

# CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting

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## BACKGROUND

Since 1988, the Centers for Disease Control and Prevention (CDC) has published 2 articles in which nosocomial infection and criteria for specific types of nosocomial infection for surveillance purposes for use in acute care settings have been defined.<sup>1,2</sup> This document replaces those articles, which are now considered obsolete, and uses the generic term “health care–associated infection” or “HAI” instead of “nosocomial.” This document reflects the elimination of criterion 1 of clinical sepsis (effective in National Healthcare Safety Network [NHSN] facilities since January 2005) and criteria for laboratory–confirmed bloodstream infection (LCBI). Specifically for LCBI, criterion 2c and 3c, and 2b and 3b, were removed effective in NHSN facilities since January 2005 and January 2008, respectively. The definition of “implant,” which is part of the surgical site infection (SSI) criteria, has been slightly modified. No other infection criteria have been added, removed, or changed. There are also notes throughout this document that reflect changes in the use of surveillance criteria since the implementation of NHSN. For example, the

population for which clinical sepsis is used has been restricted to patients  $\leq 1$  year old. Another example is that incisional SSI descriptions have been expanded to specify whether an SSI affects the primary or a secondary incision following operative procedures in which more than 1 incision is made. For additional information about how these criteria are used for NHSN surveillance, refer to the *NHSN Manual: Patient Safety Component Protocol* available at the NHSN Web site ([www.cdc.gov/ncidod/dhqp/nhsn.html](http://www.cdc.gov/ncidod/dhqp/nhsn.html)). Whenever revisions occur, they will be published and made available at the NHSN Web site.

## CDC/NHSN SURVEILLANCE DEFINITION OF HEALTH CARE–ASSOCIATED INFECTION

For the purposes of NHSN surveillance in the acute care setting, the CDC defines an HAI as a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s). There must be no evidence that the infection was present or incubating at the time of admission to the acute care setting.

HAIs may be caused by infectious agents from endogenous or exogenous sources.

- Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.
- Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the health care environment.

Other important considerations include the following:

- Clinical evidence may be derived from direct observation of the infection site (eg, a wound) or

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review of information in the patient chart or other clinical records.

- For certain types of infection, a physician or surgeon diagnosis of infection derived from direct observation during a surgical operation, endoscopic examination, or other diagnostic studies or from clinical judgment is an acceptable criterion for an HAI, unless there is compelling evidence to the contrary. For example, one of the criteria for SSI is “surgeon or attending physician diagnosis.” Unless stated explicitly, physician diagnosis alone is not an acceptable criterion for any specific type of HAI.
- Infections occurring in infants that result from passage through the birth canal are considered HAIs.
- The following infections are *not* considered health care associated:
  - Infections associated with complications or extensions of infections already present on admission, unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection;
  - infections in infants that have been acquired transplacentally (eg, herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and become evident  $\leq 48$  hours after birth; and
  - reactivation of a latent infection (eg, herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis).
- The following conditions are *not* infections:
  - Colonization, which means the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms; and
  - inflammation that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.

## CRITERIA FOR SPECIFIC TYPES OF INFECTION

Once an infection is deemed to be health care associated according to the definition shown above, the specific type of infection should be determined based on the criteria detailed below. These have been grouped into 13 major type categories to facilitate data analysis. For example, there are 3 specific types of urinary tract infections (symptomatic urinary tract infection, asymptomatic bacteriuria, and other infections of the urinary tract) that are grouped under the major type of Urinary Tract Infection. The specific and major types of infection used in NHSN and their abbreviated codes are listed in Table 1, and the criteria for each of the specific types of infection follow it.

## USE OF THESE CRITERIA FOR PUBLICLY REPORTED HAI DATA

Not all infections or infection criteria may be appropriate for use in public reporting of HAIs. Guidance on what infections and infection criteria are recommended is available from other sources (eg, HICPAC [[http://www.cdc.gov/ncidod/dhqp/hicpac\\_pubs.html](http://www.cdc.gov/ncidod/dhqp/hicpac_pubs.html)]; National Quality Forum [<http://www.qualityforum.org/>]; professional organizations).

## UTI-URINARY TRACT INFECTION

### SUTI-Symptomatic urinary tract infection

A symptomatic urinary tract infection must meet at least 1 of the following criteria:

1. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), urgency, frequency, dysuria, or suprapubic tenderness  
and  
patient has a positive urine culture, that is,  $\geq 10^5$  microorganisms per cc of urine with no more than 2 species of microorganisms.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), urgency, frequency, dysuria, or suprapubic tenderness  
and  
at least 1 of the following
  - a. positive dipstick for leukocyte esterase and/or nitrate
  - b. pyuria (urine specimen with  $\geq 10$  white blood cell [WBC]/ $\text{mm}^3$  or  $\geq 3$  WBC/high-power field of unspun urine)
  - c. organisms seen on Gram's stain of unspun urine
  - d. at least 2 urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or *Staphylococcus saprophyticus*) with  $\geq 10^2$  colonies/mL in non-voided specimens
  - e.  $\leq 10^5$  colonies/mL of a single uropathogen (gram-negative bacteria or *S saprophyticus*) in a patient being treated with an effective antimicrobial agent for a urinary tract infection
  - f. physician diagnosis of a urinary tract infection
  - g. physician institutes appropriate therapy for a urinary tract infection.
3. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia

