Yes
        - STOP Secondary BSI
      - No
        - STOP Secondary BSI
  - No
    - Can the positive blood specimen, which is collected during the attribution window period, be used to meet the site-specific infection criteria?
      - Yes
        - STOP Secondary BSI
      - No
        - STOP Primary BSI

*Exceptions: The necrotizing enterocolitis (NEC) definition does not include criteria for a matching site-specific specimen nor an organism identified from a blood specimen, however an exception for assigning a BSI secondary to NEC is provided. A BSI is considered secondary to NEC of the patient must one of the two NEC criteria AND an organism identified from a blood specimen, collected during the secondary BSI attribution period, is an LCBI pathogen or the same common commensal is identified from 2 or more blood specimens drawn on separate occasions but on the same or consecutive days.
Surveillance for Bloodstream Infections
Central Line-Associated Bloodstream Infection (CLABSI) and non-central line-associated Bloodstream Infection

Resources for NHSN Users Already Enrolled

Supporting Material

- NHSN Patient Safety Component Alerts, [PDF - 1 MB]
- Unusual Susceptibility Profiles Alert January 2015, [PDF - 362 KB]
- CDC Location Labels and Location Descriptions, January 2019, [PDF - 1 MB]
- NHSN Key Terms, January 2019, [PDF - 350 KB]
- CDC/NHSN Surveillance Definitions for Specific Types of Infections, January 2019, [PDF - 1 MB]
- NHSN Organism List (All Organisms, Common Commensals, MBI Organisms, and UTI Bacteria), January 2019, [XML - 296 KB]
- Guidance for Missing Device-associated Denominator Data, [PDF - 145 KB]
HAI Checklists

The NHHSN Healthcare Associated Infections (HAI) checklists developed by the National Healthcare Network (NHHSN) subject matter experts (SMEs) were adapted from the Tennessee Department of Health HAI checklists. While the format may offer the intended use of the HAI checklists remains the same.

Our goal is to provide a tool to assist infection preventionists when making a determination about a healthcare-associated infection. The HAI checklists should be used to guide infection preventionists and other users towards a final determination when evaluating NHHSN HAI criteria. The checklist should not be used in isolation but in conjunction with the Patient Safety Manual.

Please note all criteria for each respective module is listed in a single document. Use the scroll bar to select the criterion of interest. It is our hope that the checklists will help streamline your surveillance efforts.

2019 NHHSN HAI Site Specific Infections

- NHHSN Laboratory Confirmed Bloodstream Infection (LCBS) Checklist
- NHHSN Pneumonia (PNEU) Checklist
- NHHSN Surgical Site Infection (SSI) Checklist
- NHHSN Urinary Tract Infection (UTI) Checklist
- NHHSN Ventilator Associated Event (VAP) Checklist

2019 NHHSN Chapter 17 Site Specific Infections

- NHHSN Bone and Joint Infection (BJI) Checklist
- NHHSN Cardiovascular (CVS) System Infection Checklist
- NHHSN Central Nervous System (CNS) Infection Checklist
- NHHSN Eye, Ear, Nose, Throat, or Mouth (ENT) Infection Checklist
- NHHSN Gastrointestinal System Infection (GI) Checklist
- NHHSN Lower Respiratory Infection (LRI) Checklist
- NHHSN Reproductive Tract Infection (RTI) Checklist

2019 NHHSN Bone and Joint Infection (BJI) Checklist

BONE-Osteomyelitis

Documentation/Review Checklist
BJI - Bone and Joint Infection

Osteomyelitis must meet at least one of the following criteria:
1. Patient has organization(s) identified from bone by culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis and treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)
   - AND
   - At least one of the following:
   a. Organism(s) identified from bone by culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis and treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)
   b. Imaging test evidence suggestive of infection (for example, x-ray, CT scan, MRI, radiolabelled scan [gallium, technetium, etc.]), which is equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for osteomyelitis.

Reporting instructions:
- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.
- If a patient meets both organ space INT and BONE report the SSI as BONE.
- If the patient meets both organ space PJ and BONE report the SSI as BONE.

*With no other recognized cause

https://www.cdc.gov/nhsn/hai-checklists/index.html
Primary BSI vs. Secondary BSI
Primary BSI versus Secondary BSI – What’s the Difference?

