Distinguishing Secondary From Primary Bloodstream Infections in NHSN

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Objectives

1. Identify the relationship of site-specific infections to secondary bloodstream infections (BSI)

2. Review Secondary BSI Guide and apply to educational case studies
Agenda

- Define “primary” bloodstream infection
- Review the Secondary Bloodstream Infection (BSI) Guide
  - Scenario 1
  - Scenario 2
- Practice applying Secondary BSI Guide to case scenarios
Bloodstream Infections (BSI) Reported to NHSN

- Must be primary in nature
- CANNOT be secondary to another site of infection

- Primary bloodstream infection: “Organism(s) identified in blood is not related to an infection at another site. (See Appendix B Secondary BSI Guide)”
Why is it important to distinguish primary from secondary BSIs when performing CLABSI surveillance?

A. Secondary BSIs are easier to prevent than primary BSIs.

B. Central line insertion and maintenance practices can influence the incidence of primary BSIs that are central line-associated.

✔ B. Central line insertion and maintenance practices can influence the incidence of primary BSIs that are central line-associated.
APPENDIX B. Secondary Bloodstream Infection (BSI) Guide

To determine a BSI is secondary to another source of infection:

- An NHSN site-specific infection must be met
  - UTI, PNEU, SSI, VAE (2 scenarios below don’t apply to VAE), or one of the infections defined in Chapter 17,
  AND
- One of the following 2 scenarios must be met:
APPENDIX B. Secondary Bloodstream Infection (BSI) Guide

- **Scenario 1**: At least one organism from the blood specimen matches an organism identified from the site-specific infection 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).

OR

- **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.
Secondary Bloodstream Infections
Scenario 1
Secondary Bloodstream Infection (BSI) Scenario 1

- At least one organism from the blood specimen matches an organism identified from the site-specific infection 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
  - Blood specimen organism matches at least one organism found in a site-specific infection specimen
  - Site specific specimen organism is used to meet the primary site infection criterion
  - Blood specimen has a collection date within the secondary bloodstream infection attribution period
Secondary BSI Scenario 1

- Blood specimen organism matches at least one organism found in a site-specific infection specimen
- Site specific specimen organism is used to meet the primary site infection criterion

Ex: A breast abscess or mastitis must meet at least one of the following criteria:

1. Patient has **organisms identified from affected breast tissue or fluid** obtained by invasive procedure by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
### Secondary BSI Scenario 1

<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>
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<tbody>
<tr>
<td>1/12/2017</td>
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<td>3. · 1/15/2017</td>
<td>✓</td>
<td>✓</td>
<td>Drainage from breast: Staphylococcus aureus</td>
<td>HAI</td>
<td>Blood culture with S. aureus collected during this time</td>
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</table>
Secondary BSI Scenario 1

- The organisms in the blood cannot be an excluded organism for that site-specific infection

Ex: Urinary Tract Infection (UTI)

The NHSN UTI criteria cannot be met with *Candida glabrata*, a fungus, as the only organism. Therefore a BSI with *C. glabrata* cannot be secondary to UTI.
What other types of NHSN infection definitions have organism exclusions?

A. MEN (meningitis or ventriculitis)
B. Ventilator-associated Events
C. Pneumonia
D. Both VAE and Pneumonia

✔ D. Both VAE and Pneumonia
Secondary Blood Stream Infections
Scenario 2
Secondary BSI 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.

  - Identification of an organism in a blood specimen is an element of the infection criterion that is met
  - Blood specimen has a collection date within the infection window period (or SSI surveillance period if SSI)
Secondary BSI Scenario 2

- Identification of an organism in a blood specimen *is an element of the infection criterion* that is met

  - **Collection date** within the infection window period

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**Ex: Intraabdominal infection (IAB):**

1. Patient has at least one of the following:
   …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 (e.g., 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.
# Secondary BSI Scenario 2

