Distinguishing Primary from Secondary Bloodstream Infections (BSIs) for the NHSN Patient Safety Component

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Objectives / Agenda

1. Review important foundational concepts from Ch. 2 and Ch. 4

2. Identify the relationship between site-specific infections and secondary bloodstream infections.


4. Practice/Apply Secondary BSI Guidelines to educational case studies.
Primary BSI versus Secondary BSI

**Primary BSI** is a laboratory confirmed bloodstream infection (LCBI) where an eligible BSI organism is identified and the BSI is not secondary to a site-specific infection at another body site.

**Secondary BSI** is a bloodstream infection that is associated with a site-specific infection at another body site which may have seeded the bloodstream.

Refer to Ch. 4 BSI-Device-Associated Module, Appendix B. *Secondary BSI Guide* and CDC/NHSN Surveillance Definitions for Specific Types of Infection Ch. 17.
LCBIs Reported to NHSN

Organism(s) identified in blood is not related to an infection at another site

- Must be primary in nature
- CANNOT be secondary to another site of infection
Why is it important to distinguish a primary BSI from a secondary BSI when performing CLABSI surveillance?

A. Secondary BSIs are not reported to NHSN
B. Primary BSIs are more difficult to prevent than secondary BSIs

C. To identify those BSIs for which improving central line insertion and maintenance practices may reduce the incidence.
Primary vs Secondary BSIs

Secondary BSIs are never reported to NHSN as LCBIs

UTI
PNEU
SSI
Site-specific Infections from Ch. 17

Secondary BSI
Meeting Secondary BSI Requirements:

- Scenario One: Involves a matching site-specific specimen as an element.
- Scenario Two: Involves an organism(s) identified in the blood as an element.
2 Secondary BSI Scenarios

- **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 (SBAP = 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.
Secondary Bloodstream Infections
Scenario 1
Secondary BSI Scenario 1

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)†.

1. Blood and site-specific specimen **must have at least one eligible matching pathogen**
2. That site-specific specimen is **used as an element to meet the primary-infection criterion**
   
   **AND**

3. Blood specimen is **collected within the SBAP of the site-specific infection**
Ex: UTI

*Candida* are excluded pathogens that cannot be used to meet the NHSN UTI definition. Therefore, a BSI with *Candida* cannot be deemed secondary to a UTI.

PNEU also has excluded pathogens.
Secondary BSI Scenario 1: Example SINU

Example:

1/12/18: Patient with PMH of chronic sinusitis admitted to Medical/Surgical unit
1/15/18: Patient sent to special procedures for functional endoscopic sinus evaluation. Fluid aspirated from sinus cavity sent for culture; Results: + S. pneumoniae
1/19/18: Fever 102°F, blood specimen x 2 + S. pneumoniae

Scenario 1

A positive blood specimen contains at least one eligible matching organism to the site-specific specimen

The blood specimen is collected in the secondary BSI attribution period

An eligible organism identified in the site-specific specimen is used as an element to meet the site-specific definition
Secondary BSI Scenario 1

**SINU-Sinusitis**

Sinusitis must meet at least one of the following criteria:

1. **Patient has organism(s) identified from fluid or tissue from the sinus cavity obtained during an invasive procedure 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).**

<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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<tr>
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</tbody>
</table>

**Scenario 1**

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

The blood specimen is collected in the secondary BSI attribution period.

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

Primary HAI SINU DOE 1/15 with S. pneumoniae & secondary BSI
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 \textit{E. coli}
  - 1/22: Positive blood culture \textit{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 \textit{E. coli} BSI was primary or secondary to determine if the \textit{S. aureus} BSI must be investigated as possible LCBI.

Refer to Ch. 4 Device-associated BSI Module page 4-13 & 4-14 for examples
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 > \(10^5\) CFU/ml \(E.\ coli\), & 1 of 2 BCs positive for \(E.\ coli\)

1/21/18: Repeat BC’s collected positive \(S.\ aureus\).