- **Primary BSI**
  - A Laboratory Confirmed Bloodstream Infection (LCBI) where an eligible BSI is identified and the BSI is not secondary to an infection at another body site
    - LCBI/ MBI-LCBI 1
    - LCBI/ MBI-LCBI 2
    - LCBI/ MBI-LCBI 3
  - Reportable to NHSN (if an eligible central line in place and part of the location’s monthly reporting plan)

- **Secondary BSI**
  - A bloodstream infection that is associated with a site-specific infection at another body site which may have seeded the bloodstream - Ex’s:
    - IAB 1 with a secondary BSI
    - PNEU with a secondary BSI
    - GIT 2c with a secondary BSI
  - **Not** reportable to NHSN as an LCBI
Primary BSI vs. Secondary BSI

- Primary BSI
- Secondary BSI

Secondary BSI
- SSI
- Site-specific Infections (Chapter 17)
- UTI
- PNEU
- VAE
Knowledge Check

- Primary BSI’s are reportable to NHSN if an eligible central line was in place and part of your monthly reporting plan.
  
  A. True
  
  B. False
Knowledge Check - Rationale

Correct Answer
A. True

• Primary BSI
  – A Laboratory Confirmed Bloodstream Infection (LCBI) where an eligible BSI is identified and the BSI is not secondary to an infection at another body site
    • LCBI/MBI-LCBI 1
    • LCBI/MBI-LCBI 2
    • LCBI/MBI-LCBI 3
  – Reportable to NHSN (if an eligible central line in place and part of the location’s monthly reporting plan)
Important Key Terms

- **Infection Window Period (IWP)**
  - 7-days during which all site-specific infection criteria must be met.
  - Collection date of the first positive diagnostic test that is used as an element to meet the site-specific infection criterion, the 3 calendar days before, and the 3 calendar days after

- **Repeat Infection Timeframe (RIT)**
  - 14-day timeframe during which no new infections of the same type are reported
Important Key Terms (cont.)

- **Secondary bloodstream infection attribution period (SBAP)**
  - The period in which a blood specimen must be collected for a secondary BSI to be attributed to a primary site of infection
  - Includes the Infection Window Period (IWP) combined with the Repeat Infection Timeframe (RIT)
  - 14-17 days in length depending upon the date of event
Endocarditis (ENDO) Criteria

- **ENDO Infection Window Period**
  - 21 days during which all site-specific infection criteria must be met
    - Date the first positive diagnostic test that is used as an element of the ENDO criterion was obtained, the 10 calendars days before, and the 10 calendar days after
Endocarditis (ENDO) Criteria (cont.)

- **ENDO RIT**
  - Extended to include the remainder of the patient’s current admission

- **ENDO SBAP**
  - Includes the 21-day infection window period and all subsequent days of the patient’s current admission
  - Limited to organism(s) identified in blood specimen that match the organism(s) used to meet the ENDO definition
Secondary BSI Concepts
Meeting the Secondary BSI Requirements

Scenario 1
At least one organism from the blood specimen matches an organism identified from the site-specific specimen that is used as an element to meet the NHSN site-specific infection criterion AND the blood specimen is collected during the secondary BSI attribution period (infection window period + repeat infection timeframe)

Scenario 2
An organism identified in the blood specimen is an element that is used to meet the NHSN site-specific infection criterion, and therefore is collected during the site-specific infection window period

Misconception #1
The **ONLY** Exception to the Secondary BSI Attribution Rules . . .

### NEC-Necrotizing enterocolitis

Necrotizing enterocolitis in infants (≤1 year of age) must meet one of the following criteria:

1. Infant has at least **one** of the clinical and **one** of the imaging test findings from the lists below:
   - **At least one clinical sign:**
     a. bilious aspirate** (see Note)
     b. vomiting
     c. abdominal distention
     d. occult or gross blood in stools (with no rectal fissure)
   
   **And at least one imaging test finding which if equivocal is supported by clinical correlation (specifically, physician documentation of antimicrobial treatment for NEC):**
     a. Pneumatosis intestinalis
     b. Portal venous gas (Hepatobiliary gas)
     c. Pneumoperitoneum
   **Note:** Bilious aspirate from a transpyloric feeding tube should be excluded

2. Surgical NEC: Infant has at least **one** of the following surgical findings:
   a. surgical evidence of extensive bowel necrosis (>2 cm of bowel affected)
   b. surgical evidence of pneumatosis intestinallis with or without intestinal perforation

### Exception Notes:

1. *The necrotizing enterocolitis (NEC) definition does not include criteria for a matching site-specific specimen nor an organism identified from a blood specimen that can be used as an element to meet the NEC criteria, however an *exception for assigning a BSI secondary to NEC* is provided.