<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>
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<td>12. - 2/12/2017</td>
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<tr>
<td>13. - 2/13/2017</td>
<td>✓</td>
<td>Blood culture collected: E faecalis</td>
<td>HAI</td>
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<td>14. - 2/14/2017</td>
<td>✓</td>
<td>Intra-abdominal abscess identified during surgical procedure</td>
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Intra-abdominal abscess (2b) with secondary BSI
In order for the NHSN Secondary BSI rule to be applied, the site specific infection definition must be met using either **Scenario 1** or **Scenario 2** below:

<table>
<thead>
<tr>
<th>Blood Specimen</th>
<th>Scenario 1</th>
<th>OR</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood specimen must contain at least one matching organism of the site specific specimen</td>
<td></td>
<td></td>
<td>Blood specimen must be an element of the site specific specimen</td>
</tr>
<tr>
<td>And is collected in the secondary BSI attribution period</td>
<td></td>
<td></td>
<td>And is collected during the site specific infection’s infection window period</td>
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<tr>
<td>And an organism identified from the site specific infection is used as an element to meet the site specific infection criterion</td>
<td></td>
<td></td>
<td>And an organism identified in the blood specimen is an element that is used to meet the site-specific infection criterion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>See appropriate site specific infection to determine if criterion are met</th>
<th>Site</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABUTI</td>
<td>ABUTI</td>
<td></td>
</tr>
<tr>
<td>BONE</td>
<td>1</td>
<td></td>
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<tr>
<td>BRST</td>
<td>1</td>
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<tr>
<td>CARD</td>
<td>1</td>
<td></td>
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<tr>
<td>CIRC</td>
<td>2 or 3</td>
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<td>CONJ</td>
<td>1</td>
<td></td>
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<tr>
<td>DECU</td>
<td>1</td>
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<tr>
<td>DISC</td>
<td>1</td>
<td></td>
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<tr>
<td>EAR</td>
<td>1, 3, 5 or 7</td>
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<tr>
<td>EMET</td>
<td>1</td>
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<td>ENDO</td>
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<td>ERE</td>
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<tr>
<td>Site</td>
<td>Criterion</td>
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<tr>
<td>BONE</td>
<td>3a</td>
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<td>BURN</td>
<td>1</td>
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<tr>
<td>DISC</td>
<td>3a</td>
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<tr>
<td>ENDO</td>
<td>4a, 4b, 5a or 5b (specific organisms) 6e or 7e plus other criteria as listed</td>
<td></td>
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<tr>
<td>GIT</td>
<td>2c</td>
<td></td>
</tr>
<tr>
<td>IAB</td>
<td>2b or 3b</td>
<td></td>
</tr>
<tr>
<td>JNT</td>
<td>3c</td>
<td></td>
</tr>
<tr>
<td>MEN</td>
<td>2c or 3c</td>
<td></td>
</tr>
<tr>
<td>ORFR</td>
<td>3a</td>
<td></td>
</tr>
</tbody>
</table>
Using the section of Table B1 provided on the previous page, if I suspect that a BSI is secondary to a BRST infection, there must be a matching organism from the breast specimen.

A. True
B. False

Since BRST is not found under Scenario 2, Scenario 1 is the only possible way for a BSI to be secondary to a BRST infection.
Secondary BSI Scenarios

- What if NEITHER Secondary BSI Scenario 1 nor 2 is met?
  - It’s a primary BSI

Ex: Patient with needle aspirate from decubitus ulcer margin is + for *E. coli* (Day 13). Patient has swelling of wound edges and erythema (Day 13). Patient meets DECU criterion 1. The patient spikes a fever 7 days later and blood culture collected is “+” for *S. aureus*. Because the organisms from the site and blood cultures do not match (scenario 1) and no site-specific criterion that includes positive blood culture as an element is met (scenario 2), requirements for both a site-specific infection (DECU with *E. coli*) and a primary BSI (with *S. aureus*) are met.
DECU Criterion

Decubitus ulcer infections must meet the following criterion:

1. Patient has at least two of the following signs or symptoms: erythema*, tenderness*, or swelling of decubitus wound edges*, AND

Organisms identified from needle aspiration of fluid or biopsy of tissue from ulcer margin by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
Figure B1: Secondary BSI Guide for eligible organisms†‡
(Not applicable to Ventilator-associated Events [VAE], See 5)

Scena 1

Yes

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?*

Positive blood specimen and site-specific specimen, which is collected during the secondary BSI attribution period, match for at least 1 organism?