Refer to UTI in Resource Manual

Primary POA SUTI 1b non-catheter associated, DOE 1/12 secondary \(E.\ coli\) BSI
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<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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</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>
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<td>2. 1/13/2018</td>
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</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
Secondary Blood Stream 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.

1. Organism in the blood is an element used to meet the primary-site infection criterion
2. Blood specimen is collected in the IWP (or surveillance period if SSI)
Secondary BSI Scenario 2: Example BURN

1/12/18: Patient admitted after a fireworks accident with 1st & 2nd degree burns to right hand. Wound assessment: Pale pink to red, glistening, mild swelling with small blisters between fingers.

1/15/18: Wound assessment: a marked increase in swelling of fingers, purplish eschar with right index fingertip noted to be black.

1/18/18: Fever 101°F, blood specimen x2 positive for Pseudomonas aeruginosa.

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### Scenario 2

<table>
<thead>
<tr>
<th>An eligible organism identified in the blood is used as an element to meet the site-specific definition</th>
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</thead>
<tbody>
<tr>
<td>The blood specimen is collected in the site-specific infection window period (IWP)</td>
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</table>
### Secondary BSI Scenario 2

**Primary HAI BURN with *P. aeruginosa* DOE 1/15 with a secondary BSI**

<table>
<thead>
<tr>
<th>Hospital Day/Date</th>
<th>First Diagnostic Test</th>
<th>Infection Window Period</th>
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<th>Secondary BSI Attribution Period</th>
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<tbody>
<tr>
<td>4. - 1/15/2018</td>
<td></td>
<td><strong>increased swelling, purplish-black eschar right index finger</strong></td>
<td>HAI</td>
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<td>5. - 1/16/2018</td>
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<td><strong>+BC Pseudomonas aeruginosa</strong></td>
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**Scenario 2**

An eligible organism identified in the blood is used as an element to meet the site-specific definition.

The blood specimen is collected in the site-specific infection window period (IWP).
What if neither Scenario 1 nor Scenario 2 can be met?

A. No event is identified
B. It is a primary BSI
C. Email NHSN for guidance
BREAST Example: Neither Scenario 1 nor 2 can be met...

1/15/18: Breast fluid collected during an invasive procedure + \textit{S. aureus}

1/18/18: Fever 100.6°F, blood cultures x 2 (+) for \textit{coagulase negative Staph (CNS)}
Breast or Mastitis Infection Criteria

Breast infection must meet one of the following criteria:

1. Patient has organism(s) 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, for example, not Active Surveillance Culture/Testing (ASC/AST).
2. Patient has a breast abscess or other evidence of infection on gross anatomic or histopathologic exam.
3. Patient has fever (≥38.0°C) and local inflammation of the breast, AND
   Physician initiates antimicrobial therapy within 2 days of onset or worsening of symptoms.

- S. aureus

Meets BRST criterion 1

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A positive blood specimen contains at least one eligible matrix organism to the site-specific specimen</td>
<td>Blood is not an element used to meet the BRST definition Scenario 2 not met</td>
</tr>
</tbody>
</table>

It’s a primary BSI

Blood & breast fluid organisms do not match Scenario 1 not met
Only Exception to Meeting Scenario 1 or 2 for Making Secondary BSI Determinations

**Necrotizing Enterocolitis (NEC):** NHSN NEC criteria include NO elements of

- site-specific specimen OR,
- organism(s) identified in the blood

**IF... Patient meets one of the 2 NEC criteria AND**

- Organism(s) in the blood, collected during the SBAP, is a recognized pathogen or 2 matching common commensals collected on separate occasions (which is the same or consecutive days).......The BSI is considered secondary.

