Secondary BSI Attribution: A Tale of Two Scenarios

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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."

Common Misconceptions about Secondary BSI Attribution # 3

“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?

Secondary BSI Guide

BSI
Chapter 4,
Page 4-36

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

Scenario 1	Scenario 2
A positive blood specimen must contain at least **one eligible matching organism** to the site-specific specimen	Positive blood specimen must be an **element** of the **site-specific definition**
And the blood specimen is collected in the site-specific **secondary BSI attribution period**	**And** blood specimen is collected in the site-specific **infection window period**
And an eligible organism **identified from the site-specific specimen** is used as an element to meet the site-specific definition	And an eligible organism **identified in a blood specimen** is used as an element to meet the site-specific definition

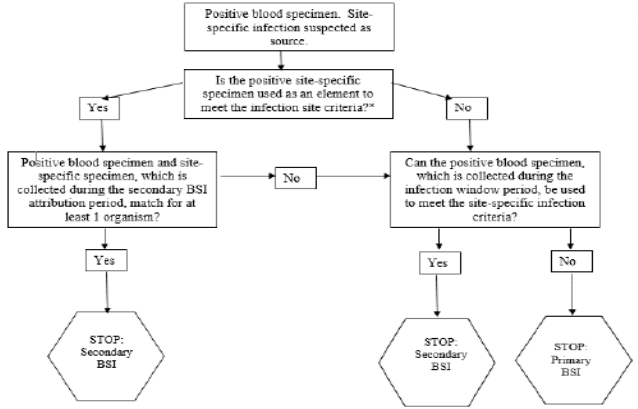
Site	Criterion
ABUTI	ABUTI
BONE	1
BRST	1
CARD	1
CIRC	2 or 3
CONJ	1
DECU	1
DISC	1
EAR	1, 3, 5 or 7,
EMET	1
ENDO	1
EYE	1
GE	2a
GIT	2a, 2b (only yeast)
IAB	1 or 3a
IC	1
JNT	1
LUNG	1
MED	1
MEN	1
ORAL	1 or 3a
OREP	1
PJI	1
PNEU	2 or 3
SA	1
SINU	1
SSI	SI, DI or OS
SKIN	2a
ST	1
UMB	1a
UR	1a or 3a
USI	1
SUTI	1a, 1b or 2
VASC *only as SSI*	1
VCUF	3

Site	Criterion
BONE	3a
BURN	1
DISC	3a
ENDO	4a, 4b, 5a or 5b (specific organisms) 6e or 7e plus other criteria as listed
GIT	1b or 2c
IAB	2b or 3b
JNT	3c
MEN	2c or 3c
OREP	3a
PNEU	2 or 3
SA	3a
UMB	1b
USI	3b or 4b

Secondary BSI Guide

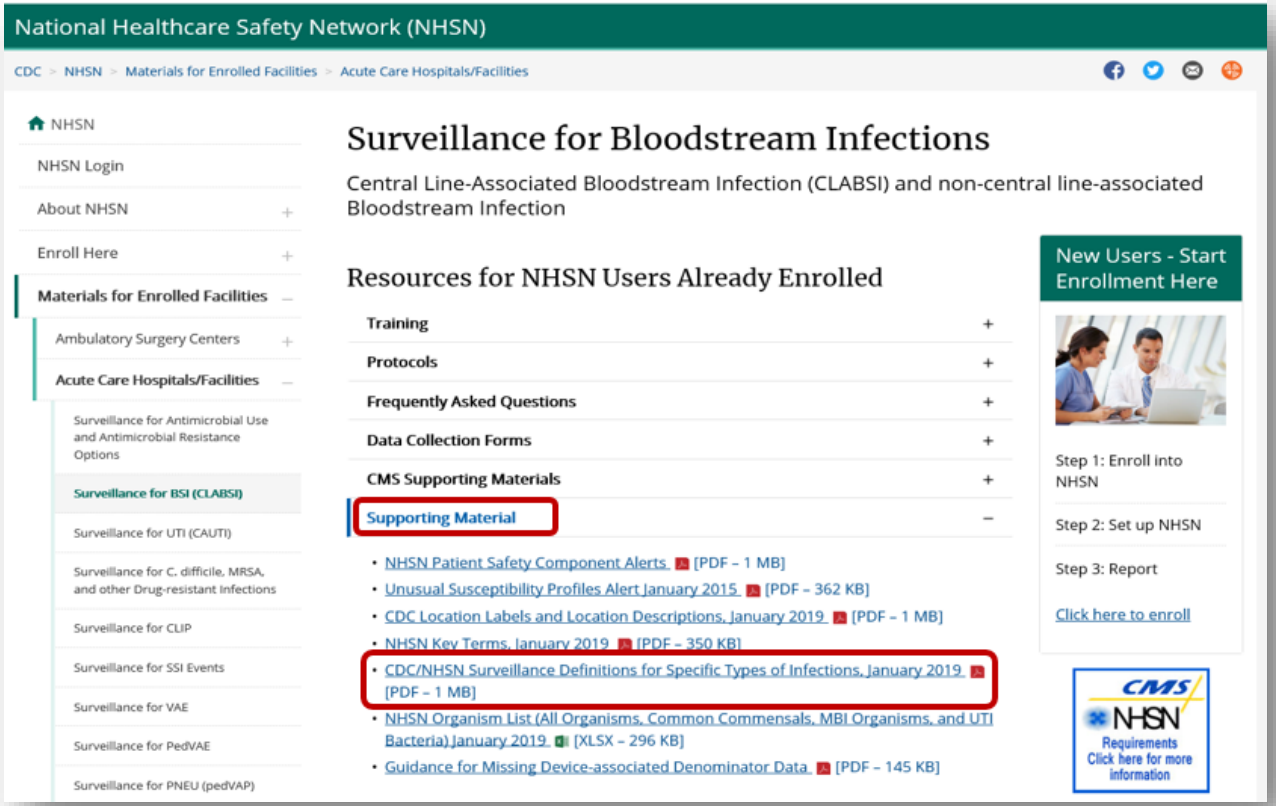
BSI Chapter 4, Page 4-44

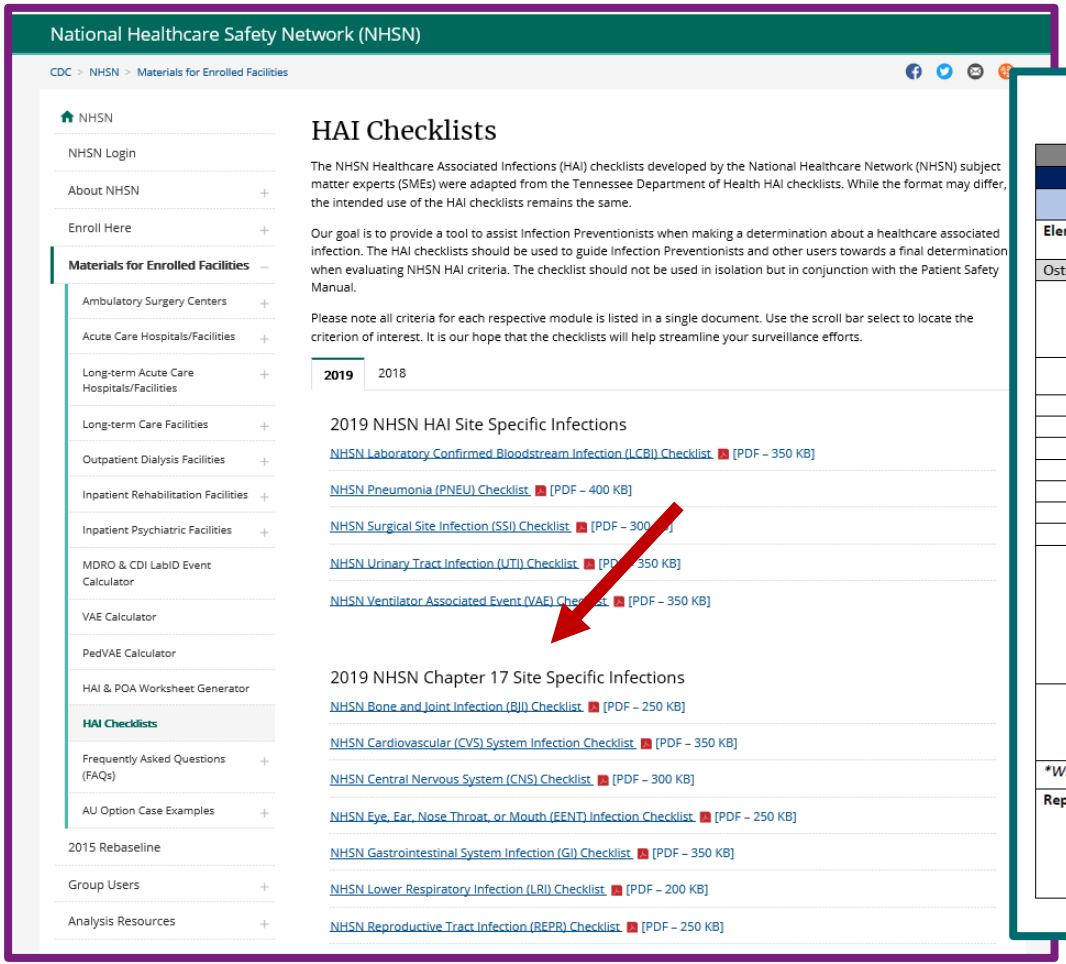
Figure B1: Secondary BSI Guide for eligible organisms*‡
(Not applicable to Ventilator-associated Events [VAE], See Figure B2)