STOP: Secondary BSI

No

Can the positive blood specimen, which is collected during the infection window period, be used to meet the site-specific infection criteria?

Yes

STOP: Secondary BSI

No

STOP: Primary BSI

Scenario 2
One Exception to Not Meeting Scenario 1 or 2 but BSI is Secondary

- Exception: Necrotizing enterocolitis (NEC) criteria include neither a site-specific specimen nor organism identified from blood specimen, however an exception for assigning a BSI secondary to NEC is provided. A BSI is considered secondary to NEC if the patient meets one of the 2 NEC criteria AND an organism identified from 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 on the same or consecutive days.
Resource - Quick Learn Video

- CLABSI Training (CBT - 60 min)
  - YouTube link - CLABSI Definition and Case Studies
  - CDC Streaming Video - CLABSI Definition and Case Studies
  - Slide set - CLABSI Definition and Case Studies (PDF - 5 MB)
- New! CLABSI Definition and Case Studies - March 2016 [Video - 72 min]
  - YouTube link - CLABSI Definition and Case Studies
  - CDC Streaming Video - CLABSI Definition and Case Studies
  - Slide set - CLABSI Definition and Case Studies (PDF - 5 MB)
- New! Secondary BSI, Site-Specific Infection Definitions - March 2016 [Video - 61 min]
  - YouTube link - Secondary BSI, Site-Specific Infection Definitions
  - CDC Streaming Video - Secondary BSI, Site-Specific Infection Definitions
  - Slide set - Secondary BSI, Site-Specific Infection Definitions (PDF - 2 MB)
- New! Secondary Bloodstream Infections May 2016 [Video - 9 min]
  - YouTube link - Secondary Bloodstream Infections
  - CDC Streaming Video - Secondary Bloodstream Infections
- New! Patient Safety Component (PSC) Annual Survey January 2016 [Video - 6 min]
  - YouTube link - Completing the 2015 Facility Survey
  - CDC Streaming Video - Completing the 2015 Facility Survey
- BSI Definition Changes for January 2015 [Video - 14 min]
  - YouTube link
  - CDC Streaming Video

Additional Training
- Introduction to Device-associated Module Training (CBT - 60 min)
- New! General NHSN Definitions: Rules, Tools, Re-tools - March 2016 [Video - 57 min]
  - YouTube link - General NHSN Definitions: Rules, Tools, Re-tools
  - CDC Streaming Video - General NHSN Definitions: Rules, Tools, Re-tools
  - Slide set - General NHSN Definitions: Rules, Tools, Re-tools (PDF - 3 MB)
- New! NHSN Definition and Rules Changes for January 2016 [Video - 8 min]
  - YouTube link - NHSN Definition and Rules Changes
  - CDC Streaming Video - NHSN Definition and Rules Changes
Case Studies
Joe Mama

- February 2: 55-year old man admitted with complaints of right knee pain, swelling, stiffness, and fever. Abrasion to right knee from floor during basketball game 5 days earlier is scabbed and without drainage. Cloudy fluid aspirated from knee joint today and sent for culture. Admit for IV antibiotics.
- February 3: Joint cultures positive for *S. aureus*.
- February 4: Patient fever continues, and WBCs continue to increase, now at 20,000 WBC/µL. Blood cultures are collected and final results are positive for methicillin-resistant *S. aureus*.
Does Joe Mama have a Laboratory Confirmed Bloodstream Infection?

A. Yes. This LCBI was identified on hospital day 3, therefore this is an LCBI.

B. No. This LCBI is secondary to JNT (joint or bursa infection).
Joe Mama - Rationale

JNT-Joint or bursa infection (not for use as Organ/Space SSI after HPRO or KPRO procedures)

Joint or bursa infections must meet at least one of the following criteria:

1. Patient has organisms identified from joint fluid or synovial biopsy by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis and treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
2. Patient has evidence of joint or bursa infection on gross anatomic or histopathologic exam.
3. Patient has at least two of the following: swelling*, pain* or tenderness*, heat*, evidence of effusion*, or limitation of motion*.