2. A BSI is considered secondary to NEC if the patient meets one of the two NEC criteria AND an organism identified from a blood specimen, collected during the secondary BSI attribution period, is an LCBI pathogen, or the same common commensal identified from two or more blood specimens drawn on separate occasions that are on the same or consecutive days.
Important Secondary BSI Concept

- A positive blood culture on admission does NOT necessarily set a BSI RIT
  - 1/12: Patient admitted with positive blood culture *E. coli*
  - 1/21: Positive blood culture *S. aureus*

- Only primary BSIs set a 14-day BSI RIT

- Secondary BSIs do NOT- an RIT will be set for the primary type of infection

- It is necessary to determine if the *E. coli* BSI was primary or secondary to determine if the *S. aureus* BSI must be investigated as possible LCBI

Chapter 4, page 4-14
Example: POA BSI

1/12/18: 55-year-old patient admitted with fever (102.4°F) of unknown origin, work-up in progress. UA, Urine for C&S and blood cultures x 2 collected.

Results: Urine positive > 10⁵ CFU/ml E. coli, and 1 of 2 BCs positive for E. coli.

1/21/18: Repeat BC’s collected positive for S. aureus.

Refer to UTI in Resource Manual.
<table>
<thead>
<tr>
<th>Hospital Day/Date</th>
<th>First Diagnostic Test</th>
<th>Infection Window Period</th>
<th>Date of Event</th>
<th>Repeat Infection Timeframe</th>
<th>Secondary BSI Attribution Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/11/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. - 1/12/2018 - Admit Date</td>
<td>✓</td>
<td>UA + E. coli</td>
<td>Fever 102.4°F</td>
<td>POA</td>
<td>BC + E. coli</td>
</tr>
<tr>
<td>2. - 1/13/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. - 1/14/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. - 1/15/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. - 1/16/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. - 1/17/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. - 1/18/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. - 1/19/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. - 1/20/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. - 1/21/2018</td>
<td>✓ ✓</td>
<td>+BC S. aureus</td>
<td>HAI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. - 1/22/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. - 1/23/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. - 1/24/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. - 1/25/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. - 1/26/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. - 1/27/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Primary POA SUTI 1b non-catheter associated, DOE 1/12 secondary E. coli BSI**

**Primary HAI LCBI 1 with S. aureus, DOE 1/21**

**UTI RIT 1/12 – 1/25**

**BSI RIT 1/21 - 2/3**

**BC S. aureus X**
As Always, the Story Begins With...
Secondary Bloodstream Infections

Scenario 1
Secondary BSI Scenario 1

At least one organism from the blood specimen matches an organism identified from the site-specific specimen that is used as an element to meet the NHSN site-specific infection criterion AND the blood specimen is collected during the secondary BSI attribution period (infection window period + repeat infection timeframe)
Questions to Ask When Applying Scenario 1

- Does at least one organism in the blood culture match the organism in the site-specific specimen?
- Can the site-specific specimen be used to meet a site-specific criteria?
- Was the blood culture collected during the SBAP?

If the answer to all three questions is ‘Yes’, Scenario 1 can be applied.
# Matching Organisms Table

<table>
<thead>
<tr>
<th>Identification # 1</th>
<th>Identification # 2</th>
<th>Matching Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterobacter aerogenes</td>
<td>Enterobacter cloacae</td>
<td>No</td>
</tr>
<tr>
<td><strong>Enterococcus faecalis</strong></td>
<td>Enterococcus</td>
<td>Yes</td>
</tr>
<tr>
<td>Enterococcus faecium</td>
<td>Enterococcus faecalis</td>
<td>No</td>
</tr>
<tr>
<td>Pseudomonas species</td>
<td><strong>Pseudomonas aeruginosa</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Coagulase-negative Staphylococcus</td>
<td>Staphylococcus aureus</td>
<td>No</td>
</tr>
<tr>
<td><strong>Staphylococcus epidermidis</strong></td>
<td>Coagulase-negative Staphylococcus</td>
<td>Yes</td>
</tr>
<tr>
<td>Staphylococcus species</td>
<td>Coagulase-positive Staphylococcus</td>
<td>No</td>
</tr>
<tr>
<td>Streptococcus species</td>
<td><strong>Streptococcus Viridans Group</strong></td>
<td>No</td>
</tr>
<tr>
<td>Yeast</td>
<td><strong>Candida</strong> species</td>
<td>Yes</td>
</tr>
</tbody>
</table>
An Important Note about Scenario 1 . . .