**Table 1.** CDC/NHSN major and specific types of health care–associated infections

|             |                                        |                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UTI</b>  | <b>Urinary tract infection</b>         |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | SUTI                                   | Symptomatic urinary tract infection                                                                                                                                                                                                                                                                                                                                                                         |
|             | ASB                                    | Asymptomatic bacteriuria                                                                                                                                                                                                                                                                                                                                                                                    |
|             | OUTI                                   | Other infections of the urinary tract                                                                                                                                                                                                                                                                                                                                                                       |
| <b>SSI</b>  | <b>Surgical site infection</b>         |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | SIP                                    | Superficial incisional primary SSI                                                                                                                                                                                                                                                                                                                                                                          |
|             | SIS                                    | Superficial incisional secondary SSI                                                                                                                                                                                                                                                                                                                                                                        |
|             | DIP                                    | Deep incisional primary SSI                                                                                                                                                                                                                                                                                                                                                                                 |
|             | DIS                                    | Deep incisional secondary SSI                                                                                                                                                                                                                                                                                                                                                                               |
|             | Organ/space                            | Organ/space SSI. Indicate specific type:                                                                                                                                                                                                                                                                                                                                                                    |
|             |                                        | <ul style="list-style-type: none"> <li>• BONE</li> <li>• BRST</li> <li>• CARD</li> <li>• DISC</li> <li>• EAR</li> <li>• EMET</li> <li>• ENDO</li> <li>• EYE</li> <li>• GIT</li> <li>• IAB</li> <li>• IC</li> <li>• JNT</li> <li>• LUNG</li> <li>• MED</li> <li>• MEN</li> <li>• ORAL</li> <li>• OREP</li> <li>• OUTI</li> <li>• SA</li> <li>• SINU</li> <li>• UR</li> <li>• VASC</li> <li>• VCUF</li> </ul> |
| <b>BSI</b>  | <b>Bloodstream infection</b>           |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | LCBI                                   | Laboratory-confirmed bloodstream infection                                                                                                                                                                                                                                                                                                                                                                  |
|             | CSEP                                   | Clinical sepsis                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>PNEU</b> | <b>Pneumonia</b>                       |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | PNU1                                   | Clinically defined pneumonia                                                                                                                                                                                                                                                                                                                                                                                |
|             | PNU2                                   | Pneumonia with specific laboratory findings                                                                                                                                                                                                                                                                                                                                                                 |
|             | PNU3                                   | Pneumonia in immunocompromised patient                                                                                                                                                                                                                                                                                                                                                                      |
| <b>BJ</b>   | <b>Bone and joint infection</b>        |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | BONE                                   | Osteomyelitis                                                                                                                                                                                                                                                                                                                                                                                               |
|             | JNT                                    | Joint or bursa                                                                                                                                                                                                                                                                                                                                                                                              |
|             | DISC                                   | Disc space                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>CNS</b>  | <b>Central nervous system</b>          |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | IC                                     | Intracranial infection                                                                                                                                                                                                                                                                                                                                                                                      |
|             | MEN                                    | Meningitis or ventriculitis                                                                                                                                                                                                                                                                                                                                                                                 |
|             | SA                                     | Spinal abscess without meningitis                                                                                                                                                                                                                                                                                                                                                                           |
| <b>CVS</b>  | <b>Cardiovascular system infection</b> |                                                                                                                                                                                                                                                                                                                                                                                                             |
|             | VASC                                   | Arterial or venous infection                                                                                                                                                                                                                                                                                                                                                                                |
|             | ENDO                                   | Endocarditis                                                                                                                                                                                                                                                                                                                                                                                                |
|             | CARD                                   | Myocarditis or pericarditis                                                                                                                                                                                                                                                                                                                                                                                 |
|             | MED                                    | Mediastinitis                                                                                                                                                                                                                                                                                                                                                                                               |

Continued

**Table 1.** Continued

|             |                                                                |                                                                          |
|-------------|----------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>EENT</b> | <b>Eye, ear, nose, throat, or mouth infection</b>              |                                                                          |
|             | CONJ                                                           | Conjunctivitis                                                           |
|             | EYE                                                            | Eye, other than conjunctivitis                                           |
|             | EAR                                                            | Ear, mastoid                                                             |
|             | ORAL                                                           | Oral cavity (mouth, tongue, or gums)                                     |
|             | SINU                                                           | Sinusitis                                                                |
|             | UR                                                             | Upper respiratory tract, pharyngitis, laryngitis, epiglottitis           |
| <b>GI</b>   | <b>Gastrointestinal system infection</b>                       |                                                                          |
|             | GE                                                             | Gastroenteritis                                                          |
|             | GIT                                                            | Gastrointestinal (GI) tract                                              |
|             | HEP                                                            | Hepatitis                                                                |
|             | IAB                                                            | Intraabdominal, not specified elsewhere                                  |
|             | NEC                                                            | Necrotizing enterocolitis                                                |
| <b>LRI</b>  | <b>Lower respiratory tract infection, other than pneumonia</b> |                                                                          |
|             | BRON                                                           | Bronchitis, tracheobronchitis, tracheitis, without evidence of pneumonia |
|             | LUNG                                                           | Other infections of the lower respiratory tract                          |
| <b>REPR</b> | <b>Reproductive tract infection</b>                            |                                                                          |
|             | EMET                                                           | Endometritis                                                             |
|             | EPIS                                                           | Episiotomy                                                               |
|             | VCUF                                                           | Vaginal cuff                                                             |
|             | OREP                                                           | Other infections of the male or female reproductive tract                |
| <b>SST</b>  | <b>Skin and soft tissue infection</b>                          |                                                                          |
|             | SKIN                                                           | Skin                                                                     |
|             | ST                                                             | Soft tissue                                                              |
|             | DECU                                                           | Decubitus ulcer                                                          |
|             | BURN                                                           | Burn                                                                     |
|             | BRST                                                           | Breast abscess or mastitis                                               |
|             | UMB                                                            | Omphalitis                                                               |
|             | PUST                                                           | Pustulosis                                                               |
|             | CIRC                                                           | Newborn circumcision                                                     |
| <b>SYS</b>  | <b>Systemic Infection</b>                                      |                                                                          |
|             | DI                                                             | Disseminated infection                                                   |

(<37°C rectal), apnea, bradycardia, dysuria, lethargy, or vomiting  
and

patient has a positive urine culture, that is,  $\geq 10^5$  microorganisms per cc of urine with no more than two species of microorganisms.

4. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^\circ\text{C}$ ), hypothermia ( $<37^\circ\text{C}$ ), apnea, bradycardia, dysuria, lethargy, or vomiting

and

at least 1 of the following:

- a. positive dipstick for leukocyte esterase and/or nitrate
- b. pyuria (urine specimen with  $\geq 10$  WBC/mm<sup>3</sup> or  $\geq 3$  WBC/high-power field of unspun urine)
- c. organisms seen on Gram's stain of unspun urine
- d. at least 2 urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or *S saprophyticus*) with  $\geq 10^2$  colonies/mL in nonvoided specimens
- e.  $\leq 10^5$  colonies/mL of a single uropathogen (gram-negative bacteria or *S saprophyticus*) in a patient being treated with an effective antimicrobial agent for a urinary tract infection
- f. physician diagnosis of a urinary tract infection
- g. physician institutes appropriate therapy for a urinary tract infection.

### ASB-Asymptomatic bacteriuria

An asymptomatic bacteriuria must meet at least 1 of the following criteria:

1. Patient has had an indwelling urinary catheter within 7 days before the culture  
and  
patient has a positive urine culture, that is,  $\geq 10^5$  microorganisms per cc of urine with no more than 2 species of microorganisms  
and  
patient has no fever ( $>38^\circ\text{C}$ ), urgency, frequency, dysuria, or suprapubic tenderness.
2. Patient has *not* had an indwelling urinary catheter within 7 days before the first positive culture  
and  
patient has had at least 2 positive urine cultures, that is,  $\geq 10^5$  microorganisms per cc of urine with repeated isolation of the same microorganism and no more than 2 species of microorganisms  
and  
patient has no fever ( $>38^\circ\text{C}$ ), urgency, frequency, dysuria, or suprapubic tenderness.

### Comments

- A positive culture of a urinary catheter tip is *not* an acceptable laboratory test to diagnose a urinary tract infection.

- Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization.
- In infants, a urine culture should be obtained by bladder catheterization or suprapubic aspiration; a positive urine culture from a bag specimen is unreliable and should be confirmed by a specimen aseptically obtained by catheterization or suprapubic aspiration.

### OUTI-Other infections of the urinary tract (kidney, ureter, bladder, urethra, or tissue surrounding the retroperitoneal or perinephric space)

Other infections of the urinary tract must meet at least 1 of the following criteria:

1. Patient has organisms isolated from culture of fluid (other than urine) or tissue from affected site.
2. Patient has an abscess or other evidence of infection seen on direct examination, during a surgical operation, or during a histopathologic examination.
3. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^\circ\text{C}$ ), localized pain, or localized tenderness at the involved site

and

at least 1 of the following:

- a. purulent drainage from affected site
- b. organisms cultured from blood that are compatible with suspected site of infection
- c. radiographic evidence of infection (eg, abnormal ultrasound, computerized tomography [CT] scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium], etc)
- d. physician diagnosis of infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space
- e. physician institutes appropriate therapy for an infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space.
4. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^\circ\text{C}$  rectal), hypothermia ( $<37^\circ\text{C}$  rectal), apnea, bradycardia, lethargy, or vomiting  
and  
at least 1 of the following:
  - a. purulent drainage from affected site
  - b. organisms cultured from blood that are compatible with suspected site of infection

- c. radiographic evidence of infection (eg, abnormal ultrasound, CT scan, MRI, or radiolabel scan [gallium, technetium])
- d. physician diagnosis of infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space
- e. physician institutes appropriate therapy for an infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space.

## Reporting instruction

- Report infections following circumcision in newborns as CIRC.

## SSI-SURGICAL SITE INFECTION

### SIP/SIS-Superficial incisional surgical site infection

A superficial incisional SSI (SIP or SIS) must meet the following criterion:

Infection occurs within 30 days after the operative procedure

and

involves only skin and subcutaneous tissue of the incision

and

patient has at least 1 of the following:

- a. purulent drainage from the superficial incision
- b. organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- c. at least 1 of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon and is culture positive or not cultured. A culture-negative finding does not meet this criterion.
- d. diagnosis of superficial incisional SSI by the surgeon or attending physician.

There are 2 specific types of superficial incisional SSI:

- *Superficial incisional primary (SIP)*: a superficial incisional SSI that is identified in the primary incision in a patient who has had an operation with 1 or more incisions (eg, C-section incision or chest incision for coronary artery bypass graft with a donor site [CBGB]).
- *Superficial incisional secondary (SIS)*: a superficial incisional SSI that is identified in the secondary incision in a patient who has had an operation with more than 1 incision (eg, donor site [leg] incision for CBGB).

## Reporting instructions

- Do not report a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) as an infection.
- Do not report a localized stab wound infection as SSI, instead report as skin (SKIN), or soft tissue (ST), infection, depending on its depth.
- Report infection of the circumcision site in newborns as CIRC. Circumcision is not an NHSN operative procedure.
- Report infected burn wound as BURN.
- If the incisional site infection involves or extends into the fascial and muscle layers, report as a deep incisional SSI.
- Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

## DIP/DIS-Deep incisional surgical site infection

A deep incisional SSI (DIP or DIS) must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant<sup>1</sup> is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure

and

involves deep soft tissues (eg, fascial and muscle layers) of the incision

and

patient has at least 1 of the following:

- a. purulent drainage from the deep incision but not from the organ/space component of the surgical site
- b. a deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or not cultured when the patient has at least 1 of the following signs or symptoms: fever (>38°C), or localized pain or tenderness. A culture-negative finding does not meet this criterion.
- c. an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- d. diagnosis of a deep incisional SSI by a surgeon or attending physician.