And at least one of the following:
   a. elevated joint fluid white blood cell count (per reporting laboratory’s reference range) OR positive leukocyte esterase test strip of joint fluid
   b. organisms and white blood cells seen on Gram stain of joint fluid
   c. organisms identified from blood by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis and treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
   d. imaging test evidence suggestive of infection (e.g., x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]), which if equivocal is supported by clinical correlation (i.e., physician documentation of antimicrobial treatment for joint or bursa infection).

* With no other recognized cause
# Joe Mama-Rationale

## Criteria

<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>
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<tbody>
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<tr>
<td>1. 2/2/2017 - Admit Date</td>
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<td>2. 2/3/2017</td>
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<td>3. 2/4/2017</td>
<td>Blood culture collection (positive for S. aureus)</td>
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- **JNT criterion 3c**
- **JNT criterion 1**
Ima Patient

- January 16: 67-year old female is admitted for abdominal hysterectomy. Ms. Patient suffers intraoperative cerebrovascular accident and is admitted to neurological ICU and placed on a ventilator.

- January 31: Ms. Patient remains on a ventilator and spikes a fever to 38.1°C. Her WBCs are elevated at 15,000 WBCs/μl. Her breath sounds are coarse. She produces a small amount of white sputum, and her chest x-rays show some pulmonary edema, but no evidence of pneumonia. Patient grimaces on suprapubic palpation. Vaginal exam performed and purulent drainage noted at vaginal cuff. Vaginal cuff, blood, and urine cultures are collected.
Ima Patient

- February 2: Final results of urine cultures are negative, but both sets of blood cultures are positive for *Acinetobacter baumannii*, and culture of pus from vaginal cuff is positive for Group B *Streptococcus*.
Does Ms. Patient have an LCBI?

A. No. This patient has a VCUF (vaginal cuff) infection with secondary BSI.

B. Yes. This patient has an LCBI.

C. Yes. This patient has both an LCBI and a surgical site infection (organ space-VCUF).
VCUF-Vaginal cuff infection

Vaginal cuff infections must meet at least one of the following criteria:

1. Post hysterectomy patient has purulent drainage from the vaginal cuff on gross anatomic exam.

2. Post hysterectomy patient has an abscess or other evidence of infection at the vaginal cuff on gross anatomic exam.

3. Post hysterectomy patient has organisms identified from fluid or tissue obtained from the vaginal cuff by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).

Reporting instruction
- Report vaginal cuff infections as SSI-VCUF.
Miss Demeaner

- May 4: 45-year old with colon cancer admitted and undergoes colectomy. Patient’s tunneled central line for hemodialysis is accessed today in the unit.
- May 9: Patient has nausea, vomiting, increase in abdominal pain, and fever of 38.3°C. Blood cultures are collected, and are positive for *Candida albicans*.
- May 10: Pain and fever continue. Patient has 2 episodes of vomiting. CT scan of abdomen shows, small bowel obstruction. Physician documents that source of positive blood cultures is the gastrointestinal tract.
A. Yes. She has an LCBI 1.
B. No. She has an SSI-IAB (intraabdominal infection) with secondary BSI.
C. No. She has a SSI-GIT (gastrointestinal infection) with secondary BSI.
“GIT-Gastrointestinal tract infection (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis, appendicitis, and *C. difficile* infection” (NHSN Manual pages 17-20)
- Infections involving the lumen of the GI tract = GIT
- Infections in the abdomen = IAB

**GIT is the appropriate infection to consider**
GIT-Gastrointestinal tract infection (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis, appendicitis, and C. difficile infection

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

1. Patient has an abscess or other evidence of infection on gross anatomic or histopathologic exam of gastrointestinal tract.

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:

- Organisms 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 (e.g., not Active Surveillance Culture/Testing (ASC/AST).

- Organisms 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

- Organisms identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., 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 (e.g., endoscopic exam, MRI, CT Scan), which if equivocal is supported by clinical correlation (i.e., physician documentation of antimicrobial treatment for gastrointestinal tract infection).