*Exception: 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 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 is identified from 2 or more blood specimens drawn on separate occasions but on the same or consecutive days.

Where to Locate Chapter 17?





2019 NHSN Bone and Joint Infection (BJ) Checklist

Documentation Review Checklist
BJ - Bone and Joint Infection
BONE-Osteomyelitis

Element	Element Met
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*	☐
• Drainage*	☐
AND at least ***one*** of the following:	
a. 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) ***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*	

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 JNT and BONE report the SSI as BONE.
- After an HPRO or a KPRO if a patient meets both organ space PJI and BONE report the SSI as BONE.

https://www.cdc.gov/nhsn/hai-checklists/index.html

Primary BSI vs. Secondary BSI

Primary BSI versus Secondary BSI – What's the Difference?

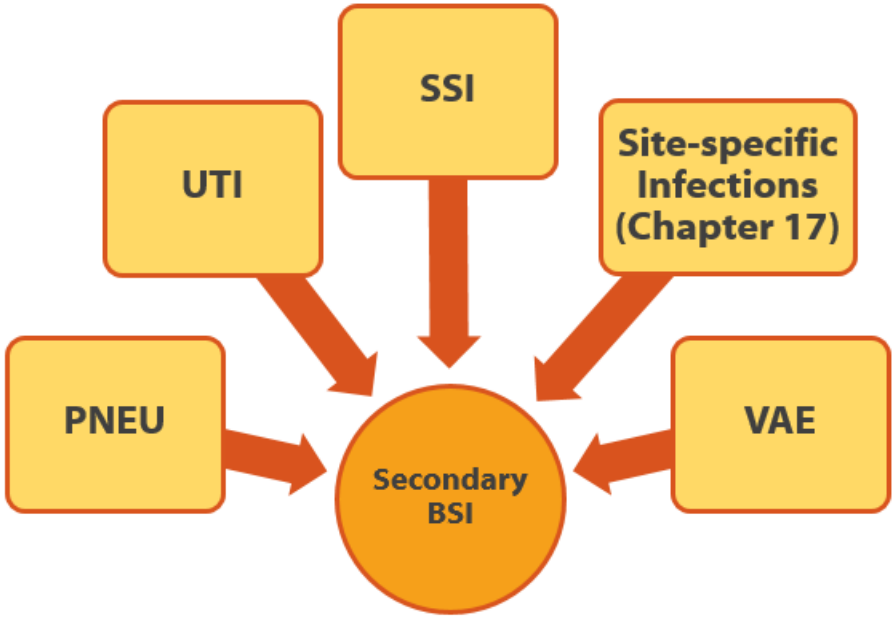
- **Primary BSI**
  - A Laboratory Confirmed Bloodstream Infection (LCBI) where an eligible BSI is identified and the BSI is not secondary to an infection at another body site
    - LCBI/ MBI-LCBI 1
    - LCBI/ MBI-LCBI 2
    - LCBI/ MBI-LCBI 3
  - Reportable to NHSN (if an **eligible central line** 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

VS



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

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)**

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**

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 intestinalis with or without intestinal perforation

Chapter 4,
Page 4-32

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 (102.4ºF) 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,* and 1 of 2 BCs positive for *E. coli*

1/21/18:

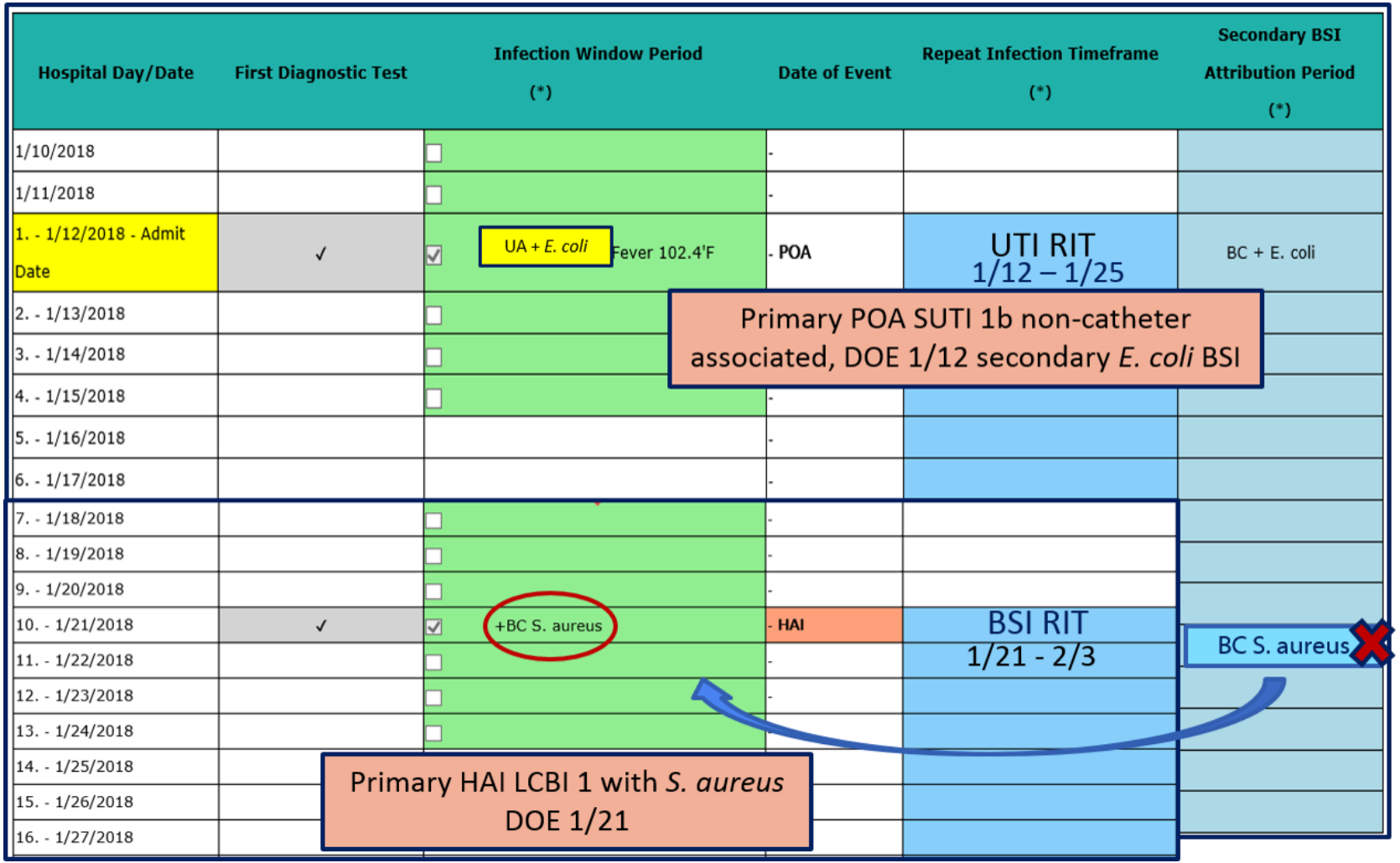
Repeat BC's collected positive for *S. aureus*