- An organism in the positive blood culture must be eligible for use in the site-specific infection criteria
- Chapter 2, page 2-19

Pathogens excluded from specific infection definitions (for example, yeast in UTI, or Enterococcus spp. in PNEU) are also excluded as pathogens for BSIs secondary to that type of infection (specifically they cannot be added to one of these infections as a pathogen). The excluded organism must be accounted for as either:
  1) A primary bloodstream infection (BSI/CLABSI) (see Example 3)
  OR
  2) A secondary BSI attributed to another primary infection (for example, to an IAB or SINU), in accordance with Appendix B, Secondary BSI Guide of the BSI Event protocol (see Example 4)
“Scooping Orphans” - Blood Culture Guidance

- Pay close attention to your blood cultures!!!!
- If a single blood culture contains an organism that matches the site-specific specimen and an organism that does not match:
  - “Scoop up” the “orphaned” organism (non-matching organism)
  - The non-matching organism is only “scooped up” when there is a matching organism in the same blood specimen
- If there are subsequent blood cultures with only the orphaned organism (non-matching), you must assess the blood cultures for LCBI criteria
### "Scooping Orphans" - Example

<table>
<thead>
<tr>
<th>Hospital Day/Date</th>
<th>First Diagnostic Test</th>
<th>Infection Window Period (* )</th>
<th>Date of Event</th>
<th>Repeat Infection Timeframe (* )</th>
<th>Secondary BSI Attribution Period (* )</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. - 2/8/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. - 2/10/2019</td>
<td>✓</td>
<td>Fever - 101</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. - 2/11/2019</td>
<td>✓</td>
<td>Urine Culture - 100k Acinetobacter baumanii/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. - 2/12/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. - 2/13/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. - 2/14/2019</td>
<td>✓</td>
<td>Blood cx - Acinetobacter baumanii/ E. cloacae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. - 2/15/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. - 2/16/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. - 2/17/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. - 2/18/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. - 2/19/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. - 2/20/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. - 2/21/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. - 2/22/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Both organisms are deemed secondary to UTI**
Secondary BSI Scenario 1: CARD 1 Example

- 3/25 – 25 year-old female h/o Lupus nephritis admitted to Telemetry unit
- 3/30 – Pericardial fluid collected: *Streptococcus pneumoniae*
- 3/31 – Blood cultures collected: *Streptococcus pneumoniae* in both specimens
CARD 1 Rationale

CARD-Myocarditis or pericarditis

Myocarditis or pericarditis must meet at least one of the following criteria:

1. Patient has organism(s) identified from pericardial tissue or fluid by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)

- Pericardial fluid culture - Streptococcus pneumoniae
- Blood culture - Streptococcus pneumoniae
Secondary BSI Scenario 1: SKIN Example

- 9/12 – A forty year-old with a history of diabetes and IV heroin abuse is admitted to a medical unit. PICC placed on admission
- 9/14 – Pain reported in left forearm
- 9/15 – Fever: 101°F; Superficial draining wound cultured (not an IV site). Blood cultures collected
  - + MRSA skin culture
  - + MRSA blood culture x 1
- 9/18 – Erythema documented
What determination should be made in this case?

A. 9/15 SKIN 1 with a secondary BSI
B. 9/15 LCBI 1
C. 9/14 SKIN 2a and CLABSI
D. 9/14 SKIN 2a and secondary BSI
SKIN Example Rationale

Correct Answer
D. 9/14 SKIN 2a and secondary BSI

- SKIN 2a met on 9/14
  - 9/15 - Eligible skin specimen collected
  - SKIN IWP: 9/12 – 9/18
  - 9/14 Pain and 9/18 Erythema captured in IWP
  - RIT: 9/14 – 9/27
  - SBAP: 9/12 – 9/27
  - 9/15 - Matching MRSA blood culture
Secondary BSI Scenario 1: IAB Example

- 9/14 – 50 year old admitted to a medical unit with a blood glucose of 900!
  - PMH: Diabetes, HTN, diverticulosis
  - PICC placed
- 9/18 CT scan: “Intra-abdominal abscess”. Blood cultures negative
  - IR drainage: 200 cc purulent drainage.
    - Abscess culture: E. cloacae
- 9/28 – 101°F. Blood culture: Enterococcus faecalis (Vancomycin Resistant)
What Determination Should Be Made In This Case?