- Imaging test evidence suggestive of infection (e.g., endoscopic exam, MRI, CT scan), which if equivocal is supported by clinical correlation (i.e., physician documentation of antimicrobial treatment for gastrointestinal tract infection).

* With no other recognized cause
Miss Iltoe

- March 1: 79-year-old female, admitted with 3 necrotic toes secondary to peripheral vascular obstructive disease. Taken to OR for toe amputation. Central line, which was in place on admission for antibiotics, is accessed.

- Day 6: Patient progressing well until fever spike of 101.3° F. Amputation site is reddened, purulent material is collected for culture. Blood is collected for culture. Empiric antibiotics are begun.

- Day 8: Wound cultures are positive for *S. aureus*. Blood cultures are positive for *E. faecium*. 
Does Miss Iltoe have a CLABSI?

A. Yes, the patient has a CLABSI with *E. faecium*.

B. No, the BSI is secondary to a superficial SSI.

---

The blood culture did not match an organism recovered from the wound culture nor can a positive blood culture be used to meet the SSI-superficial incisional criteria. Therefore, unless there is another source of infection, this is a primary BSI. CL in place > 2 days on date of LCBi and present the day of or the day before the event. Therefore it is a CLABSI.
Table B1: Secondary BSI Guide (table format)

In order for the NHSN Secondary BSI rule to be applied, the site specific infection definition must be met using either Scenario 1 or Scenario 2 below:

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>OR</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Specimen</td>
<td>Blood specimen must contain at least one matching organism of the site specific specimen</td>
<td>Blood specimen must be an element of the site specific specimen</td>
</tr>
<tr>
<td>Time Period</td>
<td>And is collected in the secondary BSI attribution period</td>
<td>And is collected during the site specific infection's infection window period</td>
</tr>
<tr>
<td>Organism identified</td>
<td>And an organism identified from the site specific infection is used as an element to meet the site specific infection criterion</td>
<td>And an organism identified from the blood specimen is an element that is used to meet the site-specific infection criterion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABUT</td>
<td>ABUT</td>
</tr>
<tr>
<td>BONE</td>
<td>1</td>
</tr>
<tr>
<td>BRST</td>
<td>1</td>
</tr>
<tr>
<td>CARD</td>
<td>1</td>
</tr>
<tr>
<td>CIRC</td>
<td>2 or 3</td>
</tr>
<tr>
<td>CONJ</td>
<td>1</td>
</tr>
<tr>
<td>DECU</td>
<td>1</td>
</tr>
<tr>
<td>DISC</td>
<td>1</td>
</tr>
<tr>
<td>EAR</td>
<td>1, 3, 5 or 7</td>
</tr>
<tr>
<td>EMET</td>
<td>1</td>
</tr>
<tr>
<td>ENDO</td>
<td>1</td>
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<tr>
<td>EYE</td>
<td>1</td>
</tr>
<tr>
<td>GE</td>
<td>2a</td>
</tr>
<tr>
<td>GIT</td>
<td>2a</td>
</tr>
<tr>
<td>IAB</td>
<td>1a or 3a</td>
</tr>
<tr>
<td>IC</td>
<td>1</td>
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<tr>
<td>JNT</td>
<td></td>
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<tr>
<td>BONE</td>
<td>1</td>
</tr>
<tr>
<td>BURN</td>
<td>3a</td>
</tr>
<tr>
<td>DISC</td>
<td>4a, 4b, 5a or 5b (specific organisms) 6e or 7e plus other criteria as listed</td>
</tr>
<tr>
<td>ENDO</td>
<td>2c</td>
</tr>
<tr>
<td>GIT</td>
<td>2b or 3b</td>
</tr>
<tr>
<td>JNT</td>
<td>3c</td>
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<tr>
<td>MEN</td>
<td>2c or 3c</td>
</tr>
<tr>
<td>OREP</td>
<td>3a</td>
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<tr>
<td>PNEU</td>
<td>2 or 3</td>
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<tr>
<td>SA</td>
<td>3a</td>
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<tr>
<td>UMB</td>
<td>1b</td>
</tr>
<tr>
<td>USI</td>
<td>3b or 4b</td>
</tr>
</tbody>
</table>