Hospital Day/Date	First Diagnostic Test	Infection Window Period (*)	Date of Event	Repeat Infection Timeframe (*)	Secondary BSI Attribution Period (*)
1/10/2018		☐	-		
1/11/2018		☐	-		
1. - 1/12/2018 - Admit Date	√	☑ UA + E. coli; Fever 102.4'F	- POA	UTI RIT	BC + E. coli
2. - 1/13/2018		☐	-		
3. - 1/14/2018		☐	-		
4. - 1/15/2018		☐	-		
5. - 1/16/2018			-		
6. - 1/17/2018			-		
7. - 1/18/2018					
8. - 1/19/2018					
9. - 1/20/2018					
10. - 1/21/2018					
11. - 1/22/2018					
12. - 1/23/2018			-		
13. - 1/24/2018			-		
14. - 1/25/2018			-		

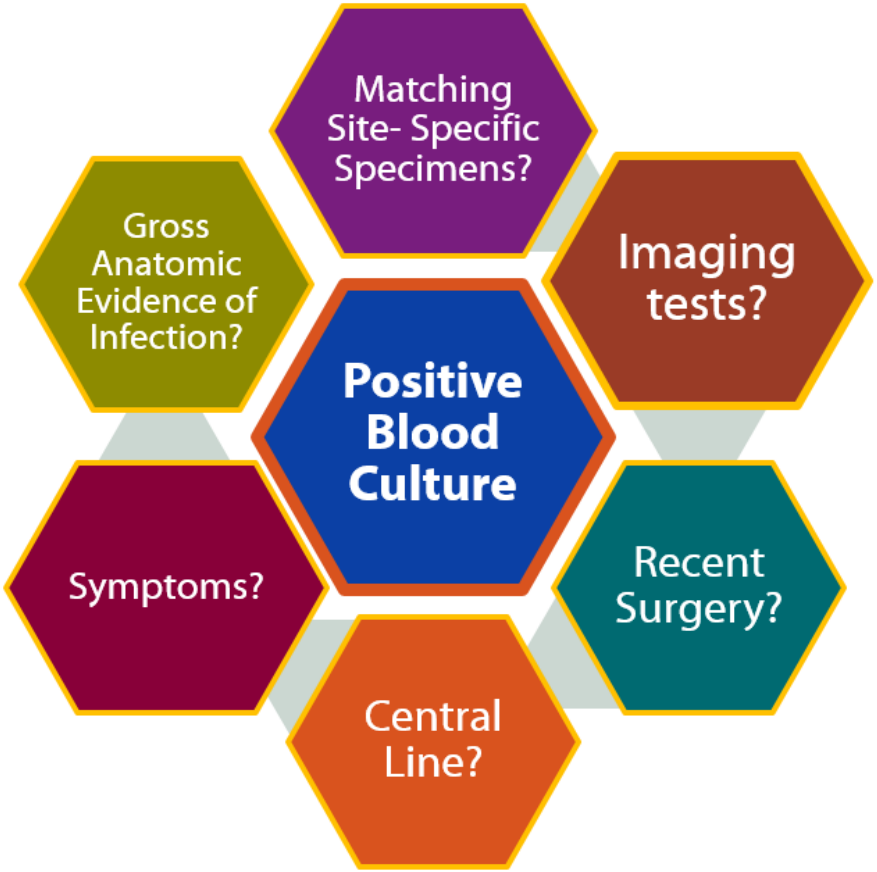
Misconception #3

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

Refer to UTI in Resource Manual


Hospital Day/Date
First Diagnostic Test
Infection Window Period (*)
Date of Event
Repeat Infection Timeframe (*)
Secondary BSI Attribution Period (*)
1/10/2018
1/11/2018
1. - 1/12/2018 - Admit Date
✓
UA + E. coli
Fever 102.4'F
- POA
UTI RIT 1/12 – 1/25
BC + E. coli
2. - 1/13/2018
3. - 1/14/2018
4. - 1/15/2018
5. - 1/16/2018
6. - 1/17/2018
Primary POA SUTI 1b non-catheter associated, DOE 1/12 secondary E. coli BSI
7. - 1/18/2018
8. - 1/19/2018
9. - 1/20/2018
10. - 1/21/2018
✓
+BC S. aureus
- HAI
BSI RIT 1/21 - 2/3
BC S. aureus
11. - 1/22/2018
12. - 1/23/2018
13. - 1/24/2018
14. - 1/25/2018
15. - 1/26/2018
16. - 1/27/2018
Primary HAI LCBI 1 with S. aureus DOE 1/21

As Always, the Story Begins With. . .

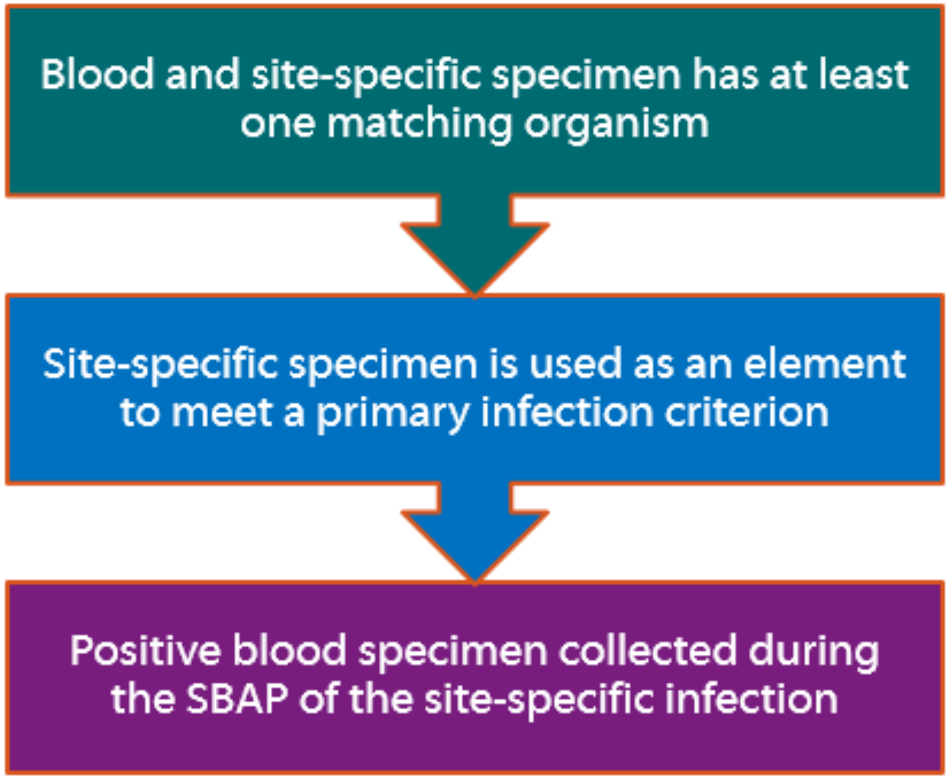


Secondary Bloodstream Infections

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

Examples for Determining Matching Organisms (correct selection for NHSN reporting is bolded)