A. 9/18 HAI IAB 1 w/secondary BSI (VRE)
B. 9/28 CLABSI
C. 9/18 HAI IAB 1 and 9/28 CLABSI
D. 9/18 IAB 2b
IAB Example Rationale

Correct Answer
C. 9/18 HAI IAB 1 and 9/28 CLABSI

- **HAI IAB 1 met 9/18**
  - 9/18 – Abscess Culture – E. cloacae
  - IAB IWP 9/15 – 9/21
  - HAI IAB RIT: 9/18 – 10/1
  - SBAP: 9/15 – 10/1

- **9/28 – E. faecalis (VRE) CLABSI**
  - Non-matching organism
  - No site-specific source
Secondary Bloodstream Infections

Scenario 2
Secondary BSI Scenario 2

Scenario 2
An organism identified in the blood specimen is an element that is used to meet the NHSN site-specific infection criterion, and therefore is collected during the site-specific infection window period.

Organism in the blood is an element used to meet the primary-site infection criterion

Blood specimen is collected in the IWP (or surveillance period if a surgical site infection or SSI)
Questions to Ask When Applying Scenario 2

Can I use the blood as an element to cite an infection criteria?

Was the blood collected during the IWP?

If the answer to the two questions is ‘Yes’, Scenario 2 can be applied.
Secondary BSI Scenario 2: BONE 3a

- 1/22 – 60 year old male admitted with a right lower leg wound
- 1/24 – Right lower leg pain documented
- 1/26 – 102°F
- 1/27 – Staph aureus blood cultures × 2; Vancomycin initiated
- 1/28 – MRI: “Findings compatible with diffuse tibial osteomyelitis”

**BJ-BONE AND JOINT INFECTION**

**BONE-Osteomyelitis**

Osteomyelitis must meet at least one of the following criteria:

1. Patient has organism(s) identified from bone by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis and treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
2. Patient has evidence of osteomyelitis on gross anatomic or histopathologic exam.
3. Patient has at least two of the following localized signs or symptoms: fever (>38.0°C), swelling*, pain or tenderness*, heat*, or drainage*

And at least one of the following:

a. organism(s) identified from bone by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis and treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)
   AND
   imaging test evidence suggestive of infection (for example, x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for osteomyelitis.

b. imaging test evidence suggestive of infection (for example, x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for osteomyelitis.

* With no other recognized cause
### Secondary BSI Scenario 2: BONE 3a

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/22</td>
<td>60 year old male admitted with a right lower leg wound</td>
</tr>
<tr>
<td>1/24</td>
<td>Right lower leg pain documented</td>
</tr>
<tr>
<td>1/26</td>
<td>102°F</td>
</tr>
<tr>
<td>1/27</td>
<td>Staphylococcus aureus blood cultures x 2; Vancomycin initiated</td>
</tr>
<tr>
<td>1/28</td>
<td>MRI: “Findings compatible with diffuse tibial osteomyelitis”</td>
</tr>
</tbody>
</table>

**Organism in the blood is an element used to meet the primary-site infection criterion**

**Blood specimen is collected in the IWP (or surveillance period if a surgical site infection or SSI)**
Secondary BSI Scenario 2: BURN  Example

- 4/1 – 70-year old man admitted to the BURN unit with a 2nd degree burn to the right chest
- 4/3 – PICC placed
- 4/8 – Only nurse’s note: “New purple-colored eschar noted on right chest wound.”
- 4/12 – 102°F; Blood cultures collected;
  - Blood culture: Staphylococcus aureus
  - Vancomycin started
- 4/20 – Right chest wound healing. Discharged
What Determination Should Be Made In This Case?

A. No infection identified
B. 4/8 BURN 1 with a secondary BSI
C. 4/12 LCBI 1
D. 4/12 CLABSI

**BURN-Burn infection**

Burn infections must meet the following criteria:

1. Patient has a change in burn wound appearance or character, such as rapid eschar separation, or dark brown, black, or violaceous discoloration of the eschar, **AND**
   - Organism(s) identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
BURN 1 Rationale

- **4/12 CLABSI**
  - Staphylococcus aureus blood culture = LCBI 1
  - Eligible central line in place on 4/12.