Note: organism identified from blood specimen is not an element SSI.
Mr. Yee

- January 5: 60-year-old male is admitted to the acute care hospital following a fall, sustaining a pelvic fracture requiring surgery.
- January 7: Patient has postoperative urinary retention requiring Foley catheterization.
- January 9: Foley catheter remains in place. Patient spikes fever to 101.2° F. Blood and urine cultures are collected. Surgical site is without redness or signs of infection.
- January 11: Urine culture “+” *E. coli* > 100,000 CFU/ml. Blood cultures are positive for *E. coli* and *P. aeruginosa*. 
Does this patient have a BSI?

A. Yes, this patient has a primary BSI with *P. aeruginosa*, and a Symptomatic Urinary Tract Infection (SUTI) with *E. coli*.

B. No. This patient has a SUTI with *E. coli* and *P. aeruginosa* and the BSI is secondary.
Figure B1: Secondary BSI Guide for eligible organisms*†
(Not applicable to Ventilator-associated Events [VAE], See 5)

Scenario 1

Positive blood specimen. Site-specific infection suspected as source.

Yes

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

No

Positive blood specimen and site-specific specimen, which is collected during the secondary BSI attribution period, match for at least 1 organism?

Yes

STOP: Secondary BSI

Can the positive blood specimen, which is collected during the infection window period, be used to meet the site-specific infection criteria?

No

Yes

STOP: Secondary BSI

STOP: Primary BSI
Mr. Yee - Rationale

SUTI 1a  Catheter-associated Urinary Tract Infection (CAUTI)

- Patient must meet 1, 2, and 3 below:

1. Patient had an indwelling urinary catheter that had been in place for > 2 days on the date of event (day of device placement = Day 1) AND was either:
   - Present for any portion of the calendar day on the date of event†,
   - OR
   - Removed the day before the date of event‡

2. Patient has at least one of the following signs or symptoms:
   - fever (>38.0°C)
   - suprapubic tenderness*
   - costovertebral angle pain or tenderness*
   - urinary urgency ^
   - urinary frequency ^
   - dysuria ^

3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml (See Comment Section on page 7-8). All elements of the UTI criterion must occur during the Infection Window Period (See Definition Chapter 2 Identifying HAIs in NHSN).
### Mr. Yee - Rationale

**Admit date: 1/5/2017**

<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>33. - 2/6/2017</td>
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<td>34. - 2/7/2017</td>
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<td>35. - 2/8/2017</td>
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<tr>
<td>36. - 2/9/2017</td>
<td>✔️</td>
<td>Fever, urine culture collected-positive for E. coli &gt; 100,000 CFU/ml</td>
<td>HAI</td>
<td>Blood culture collected- E. coli and P. aeruginosa</td>
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<td>37. - 2/10/2017</td>
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<td>38. - 2/11/2017</td>
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<td>41. - 2/14/2017</td>
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<td>42. - 2/15/2017</td>
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<td>43. - 2/16/2017</td>
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<td>44. - 2/17/2017</td>
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<td>49. - 2/22/2017</td>
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</tbody>
</table>
Miss Conception

- **8/14:** A 41 year-old female has been in your unit for 2 weeks. She has a central line through which she has been receiving hemodialysis since admission.

- **8/17:** Her central line insertion site is red, and has purulent drainage, which is cultured and positive for *Pseudomonas aeruginosa.*

- **8/19:** She develops fever of 39°C and shaking chills. Two sets of blood cultures are sent.

- **8/21:** Final blood culture results are positive for *Pseudomonas aeruginosa.*
Is there an LCBI?