*Refer to Ch. 4 BSI Module page 4-38 and Ch. 17 Site-Specific Definitions page 17-22*
Assigning Pathogens in Secondary BSIs
Pathogen Assignment Rules

- An organism may be attributed as secondary to more than 1 type of infection.
- Scenario 1: Additional organisms in the blood besides the matching organism, are considered secondary also.
  - BUT
    If no matching organism with the organism in the site-specific specimen (Scenario 1) or, with the organism in the blood (Scenario 2) the BSI cannot be considered secondary

Refer to Ch. 4 BSI Module page 4-34
Case

- **1/13/2018**: 60-year-old patient admitted to hospital with fever of 101°F. Central line and Foley placed.
- **1/14/2018**: Urine cx collected: final >10⁵ CFU/ml of *E. coli*. Foley removed.
- **1/15/2018**: Complains of dysuria. Central line removed. Positive blood cx’s growing: *E. coli*, *E. faecalis*.
- **1/16** and **1/17**: Patient with 2 + blood cx’s growing *E. faecalis*, *S. aureus*. 
# SUTI with Subsequent + BC: Pathogen Assignment

<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>PQA</td>
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<td>Urine E. coli</td>
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<td>+BC E. coli, E. faecalis</td>
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<td>+BC E. faecalis, S. aureus</td>
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- **POA SUTI 1b with secondary BSI DOE 1/13 E. coli, E. faecalis**
- **Primary LCBI 1 (CLABSI) DOE 1/16 E. faecalis, S. aureus**
- **Occurs in the BSI RIT not a new event**
## Reference Table B1: Primary Sites Eligible for Secondary BSIs

### Scenario 1

- Blood specimen must contain at least one matching organism of the site specific specimen
- And is collected in the secondary BSI attribution period
- And an organism identified from the site specific infection is used as an element to meet the site specific infection criterion

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<th>Criterion</th>
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<td>1, 3, 5 or 7</td>
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<td>EXE</td>
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### Scenario 2

- Blood specimen must be an element of the site specific specimen
- And is collected during the site specific infection’s infection window period
- And an organism identified in the blood specimen is an element that is used to meet the site-specific infection criterion

<table>
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<td>BURN</td>
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</tr>
<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>
</tr>
<tr>
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<td>2c</td>
</tr>
<tr>
<td>IAB</td>
<td>2b or 3b</td>
</tr>
<tr>
<td>JNT</td>
<td>3c</td>
</tr>
<tr>
<td>MEN</td>
<td>2c or 3c</td>
</tr>
<tr>
<td>OREF</td>
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Refer to Ch. 4 Device-associated Module-BSI page 4-27 and Resource Manual
Secondary BSI Guide

Figure B1: Secondary BSI Guide for eligible organisms*‡
(Not applicable to Ventilator-associated Events [VAE], See 5)

Scenario 1

Scenario 2

Refer to Ch. 4 BSI Device-Associated Module page 4-38
Training Resources:


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

Site-specific criteria and secondary BSI

Q2: How do I determine which site-specific criteria uses blood as an element in order to potentially meet secondary BSI criteria?

NHSN developed Table B-1 (Secondary BSI Guide) as a reference to assist users in making secondary BSI determinations. The table lists definitions that require a blood specimen with at least one matching organism to the site-specific specimen (Scenario #1) and definitions that use a blood specimen as an element to meet the site-specific definition (Scenario #2). All elements of the site-specific infection definitions must be met before a secondary BSI determination can be made. Table B-1 can be found in Chapter 4 of the Device Associated Module BSI.
Case Study 1

- **February 1:** 35-year-old woman admitted with complaints of right scapular pain and fever. Superficial laceration to back right scapula from falling into outdoor grill 5 days earlier. Wound is scabbed over in places but purulent drainage is noted from center. Admit for IV antibiotics.

- **February 3:** No improvement noted with broad spectrum antibiotic coverage. Wound is swelling, red and warm to touch. Drainage from wound is sent for culture, positive for *Streptococcus pyogenes*.

- **February 8:** 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. pyogenes*. 
Is Case Study 1 a Primary LCBI?

A. Yes. This is an primary LCBI 1 with *S. pyogenes* identified on hospital day 1-Feb 1st

*B. No. This is a primary SKIN infection with a secondary BSI.*
Case Study 1 - Rationale

When more than 1 criteria can be met, use the IWP that provides the earliest DOE Ch. 2 page 2-5

SKIN-Skin infection (skin and/or subcutaneous) excludes other conditions. 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)

2. Patient has at least two of the following localized signs or symptoms: pain*, tenderness*, swelling*, erythema*, or heat*

And at least one of the following:

A. organism(s) identified from aspirate or drainage from affected site by a culture or non-culture based testing method which is performed for purposes of clinical diagnosis and treatment for example, rapid streptococcal testing (ASC/AST). Identification of 2 or more commensal organisms is not eligible for use.