Identification # 1	Identification # 2	Matching Organisms Yes or No
Enterobacter aerogenes	*Enterobacter cloacae*	*No*
Enterococcus faecalis	*Enterococcus*	*Yes*
Enterococcus faecium	*Enterococcus faecalis*	*No*
Pseudomonas species	***Pseudomonas aeruginosa***	*Yes*
Coagulase-negative Staphylococcus	*Staphylococcus aureus*	*No*
Staphylococcus epidermidis	Coagulase-negative Staphylococcus	*Yes*
Staphylococcus species	Coagulase-positive Staphylococcus	*No*
Streptococcus species	*Streptococcus* Viridans Group	*No*
Yeast	***Candida*** species	*Yes*

Chapter 17, page 17-3

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

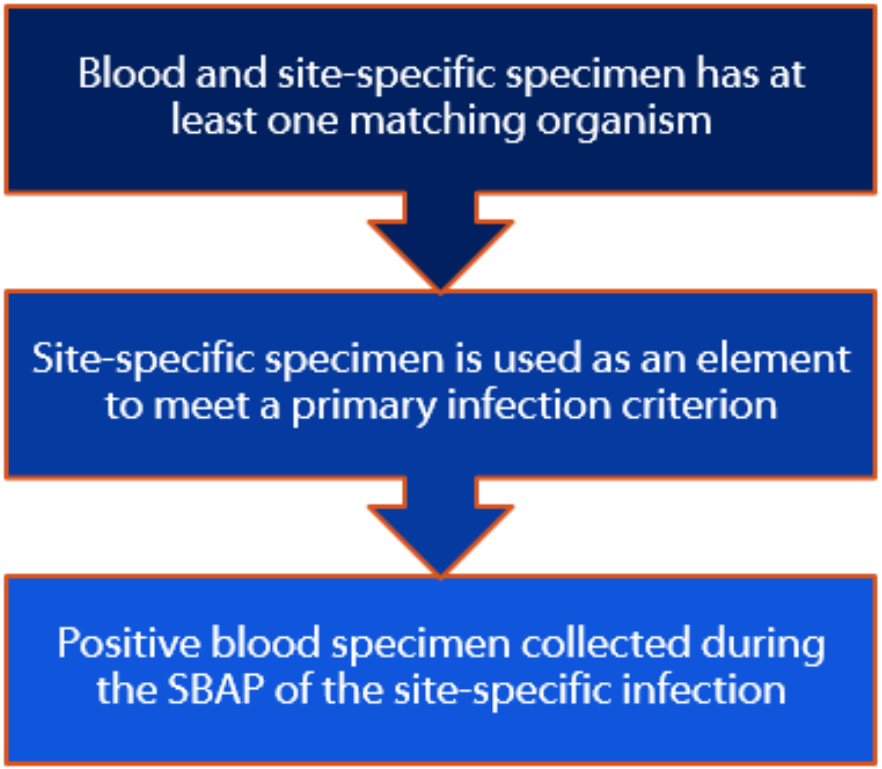
“Scooping Orphans” - Example

Hospital Day/Date	First Diagnostic Test	Infection Window Period (*)	Date of Event	Repeat Infection Timeframe (*)	Secondary BSI Attribution Period (*)
8. - 2/8/2019		☐	-		
9. - 2/9/2019		☑ Fever - 102	HAI		
10. - 2/10/2019		☐ Fever - 101	-		
11. - 2/11/2019	✓	☑ Urine Culture - 100k Acinetobacter baumanii/	-		
12. - 2/12/2019		☐	-		
13. - 2/13/2019		☐	-		
14. - 2/14/2019		☐ Blood cx - Acinetobacter baumanii/ E. cloacae	-		
15. - 2/15/2019			-		
16. - 2/16/2019			-		
17. - 2/17/2019			-		
18. - 2/18/2019			-		
19. - 2/19/2019			-		
20. - 2/20/2019			-		
21. - 2/21/2019			-		
22. - 2/22/2019			-		

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

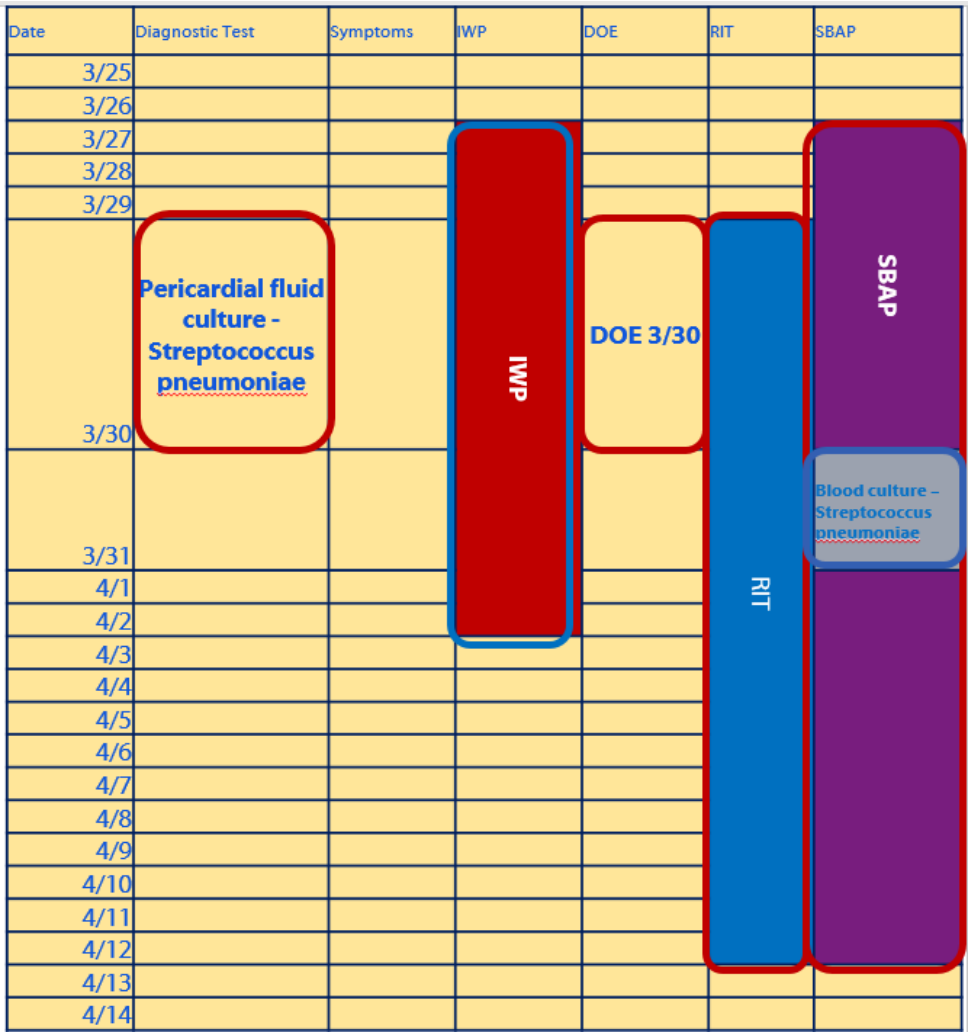


CARD 1 Rationale

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)



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-Skin infection (skin and /or subcutaneous) excluding decubitus ulcers, burns, and infections at vascular access sites (See VASC).