A. Yes, the patient has an LCBI with *P. aeruginosa*

B. No, this patient has a SKIN infection with *P. aeruginosa* and a secondary BSI with the same organism.

C. No. The patient has a VASC infection with *P. aeruginosa* and a secondary BSI with the same organism.
Skin infection (skin and/or subcutaneous) excludes decubitus ulcers and burns

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

1. Patient has at least one of the following:
   - purulent drainage
   - pustules
   - vesicles
   - boils (excluding acne)

Reporting instructions
- Do not report acne as a skin/soft tissue HAI.
- Apply the site specific definition (not SKIN) for the following:
  - Report omphalitis in infants as UMB.
  - Report infections of the circumcision site in newborns as CIRC.
  - For decubitus ulcers, apply the DECU infection.
  - Report infected burns as BURN.
  - Report breast abscesses or mastitis as BRST.
  - Report localized infection at a vascular access site as a VASC unless there is an organism identified from blood, meeting LCBI criteria, which should instead be reported as an LCBI (see VASC definition).
Miss Conception -
Rationale

NHSN Manual
pages 17-14

VASC—Arterial or venous infection

Note: If a patient meets the criteria for an LCBI in the presence of an intravascular infection report as an LCBI not as a VASC.

Arterial or venous infection must meet at least one of the following criteria:

1. Patient has organisms from extracted arteries or veins identified by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
2. Patient has evidence of arterial or venous infection on gross anatomic or histopathologic exam.
3. Patient has at least one of the following signs or symptoms: fever (>38.0°C), pain*, erythema*, or heat at involved vascular site*
   \[ \text{AND} \]
   More than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method.
4. Patient has purulent drainage at involved vascular site.
5. Patient ≤1 year of age has at least one of the following signs or symptoms: fever (>38.0°C), hypothermia (<36.0°C), apnea*, bradycardia*, lethargy*, pain*, erythema*, or heat at involved vascular site*
   \[ \text{AND} \]
   More than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method.

* With no other recognized cause
Miss Conception - Rationale

VASC- Arterial or Venous Infection

5. Occasionally, a patient with both a central line and another vascular access device develops a primary bloodstream infection (LCBI) that can clearly be attributed to the other vascular access site. If both pus at the insertion site and a culture of that pus collected during the LCBI infection window period is at least 10^4 CFU/mL, mark the data field for risk factor “Central line” as “No”:

** Report intravascular infections with organisms identified from the blood and meeting the LCBI criteria, as BSI-LCBI. However, if BOTH of the following are present within the infection window period, mark the data field for risk factor “Central line” as “No”:

- Pus at the site

AND

- Specimen collected from the site of one of the following, has at least one matching organism to organism(s) identified in a blood specimen:
  - Arterial catheters
  - Arteriovenous fistula
  - Arteriovenous graft
  - Extracorporeal membrane oxygenation (ECMO)
  - Hemodialysis reliable outflow (HERO) dialysis catheters
  - Intravascular balloon pump (IABP) devices
  - Peripheral IV or Midlines
  - Ventricular Assist Device (VAD)

Non-accessed central line (not accessed nor inserted during the hospitalization)
Dawn Anudai

- February 1: Patient admitted to PICU 4 months status post allogeneic stem cell transplant for acute myeloid leukemia. Port in place and accessed on first day. Her current weight is 25 kg.
- February 8: Patient becomes disoriented and hypotensive. 2 blood culture sets are collected. Both are positive for Enterococcus faecium.
- February 9: Dawn has nausea, emesis, diarrhea, and abdominal pain.
- February 10: She is diagnosed with Grade III graft-versus-host disease by endoscopy.
Dawn’s BSI is secondary to GIT (gastrointestinal infection) and therefore not LCBI

A. True

✓ B. False. This is an MBI-LCBI.
Dawn Anudai - Rationale

- The GIT criteria reads:
  - 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:
  - ...c. organisms identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., 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 (e.g., endoscopic exam, MRI, CT Scan), which if equivocal is supported by clinical correlation (i.e., physician documentation of antimicrobial treatment for gastrointestinal tract infection).

* With no other recognized cause
Dawn Anudai - Rationale

- LCBI criteria must be met before MBI-LCBI criteria can be met.
  - This includes determining that the BSI is not related to an infection at another site.
- The patient does not meet GIT criteria, as an infection was not identified by the imaging test.
- GVHD, neutropenia, chemotherapy can cause symptoms such as nausea, vomiting, abdominal pain.
Dawn Anudai - Rationale

- MBI-LCBI criterion:
  - Patient of any age meets criterion 1 for LCBI with at least one blood specimen identified by a culture or non-culture based microbiologic testing method, with ONLY intestinal organisms from the MBI-LCBI organisms list.
  - And patient meets at least one of the following:
    1. Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood specimen:
      a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD]
Miss Issippi


- March 21: Echocardiogram shows vegetation on the tricuspid valve. 2 sets of blood cultures, from 2 separate collections, are growing *Staphylococcus aureus*. Antibiotics begun.