There are 2 specific types of deep incisional SSI:

- *Deep incisional primary (DIP)*: a deep incisional SSI that is identified in a primary incision in a patient

<sup>1</sup>A nonhuman-derived object, material, or tissue (eg, prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes.

who has had an operation with one or more incisions (eg, C-section incision or chest incision for CBGB); and

- *Deep incisional secondary (DIS)*: a deep incisional SSI that is identified in the secondary incision in a patient who has had an operation with more than 1 incision (eg, donor site [leg] incision for CBGB).

### Reporting instruction

- Classify infection that involves *both* superficial and deep incision sites as deep incisional SSI.

### Organ/space-Organ/space surgical site infection

An organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. Specific sites are assigned to organ/space SSI to identify further the location of the infection. Listed below in reporting instructions are the specific sites that must be used to differentiate organ/space SSI. An example is appendectomy with subsequent subdiaphragmatic abscess, which would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB).

An organ/space SSI must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant<sup>1</sup> is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure

and

infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure

and

patient has at least 1 of the following:

- purulent drainage from a drain that is placed through a stab wound into the organ/space
- organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
- an abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- diagnosis of an organ/space SSI by a surgeon or attending physician.

### Reporting instructions

- Specific sites of organ/space SSI (see also criteria for these sites)

○ BONE  
○ BRST

○ LUNG  
○ MED

○ CARD  
○ DISC  
○ EAR  
○ EMET  
○ ENDO  
○ EYE  
○ GIT  
○ IAB  
○ IC  
○ JNT

○ MEN  
○ ORAL  
○ OREP  
○ OUTI  
○ SA  
○ SINU  
○ UR  
○ VASC  
○ VCUF

- Occasionally an organ/space infection drains through the incision. Such infection generally does not involve reoperation and is considered a complication of the incision; therefore, classify it as a deep incisional SSI.

### BSI-BLOODSTREAM INFECTION

#### LCBI-Laboratory-confirmed bloodstream infection

LCBI criteria 1 and 2 may be used for patients of any age, including patients  $\leq 1$  year of age.

LCBI must meet at least 1 of the following criteria:

1. Patient has a recognized pathogen cultured from 1 or more blood cultures  
and  
organism cultured from blood is *not* related to an infection at another site. (See Notes 1 and 2.)
2. Patient has at least 1 of the following signs or symptoms: fever ( $>38^{\circ}\text{C}$ ), chills, or hypotension  
and  
signs and symptoms and positive laboratory results are *not* related to an infection at another site  
and  
common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions. (See Notes 3 and 4.)
3. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms: fever ( $>38^{\circ}\text{C}$ , rectal), hypothermia ( $<37^{\circ}\text{C}$ , rectal), apnea, or bradycardia  
and  
signs and symptoms and positive laboratory results are *not* related to an infection at another site  
and  
common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood

cultures drawn on separate occasions. (See Notes 3 and 4.)

## Notes

1. In criterion 1, the phrase “1 or more blood cultures” means that at least 1 bottle from a blood draw is reported by the laboratory as having grown organisms (ie, is a positive blood culture).
2. In criterion 1, the term “recognized pathogen” does *not* include organisms considered common skin contaminants (see criteria 2 and 3 for a list of common skin contaminants). A few of the recognized pathogens are *S aureus*, *Enterococcus* spp, *E coli*, *Pseudomonas* spp, *Klebsiella* spp, *Candida* spp, and others.
3. In criteria 2 and 3, the phrase “2 or more blood cultures drawn on separate occasions” means (1) that blood from at least 2 blood draws were collected within 2 days of each other (eg, blood draws on Monday and Tuesday or Monday and Wednesday would be acceptable for blood cultures drawn on separate occasions, but blood draws on Monday and Thursday would be too far apart in time to meet this criterion) and (2) that at least 1 bottle from each blood draw is reported by the laboratory as having grown the same common skin contaminant organism (ie, is a positive blood culture). (See Note 4 for determining sameness of organisms.)
  - a. For example, an adult patient has blood drawn at 8 AM and again at 8:15 AM of the same day. Blood from each blood draw is inoculated into 2 bottles and incubated (4 bottles total). If 1 bottle from each blood draw set is positive for coagulase-negative staphylococci, this part of the criterion is met.
  - b. For example, a neonate has blood drawn for culture on Tuesday and again on Saturday, and both grow the same common skin contaminant. Because the time between these blood cultures exceeds the 2-day period for blood draws stipulated in criteria 2 and 3, this part of the criteria is *not* met.
  - c. A blood culture may consist of a single bottle for a pediatric blood draw because of volume constraints. Therefore, to meet this part of the criterion, each bottle from 2 or more draws would have to be culture positive for the same skin contaminant.
4. There are several issues to consider when determining sameness of organisms.
  - a. If the common skin contaminant is identified to the species level from 1 culture,

**Table 2.** Examples of “sameness” by organism speciation

| Culture                                     | Companion Culture                | Report as...         |
|---------------------------------------------|----------------------------------|----------------------|
| <i>S epidermidis</i>                        | Coagulase-negative staphylococci | <i>S epidermidis</i> |
| <i>Bacillus</i> spp (not <i>anthracis</i> ) | <i>B cereus</i>                  | <i>B cereus</i>      |
| <i>S salivarius</i>                         | <i>Strep viridans</i>            | <i>S salivarius</i>  |