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* or tenderness*, swelling*, erythema*, or heat*

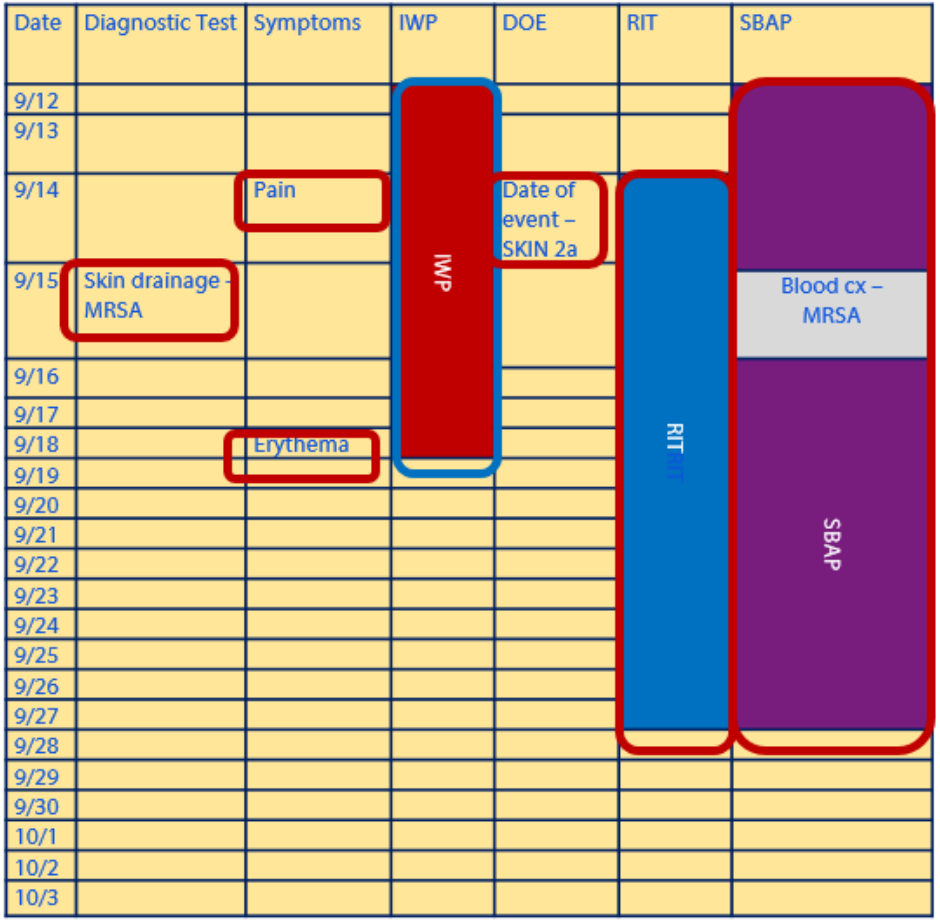
   And at least *one* of the following:
   a. organism(s) identified from aspirate or drainage from affected site by a culture or non-culture based testing method which is performed for purposes of clinical diagnosis and treatment for example, not Active Surveillance Culture/Testing (ASC/AST). Identification of 2 or more common commensal organisms without a recognized pathogen is not eligible for use. Common Commensal organisms include, but not are not limited to, diphtheroids (Corynebacterium spp. not C. diphtheria), Bacillus spp. (not B. anthracis), Propionibacterium spp., coagulase-negative staphylococci (including S. epidermidis), viridans group streptococci, Aerococcus spp., Micrococcus spp, and Rhodococcus spp. For a full list of Common Commensals see the Common Commensal tab of the NHSN organisms list.
   b. multinucleated giant cells seen on microscopic examination of affected tissue
   c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for organism

** With no other recognized cause*

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^{o}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

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, ERCP, radiolabel 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.†