- April 5: Patient becomes febrile again, and 2 blood culture sets collected identify *S. aureus* and *Klebsiella pneumoniae*. 
Does this patient have a Laboratory Confirmed BSI?

A. Yes, this is a different organism in the blood culture, therefore this is an LCBI.

B. No, this BSI is secondary to endocarditis (ENDO)

C. It depends.
Miss Issippi - Rationale

- This patient meets the ENDO (endocarditis) criteria during the Present on Admission (POA) timeframe. The *S. aureus* blood culture is a part of that criteria.

Endocarditis of a natural or prosthetic heart valve must meet at least one of the following criteria:

1. Organisms identified from cardiac vegetation, embolized vegetation (e.g., solid-organ abscess) documented as originating from cardiac source, or intracardiac abscess by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).
2. Organisms seen on histopathologic examination of cardiac vegetation, embolized vegetation (e.g., solid organ abscess) documented as originating from cardiac source, or intracardiac abscess.
3. Endocarditis seen on histopathologic examination of cardiac vegetation or intracardiac abscess.
4. At least one of the following echocardiographic evidence of endocarditis*:
   i. vegetation on cardiac valve or supporting structures
   ii. intracardiac abscess
   iii. new partial dehiscence of prosthetic valve

And at least one of the following:

a. typical infectious endocarditis organisms (i.e., *Viridans group streptococci*, *Streptococcus bovis*, *Haemophilus* spp., *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, *Kineilla* spp., *Staphylococcus aureus*) identified from ≥2 blood collections drawn on separate occasions (on same or consecutive days) by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST))

b. *Coxiella burnetii* identified from blood by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)) or identified by anti-phase IIa C.
However, even though the ENDO criteria uses an expanded secondary BSI attribution period, the April 5\textsuperscript{th} blood culture identifies an organism not used to meet the original ENDO criteria on March 20\textsuperscript{th}.

- “As a result of this lengthy secondary BSI attribution period, secondary BSI pathogen assignment for ENDO, will be limited to organism(s) identified in blood specimen that match the organism(s) used to meet the ENDO definition.” (2017 NHSN Manual pages 17-11)

Must the \textit{K. penumoniae} be considered an LCBI then?

- Not necessarily
Miss Issippi - Rationale

- Can the patient meet the ENDO criteria again, such that the BSI can be considered secondary?
  - Consider the April 5th blood cultures separately
  - Can they be used to meet the ENDO criteria using a new Infection Window Period?
    - If so, the April 5th BSI will be considered secondary to ENDO
    - If not, and there is no other primary site of infection, it will be a primary BSI with S. aureus
One Final Pearl of Wisdom

- GE criteria: “...an enteric pathogen is identified from stool or rectal swab...”
  - *Enterococcus* spp., *Pseudomonas* spp., etc. are NOT enteric pathogens
  - Enteric pathogen examples include *Campylobacter* spp., *Shigella* spp., etc. These are now excluded from being reported as cause of LCBI.
Summary

- There are only 2 ways by which a BSI may be considered secondary to another infection
  - Site-specific specimen for organism is used to meet criteria, and matching organism in blood and blood collected during the secondary BSI attribution period
  - Organism identified in blood specimen is used to meet the site-specific infection criterion, and therefore must be collected in the IWP.
- If neither is met, the BSI is primary
American Journal of Infection Control
NHSN Case - Study Series

- Additional educational tool
  - Perfect for reliability testing of ICP teams, APIC chapters, etc.
- Target: quarterly publication
- Address common surveillance scenarios
  - CLABSI, CAUTI, VAE, SSI, MDRO/CDI
- Test your knowledge
- Quiz and answers via web link
- Pursuing other access opportunities