**Table 3.** Examples of “sameness” by organism antibiogram

| Organism Name              | Isolate A                       | Isolate B                                      | Interpret as... |
|----------------------------|---------------------------------|------------------------------------------------|-----------------|
| <i>S epidermidis</i>       | All drugs <b>S</b>              | All drugs <b>S</b>                             | Same            |
| <i>S epidermidis</i>       | OX <b>R</b><br>CEFAZ <b>R</b>   | OX <b>S</b><br>CEFAZ <b>S</b>                  | Different       |
| <i>Corynebacterium</i> spp | PENG <b>R</b><br>CIPRO <b>S</b> | PENG <b>S</b><br>CIPRO <b>R</b>                | Different       |
| <i>Strep viridans</i>      | All drugs <b>S</b>              | All drugs <b>S</b><br>except<br>ERYTH <b>R</b> | Same            |

**S**, sensitive; **R**, resistant.

and a companion culture is identified with only a descriptive name (ie, to the genus level), then it is assumed that the organisms are the same. The speciated organism should be reported as the infecting pathogen (see examples in Table 2).

- b. If common skin contaminant organisms from the cultures are speciated but no antibiograms are done or they are done for only 1 of the isolates, it is assumed that the organisms are the same.
- c. If the common skin contaminants from the cultures have antibiograms that are different for 2 or more antimicrobial agents, it is assumed that the organisms are *not* the same (see examples in Table 3).
- d. For the purpose of NHSN antibiogram reporting, the category interpretation of intermediate (I) should *not* be used to distinguish whether 2 organisms are the same.

## Specimen collection considerations

Ideally, blood specimens for culture should be obtained from 2 to 4 blood draws from separate venipuncture sites (eg, right and left antecubital veins), not through a vascular catheter. These blood draws should be performed simultaneously or over a short period of time (ie, within a few hours).<sup>3,4</sup> If your facility does not currently obtain specimens using this technique, you may still report BSIs using the criteria and notes above, but you should work with appropriate personnel to facilitate better specimen collection practices for blood cultures.

## Reporting instructions

- Purulent phlebitis confirmed with a positive semi-quantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI.
- Report organisms cultured from blood as BSI-LCBI when no other site of infection is evident.

## CSEP-CLINICAL SEPSIS

CSEP may be used only to report primary BSI in neonates and infants. It is not used to report BSI in adults and children.

Clinical sepsis must meet the following criterion:

Patient  $\leq 1$  year of age has at least 1 of the following clinical signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, or bradycardia

and

blood culture *not* done or *no* organisms detected in blood

and

no apparent infection at another site

and

physician institutes treatment for sepsis.

## Reporting instruction

- Report culture-positive infections of the bloodstream as BSI-LCBI.

## PNEU-PNEUMONIA

See Appendix.

## BJ-BONE AND JOINT INFECTION

### BONE-Osteomyelitis

Osteomyelitis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from bone.
  2. Patient has evidence of osteomyelitis on direct examination of the bone during a surgical operation or histopathologic examination.
  3. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), localized swelling, tenderness, heat, or drainage at suspected site of bone infection
- and
- at least 1 of the following:
- a. organisms cultured from blood
  - b. positive blood antigen test (eg, *H influenzae*, *S pneumoniae*)

- c. radiographic evidence of infection (eg, abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc]).

## Reporting instruction

- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.

## JNT-Joint or bursa

Joint or bursa infections must meet at least 1 of the following criteria:

1. Patient has organisms cultured from joint fluid or synovial biopsy.
  2. Patient has evidence of joint or bursa infection seen during a surgical operation or histopathologic examination.
  3. Patient has at least 2 of the following signs or symptoms with no other recognized cause: joint pain, swelling, tenderness, heat, evidence of effusion or limitation of motion
- and
- at least 1 of the following:
- a. organisms *and* white blood cells seen on Gram's stain of joint fluid
  - b. positive antigen test on blood, urine, or joint fluid
  - c. cellular profile and chemistries of joint fluid compatible with infection and *not* explained by an underlying rheumatologic disorder
  - d. radiographic evidence of infection (eg, abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc]).

## DISC-Disc space infection

Vertebral disc space infection must meet at least 1 of the following criteria:

1. Patient has organisms cultured from vertebral disc space tissue obtained during a surgical operation or needle aspiration.
  2. Patient has evidence of vertebral disc space infection seen during a surgical operation or histopathologic examination.
  3. Patient has fever ( $>38^{\circ}\text{C}$ ) with no other recognized cause or pain at the involved vertebral disc space
- and
- radiographic evidence of infection, (eg, abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc]).

4. Patient has fever ( $>38^{\circ}\text{C}$ ) with no other recognized cause and pain at the involved vertebral disc space  
and  
positive antigen test on blood or urine (eg, *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*).