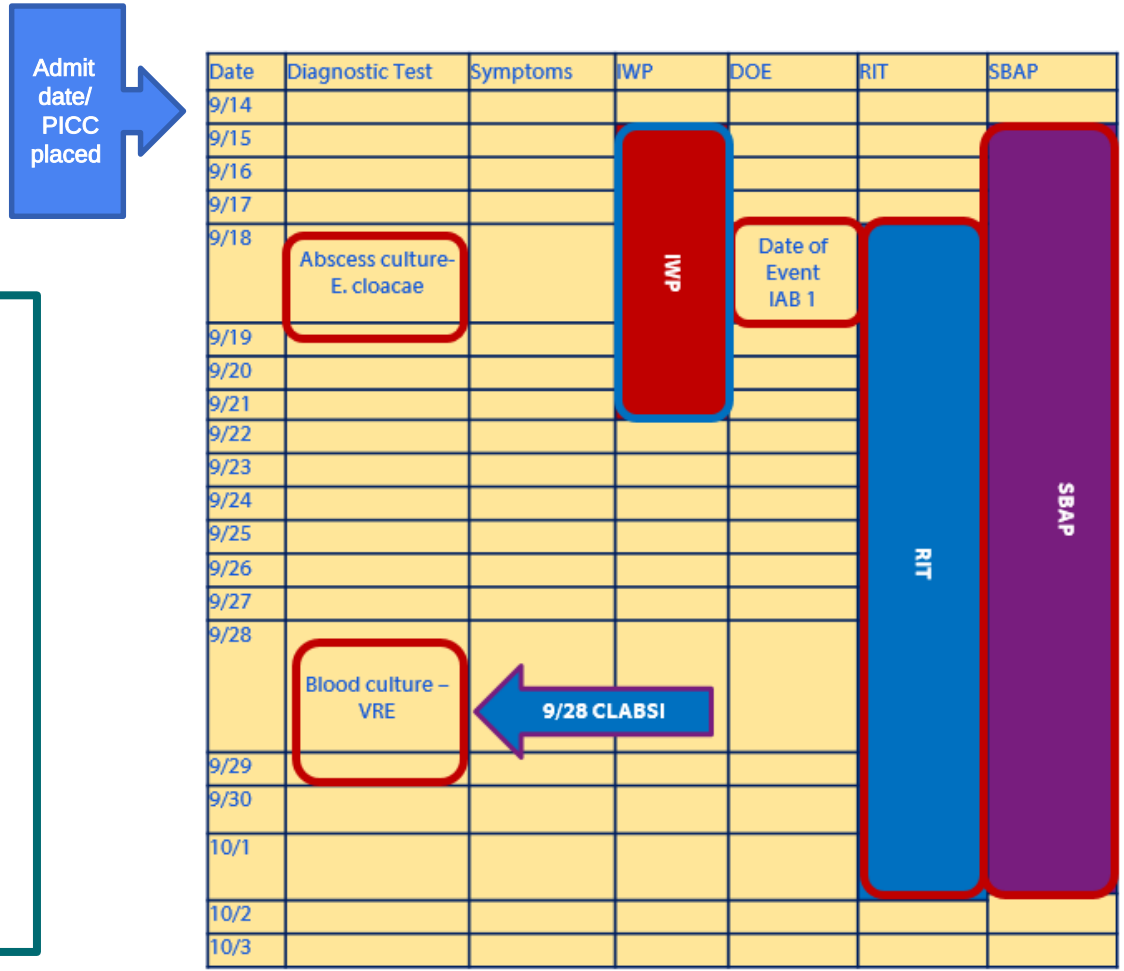
** With no other recognized cause*

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



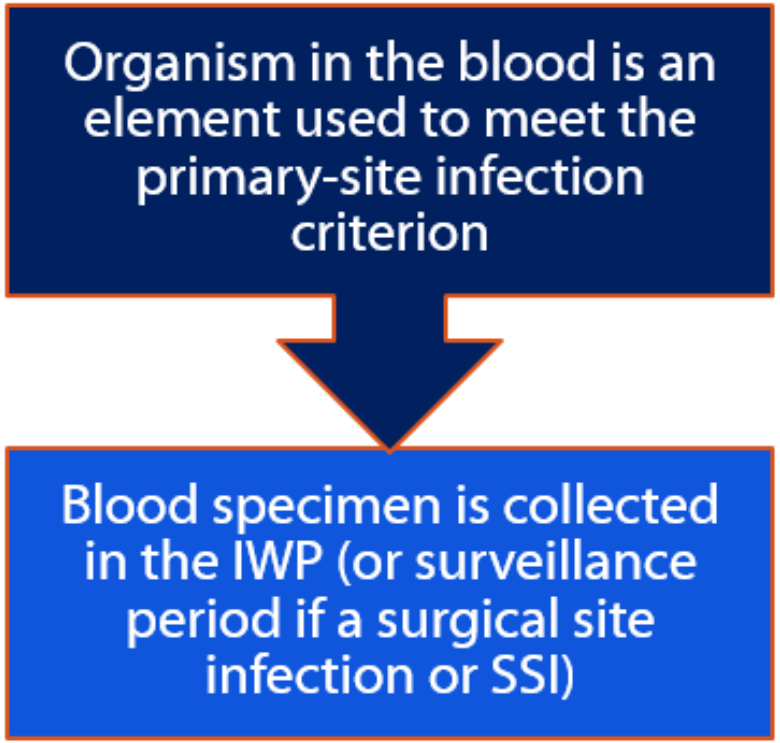
Secondary Bloodstream Infections

Scenario 2

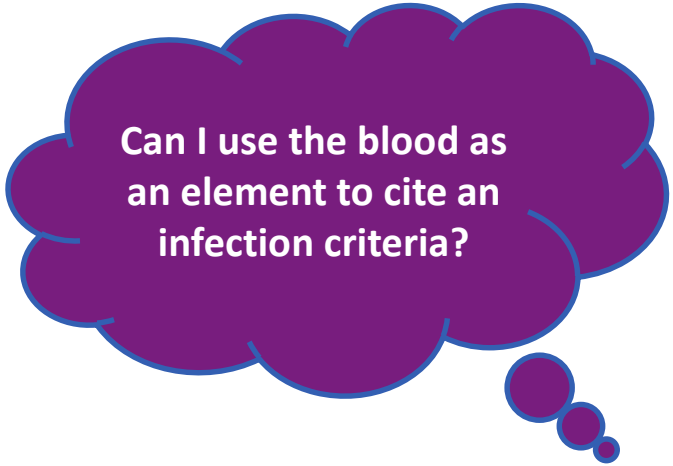
Secondary BSI Scenario 2

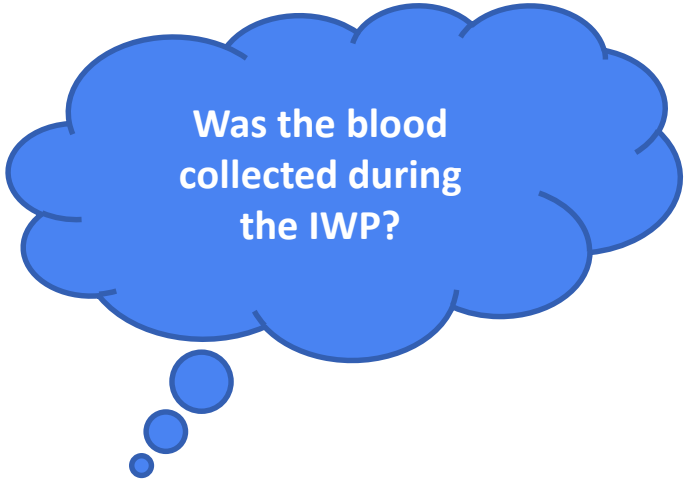
Scenario 2

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.



Questions to Ask When Applying Scenario 2





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 x 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:

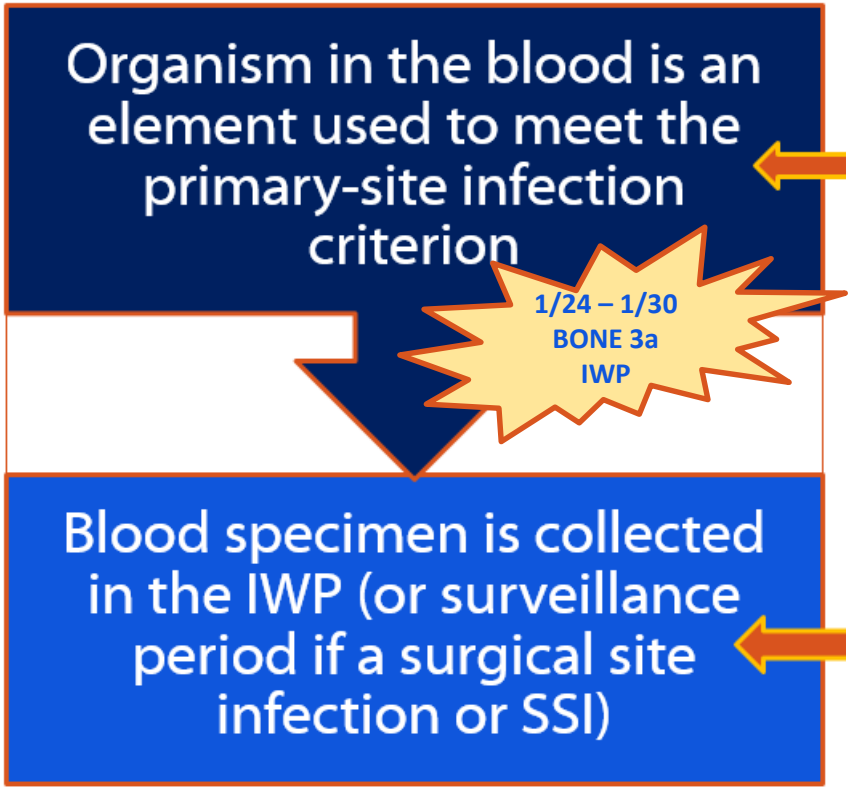
a. organism(s) identified from blood by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis and treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)
AND
imaging test evidence suggestive of infection (for example, x-ray, 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

- 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 – Staphylococcus aureus blood cultures x 2; Vancomycin initiated
- 1/28 – MRI: “Findings compatible with diffuse tibial osteomyelitis”



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 – 102ºF; 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

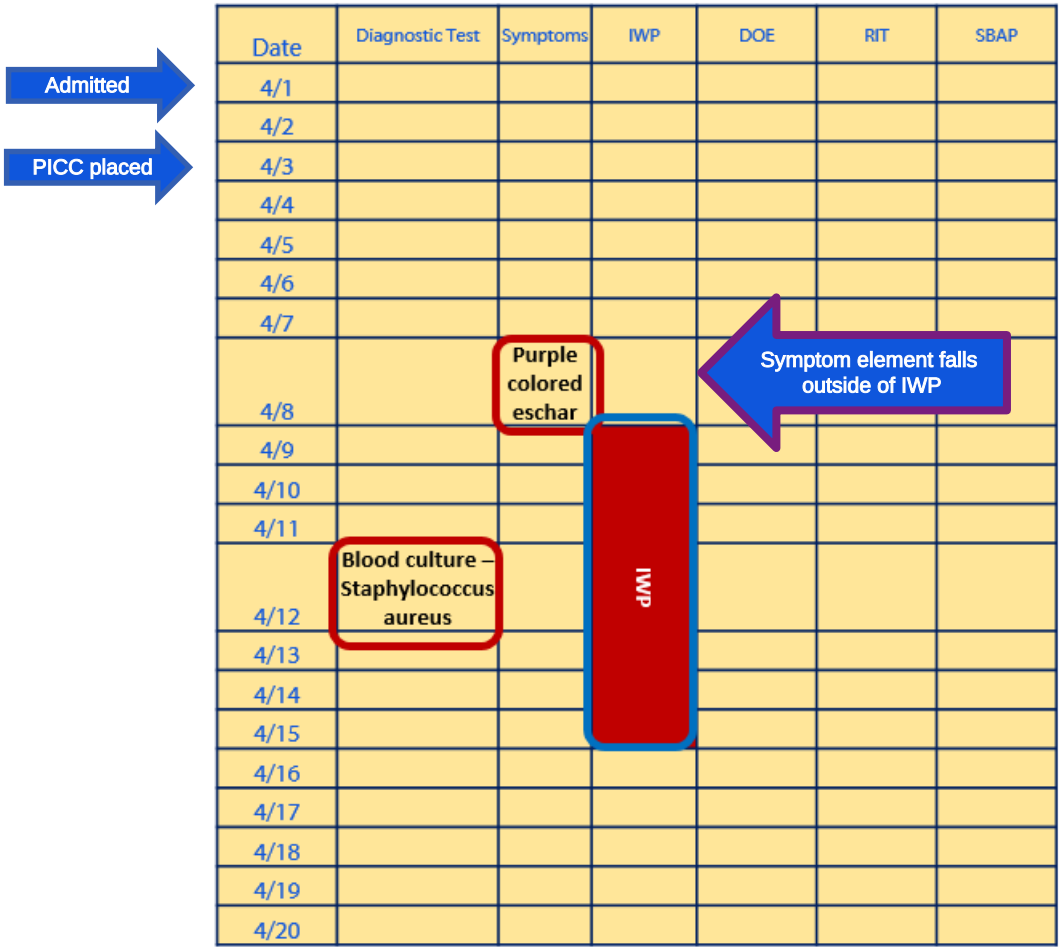
BURN-Burn infection

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^{o}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