- **BURN 1 not met**
  - Blood culture and change in eschar **cannot** be captured in the same IWP.
Secondary BSI Scenario 2: IAB Example

- 6/3 – 45-year old was admitted with diabetes, a gangrenous foot, and inflammatory bowel disease.
- 6/4 – AMP performed
- 6/12 – 103°F and Blood cultures collected
  - Positive Clostridium sp. blood culture
- 6/13 – CT scan: “RLQ abscess”
- 6/15 – Hypotension

**Note:** No signs or symptoms of a surgical-site infection
Is the Clostridium Blood Culture Secondary to IAB?

- A. Yes
- B. No

Intraabdominal infections must meet at least one of the following criteria:

1. Patient has organism(s) identified from an abscess or from purulent material from intraabdominal space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).

2. Patient has at least one of the following:
   a. abscess or other evidence of intraabdominal infection on gross anatomic or histopathologic exam
   b. abscess or other evidence of intraabdominal infection on gross anatomic or histopathologic exam
      AND
      organism(s) identified from blood by a culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

3. Patient has at least two of the following: fever (>38.0°C), hypotension, nausea*, vomiting*, abdominal pain or tenderness*, elevated transaminase level(s)*, or jaundice

And at least one of the following:

a. organism(s) seen on Gram stain and/or identified from intraabdominal fluid or tissue obtained during invasive procedure or from an aseptically-placed drain in the intraabdominal space (for example, closed suction drainage system, open drain, T-tube drain, CT guided drainage) by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)

b. organism(s) identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism (See Appendix A of the BSI protocol)

AND

imaging test evidence suggestive of infection (for example, ultrasound, CT scan, MRI, ERCF, radionuclear scans [gallium, technetium, etc.] or CA abdominal x-ray), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for intraabdominal infection.

* With no other recognized cause
IAB 3b Rationale

- Yes!
- IAB 3b met, 6/12
- 6/9 – 6/15 IAB IWP (created by positive blood culture)
  - 6/12 - Fever
  - 6/13 – Imaging suggestive of infection
  - 6/15 – Hypotension
- RIT: 6/12 – 6/25
- SBAP: 6/9 – 6/25
Pathogen Assignment – Attributing a Positive Blood Culture to More Than One Infection

- An organism may be attributed as secondary to more than 1 type of infection
- Example
  - Chapter 4, page 4-40
Re-meeting an NHSN Site-Specific Infection to Capture Non-Matching Organisms

- HAI IAB 1 met 9/18
  - 9/18: Abscess Culture – E. cloacae
  - IAB IWP 9/15 – 9/21
  - HAI IAB RIT: 9/18 – 10/1
  - SBAP: 9/15 – 10/1

- HAI IAB 3b also met 9/25 within 9/18 – 10/1 IAB RIT
  - 9/25 – 10/1 IAB IWP (created by eligible Blood culture)
  - Fever, hypotension and eligible CT scan captured within IWP

Non-matching organism in blood also deemed secondary to IAB
About VASC and Secondary BSI Attribution...

- A BSI can only be secondary to an organ space SSI-VASC

BSI Chapter 4, Page 4-36
Case Studies
Case Study 1

- 9/12 – 25-year old admitted with severe right jaw pain due to a tooth abscess. 102°F. Patient attempted to treat abscess at home with antibiotics left over from a sinus infection. Negative blood cultures on admission. Poor venous access. PICC placed.

  - Oral cavity – Prevotella and Streptococcus viridans

- 9/16 – Blood cultures collected – MRSA x 2
Can the 9/16 MRSA Blood Cultures Be Deemed Secondary?

A. Yes

B. No

ORAL-Oral cavity infection (mouth, tongue, or gums)

Oral cavity infections must meet at least one of the following criteria:

1. Patient has organism(s) identified from abscess or purulent material from tissues of oral cavity by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
2. Patient has an abscess or other evidence of oral cavity infection found on invasive procedure, gross anatomic exam, or histopathologic exam.
3. Patient has at least one of the following signs or symptoms with no other recognized cause: ulceration, raised white patches on inflamed mucosa, or plaques on oral mucosa.

And at least one of the following:

a. virus identified from mucosal scrapings or exudate by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)

b. multinucleated giant cells seen on microscopic examination of mucosal scrapings or exudate

c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for organism.

d. fungal elements seen on microscopic exam of mucosal scrapings or exudate (for example, Gram stain, KOH )

e. physician initiates antimicrobial therapy within 2 days of onset or worsening of symptoms.