## CNS-CENTRAL NERVOUS SYSTEM INFECTION

### IC-Intracranial infection (brain abscess, subdural or epidural infection, encephalitis)

Intracranial infection must meet at least 1 of the following criteria:

1. Patient has organisms cultured from brain tissue or dura.
2. Patient has an abscess or evidence of intracranial infection seen during a surgical operation or histopathologic examination.
3. Patient has at least 2 of the following signs or symptoms with no other recognized cause: headache, dizziness, fever ( $>38^{\circ}\text{C}$ ), localizing neurologic signs, changing level of consciousness, or confusion  
and  
at least 1 of the following:

- a. organisms seen on microscopic examination of brain or abscess tissue obtained by needle aspiration or by biopsy during a surgical operation or autopsy
- b. positive antigen test on blood or urine
- c. radiographic evidence of infection, (eg, abnormal findings on ultrasound, CT scan, MRI, radionuclide brain scan, or arteriogram)
- d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

4. Patient  $\leq 1$  year of age has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, localizing neurologic signs, or changing level of consciousness  
and  
at least 1 of the following:

- a. organisms seen on microscopic examination of brain or abscess tissue obtained by needle aspiration or by biopsy during a surgical operation or autopsy

- b. positive antigen test on blood or urine
- c. radiographic evidence of infection, (eg, abnormal findings on ultrasound, CT scan, MRI, radionuclide brain scan, or arteriogram)
- d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

### Reporting instruction

- If meningitis and a brain abscess are present together, report the infection as IC.

### MEN-Meningitis or ventriculitis

Meningitis or ventriculitis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from cerebrospinal fluid (CSF).
2. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), headache, stiff neck, meningeal signs, cranial nerve signs, or irritability  
and  
at least 1 of the following:
  - a. increased white cells, elevated protein, and/or decreased glucose in CSF
  - b. organisms seen on Gram's stain of CSF
  - c. organisms cultured from blood
  - d. positive antigen test of CSF, blood, or urine
  - e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

3. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, stiff neck, meningeal signs, cranial nerve signs, or irritability  
and  
at least 1 of the following:

- a. positive CSF examination with increased white cells, elevated protein, and/or decreased glucose
- b. positive Gram's stain of CSF
- c. organisms cultured from blood
- d. positive antigen test of CSF, blood, or urine
- e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

### Reporting instructions

- Report meningitis in the newborn as health care-associated *unless* there is compelling evidence indicating the meningitis was acquired transplacentally.
- Report CSF shunt infection as SSI-MEN if it occurs  $\leq 1$  year of placement; if later or after manipulation/access of the shunt, report as CNS-MEN.
- Report meningoencephalitis as MEN.
- Report spinal abscess *with* meningitis as MEN.

### SA-Spinal abscess without meningitis

An abscess of the spinal epidural or subdural space, without involvement of the cerebrospinal fluid or adjacent bone structures, must meet at least 1 of the following criteria:

1. Patient has organisms cultured from abscess in the spinal epidural or subdural space.
2. Patient has an abscess in the spinal epidural or subdural space seen during a surgical operation or at autopsy or evidence of an abscess seen during a histopathologic examination.
3. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), back pain, focal tenderness, radiculitis, paraparesis, or paraplegia  
and  
at least 1 of the following:
  - a. organisms cultured from blood
  - b. radiographic evidence of a spinal abscess (eg, abnormal findings on myelography, ultrasound, CT scan, MRI, or other scans [gallium, technetium, etc]).

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

### Reporting instruction

- Report spinal abscess *with* meningitis as MEN.

## CVS-CARDIOVASCULAR SYSTEM INFECTION

### VASC-Arterial or venous infection

Arterial or venous infection must meet at least 1 of the following criteria:

1. Patient has organisms cultured from arteries or veins removed during a surgical operation

and

blood culture *not* done or *no* organisms cultured from blood.

2. Patient has evidence of arterial or venous infection seen during a surgical operation or histopathologic examination.
3. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), pain, erythema, or heat at involved vascular site  
and  
more than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method  
and  
blood culture *not* done or *no* organisms cultured from blood.
4. Patient has purulent drainage at involved vascular site  
and  
blood culture *not* done or *no* organisms cultured from blood.
5. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, lethargy, or pain, erythema, or heat at involved vascular site  
and  
more than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method  
and  
blood culture *not* done or *no* organisms cultured from blood.

### Reporting instructions

- Report infections of an arteriovenous graft, shunt, or fistula or intravascular cannulation site without organisms cultured from blood as CVS-VASC.
- Report intravascular infections with organisms cultured from the blood as BSI-LCBI.

## ENDO-Endocarditis

Endocarditis of a natural or prosthetic heart valve must meet at least 1 of the following criteria:

1. Patient has organisms cultured from valve or vegetation.
2. Patient has 2 or more of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), new or changing murmur, embolic phenomena, skin manifestations (ie, petechiae, splinter hemorrhages, painful subcutaneous nodules),

congestive heart failure, or cardiac conduction abnormality

and

at least 1 of the following:

- a. organisms cultured from 2 or more blood cultures
- b. organisms seen on Gram's stain of valve when culture is negative or *not* done
- c. valvular vegetation seen during a surgical operation or autopsy
- d. positive antigen test on blood or urine (eg, *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*)
- e. evidence of new vegetation seen on echocardiogram

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

3. Patient  $\leq 1$  year of age has 2 or more of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, new or changing murmur, embolic phenomena, skin manifestations (ie, petechiae, splinter hemorrhages, painful subcutaneous nodules), congestive heart failure, or cardiac conduction abnormality

and

at least 1 of the following:

- a. organisms cultured from 2 or more blood cultures
- b. organisms seen on Gram's stain of valve when culture is negative or *not* done
- c. valvular vegetation seen during a surgical operation or autopsy
- d. positive antigen test on blood or urine (eg, *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*)
- e. evidence of new vegetation seen on echocardiogram

and

if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

### CARD-Myocarditis or pericarditis

Myocarditis or pericarditis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from pericardial tissue or fluid obtained by needle aspiration or during a surgical operation.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), chest pain, paradoxical pulse, or increased heart size

and

at least 1 of the following:

- a. abnormal EKG consistent with myocarditis or pericarditis
  - b. positive antigen test on blood (eg, *H influenzae*, *S pneumoniae*)
  - c. evidence of myocarditis or pericarditis on histologic examination of heart tissue
  - d. 4-fold rise in type-specific antibody with or without isolation of virus from pharynx or feces
  - e. pericardial effusion identified by echocardiogram, CT scan, MRI, or angiography.
3. Patient  $\leq 1$  year of age has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, paradoxical pulse, or increased heart size

and

at least 1 of the following:

- a. abnormal EKG consistent with myocarditis or pericarditis
- b. positive antigen test on blood (eg, *H influenzae*, *S pneumoniae*)
- c. histologic examination of heart tissue shows evidence of myocarditis or pericarditis
- d. 4-fold rise in type-specific antibody with or without isolation of virus from pharynx or feces
- e. pericardial effusion identified by echocardiogram, CT scan, MRI, or angiography.