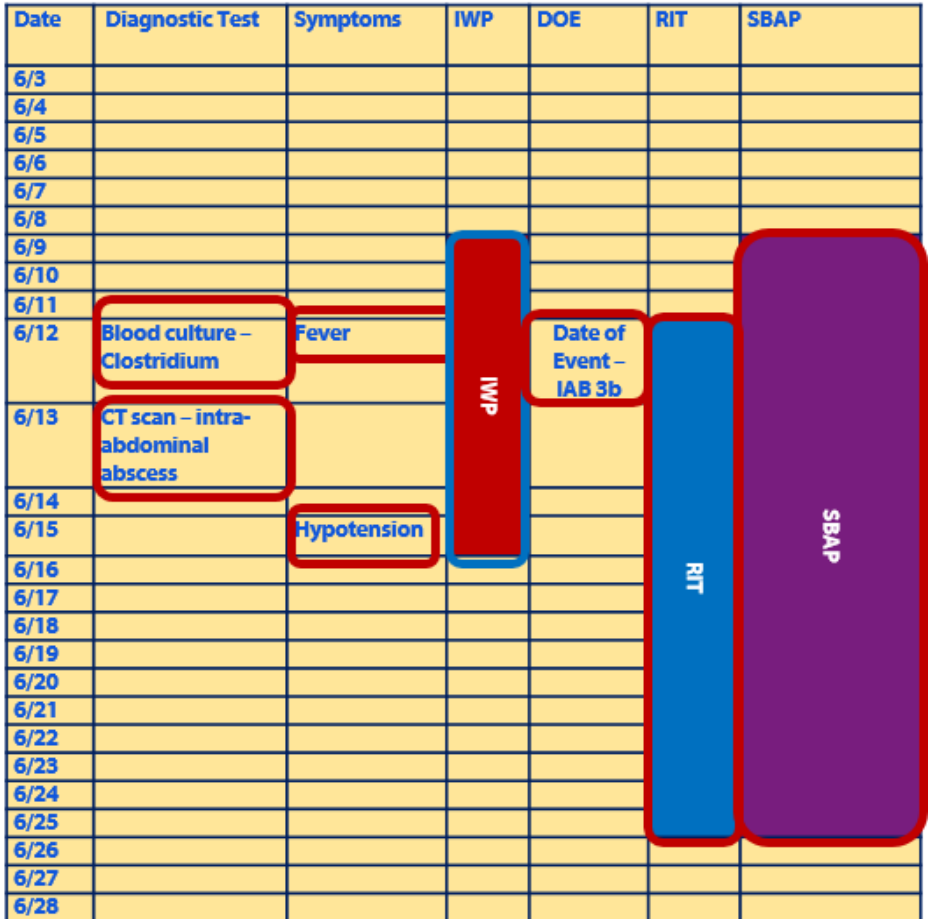
Intraabdominal infections must meet at least ***one*** of the following criteria:

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, ERCP, radiolabel 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*

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

Example 1: Pathogen Assignment

Hospital Day (HD)	UTI SBAP	UTI RIT	UTI Infection Window Period	IAB Infection Window Period	IAB RIT	IAB SBAP
1						
2						
3						
4		1	**Urine culture**: >100,000 cfu/ml *K. pneumoniae*			
5		2	Fever > 38.0 C			
6		3				
7		4				
8		5		Fever >38.0 C, Abdominal pain		
9		6		CT Scan : Abdominal abscess		
10		7	Blood culture: *K. pneumoniae*	Blood culture: *K. pneumoniae*		
11		8				
12		9				
13		10				
14		11				
15		12				
16		13				
17		14				
18						
19						
20						
21						
22						
23						
			SUTI & Secondary BSI DOE = HD 4 Pathogen: *K. pneumoniae*	**IAB & Secondary BSI DOE = HD 8 Pathogen: *K. pneumoniae***		

Infection Window Period
(First positive diagnostic test, 3 days before and 3 days after)

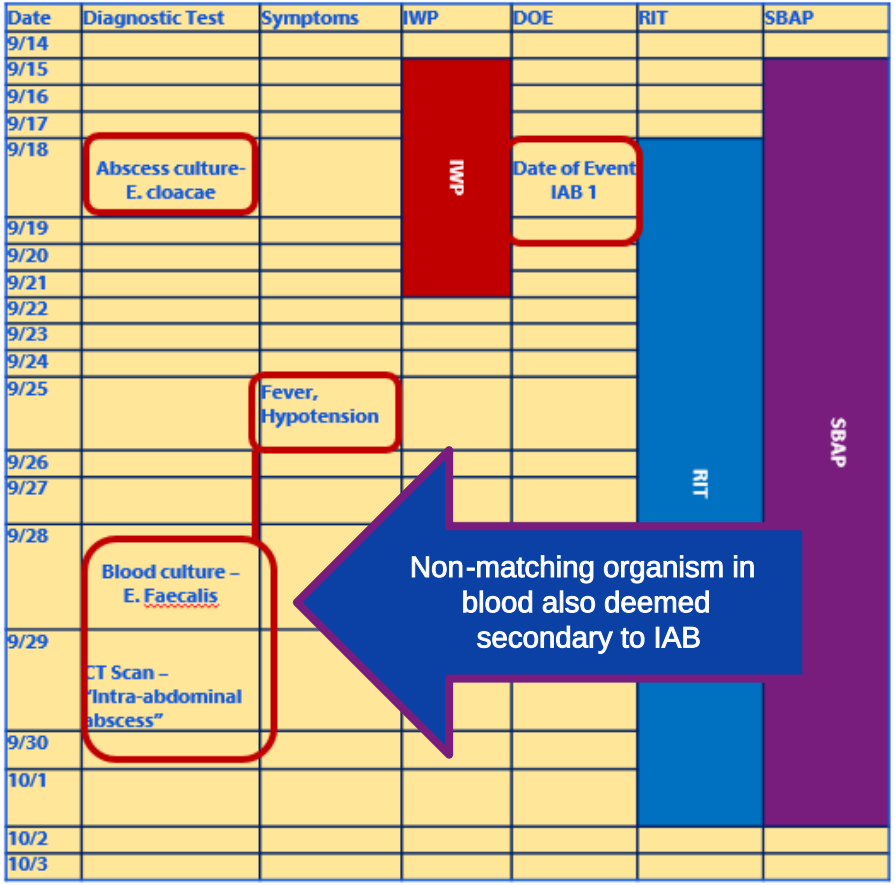
Repeat Infection Timeframe (RIT)
(DOE = day 1)

Secondary BSI Attribution Period (SBAP)
(Infection Window Period + RIT)

Date of Event (DOE)
Date the first element occurs for the first time within the infection window period

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



About VASC and Secondary BSI Attribution. . .