   Common Commensal organisms include, but are not limited to, diphtheroids (Corynebacterium spp. not C. diphtheria), Bacillus spp. (not B. anthracis), Propionibacterium spp., coagulase-negative staphylococci (including S. epidermidis), viridans streptococci, Aerococcus spp.

B. Micrococcus spp., and Rhodococcus spp. For a full list of Common Commensal tab of the NHSHN organisms list.

C. Multinucleated giant cells seen on microscopic examination of affected tissue

D. Diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG)

Refer to Case Study 1, Ch. 2 page 2- for guidance on meeting more than one site-specific criterion
### Case Study 1 Rationale:

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<th>Date of Event</th>
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**Primary POA SKIN 2a w/ secondary BSI w/ multi-Res. S. pyogenes**

- Meets POA SKIN 1
- Meets SKIN 2a
**Case Study 1 Rationale:**

You can set the wrong DOE if the IWP that provides the earliest DOE is not used. Refer to: Ch. 2 pages 2-5
Meeting More than One Criteria of Same Type of Infection?

Let’s look at a couple of examples
Case Study 2

- **January 16**: 67-year-old female is admitted for abdominal hysterectomy. Patient suffers an intraoperative stroke and is admitted to neuro ICU and placed on a ventilator.

- **January 31**: Patient spikes a fever to 38.1°C and the WBCs are elevated at 15,000 WBCs/μl. Her breath sounds are coarse throughout. Chest x-rays show 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 UA cultures are collected.

- **February 2**: Final results of UA cultures-negative, but blood cultures x 2 are positive for *Acinetobacter baumannii*, and culture of pus from vaginal cuff is positive for Group B *Streptococcus*. 
Which of the following is the correct attribution?

A. This patient has a VCUF (vaginal cuff) infection with secondary BSI.

B. This patient has an LCBI.

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

C. This patient has both an LCBI and a surgical site infection (organ space-VCUF).
Case Study 2 - Rationale

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.
Case Study 3

- **Jan 1:** Patient admitted with abdominal pain and distension
- **Jan 2:** PICC placed
- **Jan 4:** US guided drainage of 5L purulent peritoneal fluid, positive for *K. pneumoniae* and *E.coli*.
- **Jan 10:** Abdominal pain increased
- **Jan 11:** CTS multiple liver abscesses, blood cultures x 2 positive *C. glabrata* and *L. casea*
- **Jan 13:** Jaundice, fever 101.2°F
Which of the following is the correct attribution?

A. The patient has an LCBI 1.

B. She has an SSI-IAB (intra-abdominal infection) with secondary BSI.

C. She has an IAB with secondary BSI.
Case Study 3 - Rationale

IAB - Intraabdominal infection, not specified elsewhere, including gallbladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, retroperitoneal, subphrenic or subdiaphragmatic space, or other intraabdominal tissue or area not specified elsewhere.

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.

2. Patient has at least two of the following: (fever > 38.0°C), hypotension, nausea*, vomiting*, abdominal pain*, 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 BST protocol) AND imaging test evidence suggestive of infection (for example, ultrasound, CT scan, MRI, ERCP, radiolabeled scans [sodium, technetium, etc.] or on abdominal x-ray), which if equivocal is supported by clinical correlation, specifically, physician documentation of

The pathogens don't have to match, in this case, because another criteria (IAB 3b) is fully met within a new IWP. Because IAB 3b is met in the IAB RIT, it is attributed to the initial event and the organisms are added.

IAB 1 HD 4 K. pneumoniae, E. coli

IAB 3b HD 4 C. glabrata, L. casei

Abdominal pain

CTS multiple liver abscesses

Blood culture: C. glabrata, L. casei

jaundice, fever
Case Study 4

- **Jan 4**: 45-year-old with colon cancer admitted and undergoes colectomy. Patient’s tunneled central line for hemodialysis is accessed today in the unit.