### Comment

- Most cases of postcardiac surgery or postmyocardial infarction pericarditis are not infectious.

### MED-Mediastinitis

Mediastinitis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from mediastinal tissue or fluid obtained during a surgical operation or needle aspiration.
2. Patient has evidence of mediastinitis seen during a surgical operation or histopathologic examination.
3. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), chest pain, or sternal instability

and

at least 1 of the following:

- a. purulent discharge from mediastinal area
- b. organisms cultured from blood or discharge from mediastinal area

- c. mediastinal widening on x-ray.
4. Patient  $\leq 1$  year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, or sternal instability *and* at least 1 of the following:
  - a. purulent discharge from mediastinal area
  - b. organisms cultured from blood or discharge from mediastinal area
  - c. mediastinal widening on x-ray.

### Reporting instruction

- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.

## EENT-EYE, EAR, NOSE, THROAT, OR MOUTH INFECTION

### CONJ-Conjunctivitis

Conjunctivitis must meet at least 1 of the following criteria:

1. Patient has pathogens cultured from purulent exudate obtained from the conjunctiva or contiguous tissues, such as eyelid, cornea, meibomian glands, or lacrimal glands.
2. Patient has pain or redness of conjunctiva or around eye *and* at least 1 of the following:
  - a. WBCs and organisms seen on Gram's stain of exudate
  - b. purulent exudate
  - c. positive antigen test (eg, ELISA or IF for *Chlamydia trachomatis*, herpes simplex virus, adenovirus) on exudate or conjunctival scraping
  - d. multinucleated giant cells seen on microscopic examination of conjunctival exudate or scrapings
  - e. positive viral culture
  - f. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

### Reporting instructions

- Report other infections of the eye as EYE.
- Do *not* report chemical conjunctivitis caused by silver nitrate ( $\text{AgNO}_3$ ) as a health care-associated infection.
- Do *not* report conjunctivitis that occurs as a part of a more widely disseminated viral illness (such as measles, chickenpox, or a URI).

### EYE-Eye, other than conjunctivitis

An infection of the eye, other than conjunctivitis, must meet at least 1 of the following criteria:

1. Patient has organisms cultured from anterior or posterior chamber or vitreous fluid.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: eye pain, visual disturbance, or hypopyon *and* at least 1 of the following:
  - a. physician diagnosis of an eye infection
  - b. positive antigen test on blood (eg, *H influenzae*, *S pneumoniae*)
  - c. organisms cultured from blood.

### EAR-Ear mastoid

Ear and mastoid infections must meet at least 1 of the following criteria:

Otitis externa must meet at least 1 of the following criteria:

1. Patient has pathogens cultured from purulent drainage from ear canal.
2. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), pain, redness, or drainage from ear canal *and* organisms seen on Gram's stain of purulent drainage.

Otitis media must meet at least 1 of the following criteria:

1. Patient has organisms cultured from fluid from middle ear obtained by tympanocentesis or at surgical operation.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), pain in the eardrum, inflammation, retraction or decreased mobility of eardrum, or fluid behind eardrum.

Otitis interna must meet at least 1 of the following criteria:

1. Patient has organisms cultured from fluid from inner ear obtained at surgical operation.
2. Patient has a physician diagnosis of inner ear infection.

Mastoiditis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from purulent drainage from mastoid.

2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), pain, tenderness, erythema, headache, or facial paralysis

and

at least 1 of the following:

- a. organisms seen on Gram's stain of purulent material from mastoid
- b. positive antigen test on blood.

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

Oral cavity infections must meet at least 1 of the following criteria:

1. Patient has organisms cultured from purulent material from tissues of oral cavity.
2. Patient has an abscess or other evidence of oral cavity infection seen on direct examination, during a surgical operation, or during a histopathologic examination.
3. Patient has at least 1 of the following signs or symptoms with no other recognized cause: abscess, ulceration, or raised white patches on inflamed mucosa, or plaques on oral mucosa

and

at least 1 of the following:

- a. organisms seen on Gram's stain
- b. positive KOH (potassium hydroxide) stain
- c. multinucleated giant cells seen on microscopic examination of mucosal scrapings
- d. positive antigen test on oral secretions
- e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
- f. physician diagnosis of infection and treatment with topical or oral antifungal therapy.

### Reporting instruction

- Report health care-associated primary herpes simplex infections of the oral cavity as ORAL; recurrent herpes infections are *not* health care-associated.

### SINU-Sinusitis

Sinusitis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from purulent material obtained from sinus cavity.
2. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), pain or tenderness over the involved sinus, headache, purulent exudate, or nasal obstruction

and

at least 1 of the following:

- a. positive transillumination
- b. positive radiographic examination (including CT scan).