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

BSI Chapter 4, Page 4-36

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

Scenario 1	Scenario 2
A positive blood specimen must contain at least **one eligible matching organism** to the site-specific specimen	Positive blood specimen must be an **element** of the **site-specific definition**
And the blood specimen is collected in the site-specific **secondary BSI attribution period**	**And** blood specimen is collected in the site-specific **infection window period**
And an eligible organism **identified from the site-specific specimen** is used as an element to meet the site-specific definition	And an eligible organism **identified in a blood specimen** is used as an element to meet the site-specific definition

Site	Criterion
ABUTI	ABUTI
BONE	1
BRST	1
CARD	1
CIRC	2 or 3
CONJ	1
DECU	1
DISC	1
EAR	1, 3, 5 or 7,
EMET	1
ENDO	1
EYE	1
GE	2a
GIT	2a, 2b (only yeast)
IAB	1 or 3a
IC	1
JNT	1
LUNG	1
MED	1
MEN	1
ORAL	1 or 3a
OREP	1
PJI	1
PNEU	2 or 3
SA	1
SINU	1
SSI	SI, DI or OS
SKIN	2a
ST	1
UMB	1a
UR	1a or 3a
USI	1
SUTI	1a, 1b or 2
VASC *only as SSI*	1
VCUF	3

Site	Criterion
BONE	3a
BURN	1
DISC	3a
ENDO	4a, 4b, 5a or 5b (specific organisms) 6e or 7e plus other criteria as listed
GIT	1b or 2c
IAB	2b or 3b
JNT	3c

SINU	1
SSI	SI, DI or OS
SKIN	2a
ST	1
UMB	1a
UR	1a or 3a
USI	1
SUTI	1a, 1b or 2
VASC *only as SSI*	1
VCUF	3

Case Studies

Case Study 1

- 9/12 – 25-year old admitted with severe right jaw pain due to a tooth abscess. 102^{o}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.
- 9/13 – “Unbearable pain!” per patient. Temp: 101^{o}F; Purulent drainage noted in right posterior oral cavity. Culture collected.
  - 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:

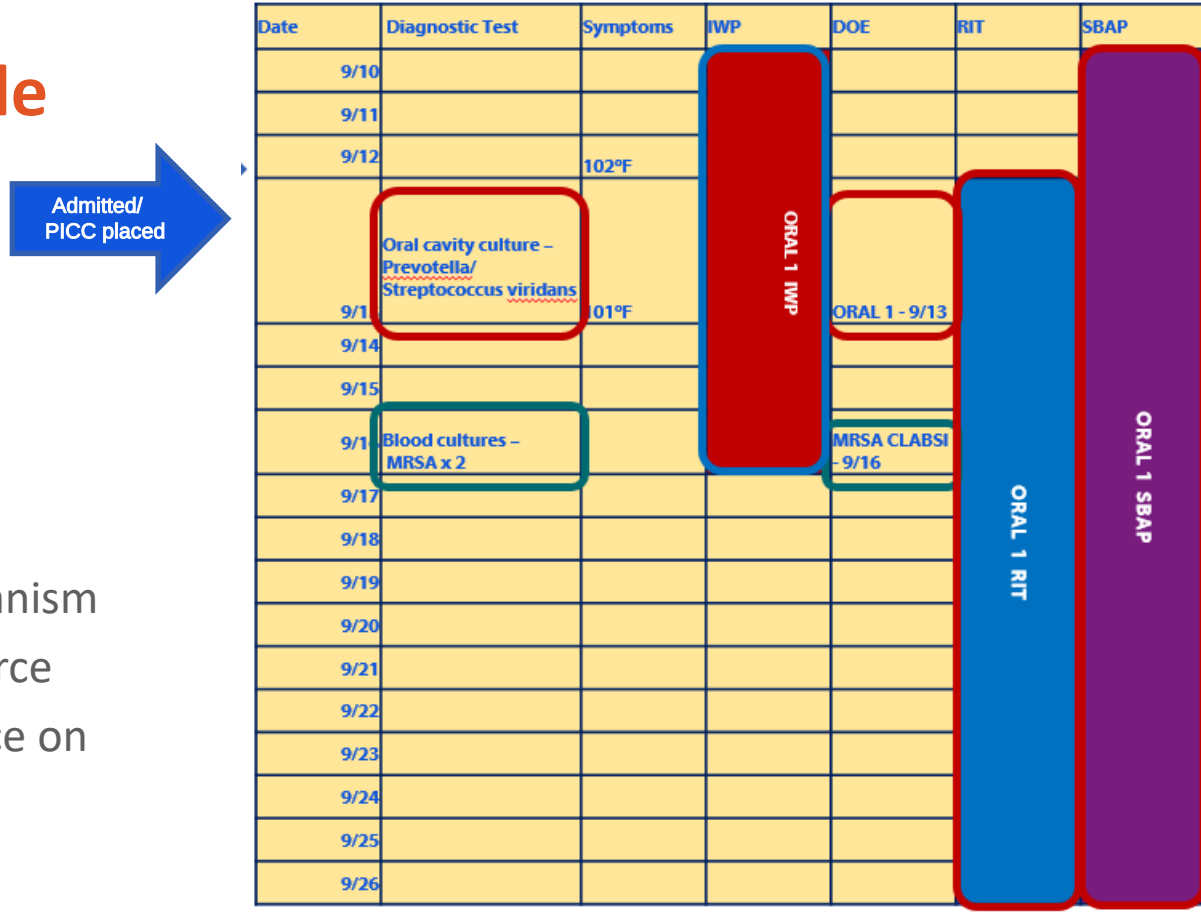
   a. virus identified from mucosal scrapings or exudate by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST)
   b. multinucleated giant cells seen on microscopic 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, 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, ERCP, radiolabel 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.†

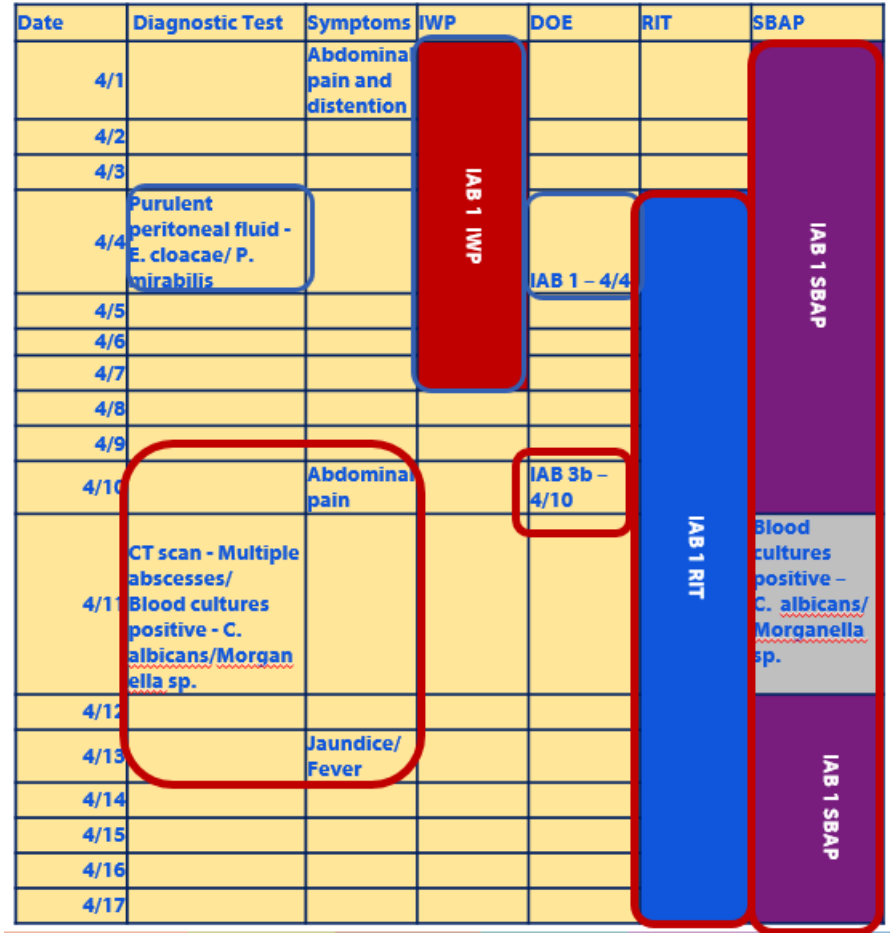
** With no other recognized cause*

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. 101ºF

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 10 – 102^{o}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”.

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

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, ERCP, radiolabel 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*

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

IAB, GIT 2c, OREP not met

- 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".

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

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

- Chapter 4: Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central Line Associated Bloodstream Infection)
  https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf

- Chapter 17: Surveillance Definitions for Specific Types of Infections
  https://www.cdc.gov/nhsn/pdfs/pscmanual/17pscnosinfdef_current.pdf

Thank You

For questions email NHSN@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.