- **Jan 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*.

- **Jan 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.
Case Study 4: Which definition should be applied in the case?

A. GIT (gastrointestinal infection)

B. IAB (intra-abdominal infection)

C. OREP (reproductive Infection)

D. None, this is a primary BSI
Case Study 4 – Rationale

“GIT-Gastrointestinal tract infection (esophagus, stomach, small and large bowel, and rectum)
-excluding gastroenteritis, appendicitis, and C. difficile infection

IAB-Intraabdominal infection, not specified elsewhere, including gallbladder, bile ducts, liver
(excluding viral hepatitis), spleen, pancreas, peritoneum, retroperitoneal, subphrenic or
subdiaphragmatic space, or other intraabdominal tissue or area not specified elsewhere

OREP- Deep pelvic tissue infection or other infection of the male or female reproductive tract
(epididymis, testes, prostate, vagina, ovaries, uterus) including chorioamnionitis, but excluding
vaginitis, endometritis or vaginal cuff infections

Refer to Ch. 17 NHSN Patient Safety Manual pages 17-20)
Case Study 4

Rationale

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

   AND

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

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 if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for gastrointestinal tract infection.

* With no other recognized cause

Primary LCBI 1
CLABSI with C. albicans
Jan 9th
Case Study 5

- **2/14**: 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.

- **2/17**: Her central line insertion site is red, and has purulent drainage, which is cultured and positive for *Pseudomonas aeruginosa*.

- **2/19**: She develops fever of 39°C and shaking chills. Two sets of blood cultures are sent.

- **2/21**: Final blood culture results are positive for *Pseudomonas aeruginosa*. 
Case Study 5 Is this an LCBI?

A. Yes, the patient has an LCBI 1 with *P. aeruginosa*

B. No, this patient has a primary 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.
Case Study 5 - Rationale

SKIN-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)

2. Patient has at least two of the following localized signs or symptoms: pain*, tenderness*, swelling*, erythema*, or heat*
   And at least one of the following:

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).

Refer to Ch. 17 NHSN Patient Safety Manual page 17-14 & 17-26
Case Study 5 – Rationale

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

Refer to Chapter 17 NHSN Patient Safety Manual page 17-14
Case Study 5

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, has at least

**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
  - Intra-aortic balloon pump (IABP) devices
  - **Non-accessed** central line (not accessed nor inserted during the hospitalization)
  - Peripheral IV or Midlines
  - Ventricular Assist Device (VAD)
Case Study 6

- **February 1**: Patient admitted to PICU 4 months status post allogeneic stem cell transplant for acute myeloid leukemia. Port in place and was accessed on admission. Her current weight is 25 kg.

- **February 8**: Patient becomes disoriented and hypotensive. 2 sets of blood culture are collected. Both are positive for *Enterococcus faecium*.

- **February 9**: Patient has nausea, emesis, diarrhea, and abdominal pain.

- **February 10**: She is diagnosed with Grade III graft-versus-host disease by endoscopy.
True or False: This BSI is secondary to GIT (gastrointestinal infection) and therefore is not an LCBI

A. True

B. False. This is an MBI-LCBI.
Case Study 6 - 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
Case Study 6 - 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, because an infection was not identified by the imaging test.

- Additionally, GVHD, neutropenia and chemotherapy can cause symptoms such as nausea, vomiting and abdominal pain.
Case Study 6 - 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 the same hospitalization as the positive blood specimen:
      a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD]

See Ch. 4 page 10 for complete MBI-LCBI requirements
One Final Pearl of Wisdom

GE criteria: “…an enteric pathogen is identified from stool or rectal swab…”

- *Enterococcus* spp., *Pseudomonas* spp., etc. are NOT considered enteric pathogens for NHSN reporting purposes because they are also important environmental pathogens.
- Examples of enteric pathogens* includes: *Campylobacter* spp., *Shigella* spp., *Enterohemorrhagic* *E. coli*, *Enteropathogenic* *E. coli*, *Salmonella* spp., *Listeria* spp., *Yersinia* spp., *Vibrio* spp., and *Giardia*.