Reporting instruction

- Report healthcare-associated primary herpes simplex infections of the oral cavity as ORAL; recurrent herpes infections are not healthcare associated.
Case Study 1 Rationale

- 9/13 ORAL 1 cited
  - 9/10 – 9/16 ORAL 1 IWP
  - 9/13 – 9/26 ORAL 1 RIT
  - 9/10 – 9/26 ORAL 1 SBAP

- 9/16 MRSA CLABSI cited
  - MRSA, non-matching organism
  - No other site-specific source
  - Eligible central line in place on 9/16
Case Study 2

- April 1 - Patient admitted with fever and abdominal pain
- April 2 - PICC placed
- April 4 - US guided drainage of 4L purulent peritoneal fluid, positive for *Enterobacter cloacae* and *Proteus mirabilis*.
- April 10 - Abdominal pain increased
- April 11 – CT Scan: multiple liver abscesses. Blood cultures x 2 positive *C. albicans* and *Morganella sp.*
- April 13 – Jaundice. Fever 101.2°F
What Determination Should Be Made in this Case?

A. CLABSI
B. SSI-IAB 1 with secondary BSI
C. IAB with secondary BSI

Intraabdominal infections must meet at least one of the following criteria:

1. Patient has organism(s) identified from an abscess or from purulent material from intraabdominal space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).

2. Patient has at least one of the following:
   a. abscess or other evidence of intraabdominal infection on gross anatomic or histopathologic exam.
   b. abscess or other evidence of intraabdominal infection on gross anatomic or histopathologic exam
   AND
   organism(s) identified from blood by a culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

3. Patient has at least two of the following: fever (>38.0°C), hypotension, tachycardia, vomiting, abdominal pain or tenderness, elevated transaminase level(s), or jaundice

And at least one of the following:

a. organism(s) seen on Gram stain and/or identified from intraabdominal fluid or tissue obtained during invasive procedure or from an aseptically-placed drain in the intraabdominal space (for example, closed suction drainage system, open drain, T-tube drain, CT guided drainage) by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).

b. organism(s) identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

AND

imaging test evidence suggestive of infection (for example, ultrasound, CT scan, MRI, ERCP, radionuclide scans [gallium, technetium, etc.] or on abdominal x-ray), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for intraabdominal infection.

* With no other recognized cause
Case Study 2 Rationale

- 4/4 IAB 1 cited
- 4/10 IAB 3b also cited (during 4/4 IAB RIT)
  - 4/10 Abdominal pain
  - 4/11 – CT scan – “Multiple abscess and C. albicans and Morganella blood cultures
  - 4/13 – Jaundice. 101°F

Note: Only 4/4 IAB is reported

Example of Re-meeting criteria to capture non-matching organisms.
Case Study 3

- July 4 – 30 year old admitted with ulcerative colitis. Severe abdominal pain reported. PMH of heroin IV drug abuse.
- July 5 – PICC placed after PIV dislodged.
- July 9 – Nausea, vomiting and increased abdominal pain
- July 12 - MD note: “Pseudomonas blood cultures secondary to colonic source”.
What Determination Should Be Made In This Case?

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least one of the following criteria:

1. Patient has one of the following:
   a. an abscess or other evidence of gastrointestinal tract infection on gross anatomic or histopathologic exam.
   b. abscess or other evidence of gastrointestinal tract infection on gross anatomic or histopathologic exam

   AND

   organism(s) identified from blood by a culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

2. Patient has at least two of the following signs or symptoms compatible with infection of the organ or tissue involved: fever (>38.0°C), nausea*, vomiting*, pain or tenderness*, odynophagia*, or dysphagia*

   And at least one of the following:
   a. organism(s) identified from drainage or tissue obtained during an invasive procedure or from drainage from an aseptically-placed drain by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
   b. organism(s) seen on Gram stain or fungal elements seen on KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during an invasive procedure or from drainage from an aseptically-placed drain.
   c. organism(s) identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

   AND

   imaging test evidence suggestive of gastrointestinal infection (for example, endoscopic exam, MRI, CT scan), which is equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for gastrointestinal tract infection.

   d. imaging test evidence suggestive of infection (for example, endoscopic exam, MRI, CT scan), which is equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for gastrointestinal tract infection.

Intrabdominal infections must meet at least one of the following criteria:

1. Patient has organism(s) identified from an abscess or from purulent material from intrabdominal space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).

2. Patient has at least one of the following:
   a. abscess or other evidence of intrabdominal infection on gross anatomic or histopathologic exam.
   b. abscess or other evidence of intrabdominal infection on gross anatomic or histopathologic exam

   AND

   organism(s) identified from blood by a culture or non-culture based microbiologic testing method, which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

3. Patient has at least two of the following: fever (>38.0°C), hypotension, nausea*, vomiting*, abdominal pain or tenderness*, elevated transaminase level(s)*, jaundice*

   And at least one of the following:
   a. organism(s) seen on Gram stain and/or identified from intrabdominal fluid or tissue obtained during invasive procedure or from an aseptically-placed drain in the intrabdominal space (for example, closed suction drainage system, open drain, T-tube drain, CT guided drainage) by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
   b. organism(s) identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST). The organism(s) identified in the blood must contain at least one MBI organism. (See Appendix A of the BSI protocol)

   AND

   imaging test evidence suggestive of infection (for example, ultrasound, CT scan, MRI, ERCP, radionuclide scan [gallium, technetium, etc.] or on abdominal x-ray), which is equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for intrabdominal infection. *

* With no other recognized cause
What Determination Should Be Made In This Case?

A. 7/9 IAB (intra-abdominal infection) with secondary BSI
B. 7/9 GIT (gastrointestinal infection) with secondary BSI
C. 7/10 CLABSI
D. 7/10 OREP (reproductive infection) with secondary BSI
Case Study 3 Rationale

- July 4 – 30 year old admitted with ulcerative colitis. Severe abdominal pain reported. PMH of heroin IV drug abuse.
- July 5 – PICC placed after PIV dislodged.
- July 9 – Nausea, vomiting and increased abdominal pain
- July 10 – 102°F.
  - Continued abdominal pain.
  - CT scan – “Dilatation pronounced in the transverse colon”.
  - Blood cultures collected- Pseudomonas x 2.
- July 12 - MD note: “Pseudomonas blood cultures secondary to colonic source”.

IAB, GIT 2c, OREP not met

Eligible symptoms 7/9 and 7/10 to meet GIT 2c (only two required)

Imaging finding not suggestive of infection or equivocal

CLABSI, 7/10

MD documentation cannot be used to apply Secondary BSI attribution

Miscarriage #2
When Submitting a Secondary BSI Case to NHSN, Please Send the Following:

- Site specific infection under consideration (for example Chapter 17 infections, SSI, UTI, PNEU)
- Supporting documentation (for example any positive blood cultures, imaging results, or sign/symptoms and associated dates if applicable)
- Date(s) and results of any positive blood cultures
- All organisms identified in the blood culture(s) (include information on whether or not the organisms are in the same blood culture or two separate blood cultures)
- Any information on recent NHSN surgical procedures (including the operative report and any imaging performed)
Summary

- There are only 2 ways to make a secondary BSI determination:
  1. **Scenario 1**: Organism in the site-specific specimen is used to meet criteria, and the blood, collected in the secondary BSI attribution period matches at least one site-specific organism.
  2. **Scenario 2**: Organism identified in the blood specimen is used as an element to meet the site-specific infection criterion, and therefore must be collected in the IWP.

- If neither scenario is met, the BSI is a primary infection. The only exception to this rule is when NEC criteria are met.

- POA BSIs must be investigated when a subsequent positive blood specimen is identified within 14 days-otherwise an incorrect determination can be made.
  - Only a primary BSI creates a 14 day BSI RIT
Summary continued…

- Blood specimens occurring in the SBAP must contain at least one matching organism to the site-specific specimen that was used to meet the definition initially, otherwise it must be investigated as being primary or secondary in nature.
  - Sometimes a patient will meet more than 1 criterion for a type of infection. If this occurs, consider all potential IWPs to identify possible primary sites of BSIs.

- The training videos, quick reference tools and the worksheet generator on the NHSN website are valuable resources that can improve your understanding of HAI surveillance, the application of the NHSN definitions and NHSN reporting.
Resources for Secondary BSI Attribution

- Chapter 2: Identifying Healthcare-associated Infections (HAI) for NHSN Surveillance
  https://www.cdc.gov/nhsn/pdfs/pscmanual/2psc_identifyinghais_nhsncurrent.pdf

  https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf

- Chapter 17: Surveillance Definitions for Specific Types of Infections
Thank You
For questions email
NHSN@cdc.gov