  *These are excluded from use in meeting LCBI criteria. Therefore, do not report as a CLABSI
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
• 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.
Table Top Group Cases
Secondary BSIs

Case #1
Case #1 Scenario

1/7/18: Admission. PMH S/P bradycardia, pacemaker placed 2016
2/4/18: +BC, Enterococcus faecium x 2
2/5/18: +BC, Enterococcus faecium
2/6/18: +BC, Enterococcus faecium x 2
2/7/18: +BC, Enterococcus faecium
2/12/18: PICC placed
2/16/18: +BC, S. aureus X1
2/22/18: Vegetation on Pacemaker lead sent for culture, + Candida albicans
2/25/18: +BC, Candida albicans
Case #1 Questions; based on the available information:

Question 1: *Which definition should be used in this case?*

*Question 2: Is this a primary or secondary BSI?*

*Question 3: Which event creates a BSI RIT?*

   a. Primary BSI
   b. Secondary BSI
   c. Both

*Question 4: What is the final determination for this case?*
Case #1

Answers & Rationale
Case #1 Answers & Rationale

Question 1: Which definition should be applied as possible primary source of BSI in this case?
A: ENDO-Endocarditis

Question 2: Is this a primary or secondary BSI?
A: It depends on which BSI you are investigating
   (2/4 or 2/22)

Question 3: Which event creates a BSI RIT?
A: Only primary BSIs create a BSI RIT- therefore the 2/4 BSI sets a BSI RIT

Question 4: What is the final determination for this case?
Case #1 Answers & Rationale

- ENDO IWP = 21 days total (day of diagnostic test, 10 days before and 10 days after)

- The SBAP = includes the 21-day infection window period and all subsequent days of the patient’s current admission.

- SBAP is limited to organism(s) identified in blood specimen that match the organism(s) used to meet the ENDO definition.
Case #1 Answers & Rationale

- There are no other elements present during an ENDO IWP set by the 2/4 BSI (1/25-2/14) to fulfill the ENDO criterion. No other type of infection is suggested, therefore that BSI is primary.

- Consider the next positive blood culture outside the BSI RIT 2/4-2/17.

- 2/22 pacemaker lead with *C. albicans* sets a potential ENDO IWP of 2/12-3/4.
Case #1 Question 4
Rationale

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Primary LCBI 1 DOE 2/4
*E. faecium, S. aureus*

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<th>Repeat Infection Timeframe</th>
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ENDO criterion 1 with *C. albicans*
DOE 2/22
Case #2
Case #2 Scenario

- 2/2/18: Admit with fever and chills of unknown origin, knee has been sore last few days but no obvious specific symptoms.
- 2/8/18: Knee fluid drained, sent for culture which grew *S. aureus*
- 2/14/18: Increased pain Left knee, unable to bend it due to swelling
- 2/17/18: +blood specimen *S. aureus*
- 2/22/18: +blood specimen *S. aureus, S. pneumoniae*
- 2/24/18: +blood specimen *Strep pneumoniae, Neisseria gonorrhea*
Case #2

- Question 1: Which definition should be used in this case?
- Question 2: What is the final determination for this case?
Case #2

Answers & Rationale
Case #2

Question 1: JNT Joint or Bursa Infection

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 organism(s) identified from joint fluid or synovial biopsy by culture or non-cultural 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 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. organism(s) and white blood cells seen on Gram stain of joint fluid
   c. organism(s) identified from blood 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).
   d. 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 joint or bursa infection.

* With no other recognized cause
### Case #2: Question 3 Answer & Rationale

Refer to Ch. 2 page 2-17

<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>
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<td>+BC S. pneumoniae, Neisseria gonorrhoea</td>
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</table>

**JNT 3c S. aureus, S. pneumoniae DOE 2/14**

**Neither S. pneumoniae nor N. gonorrhoea were identified in the site-specific specimen used to meet the JNT criteria initially. S. pneumoniae has been assigned to JNT. Must investigate N. gonorrhoea as primary or secondary BSI**