### UR-Upper respiratory tract, pharyngitis, laryngitis, epiglottitis

Upper respiratory tract infections must meet at least 1 of the following criteria:

1. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), erythema of pharynx, sore throat, cough, hoarseness, or purulent exudate in throat

and

at least 1 of the following:

- a. organisms cultured from the specific site
- b. organisms cultured from blood
- c. positive antigen test on blood or respiratory secretions
- d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
- e. physician diagnosis of an upper respiratory infection.

2. Patient has an abscess seen on direct examination, during a surgical operation, or during a histopathologic examination.

3. Patient  $\leq 1$  year of age has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$  rectal), hypothermia ( $<37^{\circ}\text{C}$  rectal), apnea, bradycardia, nasal discharge, or purulent exudate in throat

and

at least 1 of the following:

- a. organisms cultured from the specific site
- b. organisms cultured from blood
- c. positive antigen test on blood or respiratory secretions
- d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
- e. physician diagnosis of an upper respiratory infection.

### GI-GASTROINTESTINAL SYSTEM INFECTION

#### GE-Gastroenteritis

Gastroenteritis must meet at least 1 of the following criteria:

1. Patient has an acute onset of diarrhea (liquid stools for more than 12 hours) with or without

vomiting or fever ( $>38^{\circ}\text{C}$ ) and no likely noninfectious cause (eg, diagnostic tests, therapeutic regimen other than antimicrobial agents, acute exacerbation of a chronic condition, or psychologic stress).

2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: nausea, vomiting, abdominal pain, fever ( $>38^{\circ}\text{C}$ ), or headache

and

at least 1 of the following:

- a. an enteric pathogen is cultured from stool or rectal swab
- b. an enteric pathogen is detected by routine or electron microscopy
- c. an enteric pathogen is detected by antigen or antibody assay on blood or feces
- d. evidence of an enteric pathogen is detected by cytopathic changes in tissue culture (toxin assay)
- e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

### **GIT-Gastrointestinal tract (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis**

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least 1 of the following criteria:

1. Patient has an abscess or other evidence of infection seen during a surgical operation or histopathologic examination.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause and compatible with infection of the organ or tissue involved: fever ( $>38^{\circ}\text{C}$ ), nausea, vomiting, abdominal pain, or tenderness

and

at least 1 of the following:

- a. organisms cultured from drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
- b. organisms seen on Gram's or KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
- c. organisms cultured from blood
- d. evidence of pathologic findings on radiographic examination
- e. evidence of pathologic findings on endoscopic examination (eg, *Candida* esophagitis or proctitis).

### **HEP-Hepatitis**

Hepatitis must meet the following criterion:

Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), anorexia, nausea, vomiting, abdominal pain, jaundice, or history of transfusion within the previous 3 months

and

at least 1 of the following:

- a. positive antigen or antibody test for hepatitis A, hepatitis B, hepatitis C, or delta hepatitis
- b. abnormal liver function tests (eg, elevated ALT/AST, bilirubin)
- c. cytomegalovirus (CMV) detected in urine or oropharyngeal secretions.

### **Reporting instructions**

- Do *not* report hepatitis or jaundice of noninfectious origin (alpha-1 antitrypsin deficiency, etc).
- Do *not* report hepatitis or jaundice that results from exposure to hepatotoxins (alcoholic or acetaminophen-induced hepatitis, etc).
- Do *not* report hepatitis or jaundice that results from biliary obstruction (cholecystitis).

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

Intraabdominal infections must meet at least 1 of the following criteria:

1. Patient has organisms cultured from purulent material from intraabdominal space obtained during a surgical operation or needle aspiration.
2. Patient has abscess or other evidence of intraabdominal infection seen during a surgical operation or histopathologic examination.
3. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), nausea, vomiting, abdominal pain, or jaundice

and

at least 1 of the following:

- a. organisms cultured from drainage from surgically placed drain (eg, closed suction drainage system, open drain, T-tube drain)
- b. organisms seen on Gram's stain of drainage or tissue obtained during surgical operation or needle aspiration

- c. organisms cultured from blood *and* radiographic evidence of infection (eg, abnormal findings on ultrasound, CT scan, MRI, or radiolabel scans [gallium, technetium, etc] or on abdominal x-ray).

### Reporting instruction

- Do *not* report pancreatitis (an inflammatory syndrome characterized by abdominal pain, nausea, and vomiting associated with high serum levels of pancreatic enzymes) unless it is determined to be infectious in origin.

### NEC-Necrotizing enterocolitis

Necrotizing enterocolitis in infants must meet the following criterion:

Infant has at least 2 of the following signs or symptoms with no other recognized cause: vomiting, abdominal distention, or prefeeding residuals

*and*

persistent microscopic or gross blood in stools

*and*

at least 1 of the following abdominal radiographic abnormalities:

- a. pneumoperitoneum
- b. pneumatosis intestinalis
- c. unchanging "rigid" loops of small bowel.

### LRI-LOWER RESPIRATORY TRACT INFECTION, OTHER THAN PNEUMONIA

#### BRON-Bronchitis, tracheobronchitis, bronchiolitis, tracheitis, without evidence of pneumonia

Tracheobronchial infections must meet at least 1 of the following criteria:

- 1. Patient has *no* clinical or radiographic evidence of pneumonia

*and*

patient has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ), cough, new or increased sputum production, rhonchi, wheezing

*and*

at least 1 of the following:

- a. positive culture obtained by deep tracheal aspirate or bronchoscopy
- b. positive antigen test on respiratory secretions.

- 2. Patient  $\leq 1$  year of age has *no* clinical or radiographic evidence of pneumonia

*and*

patient has at least 2 of the following signs or symptoms with no other recognized cause: fever

( $>38^{\circ}\text{C}$  rectal), cough, new or increased sputum production, rhonchi, wheezing, respiratory distress, apnea, or bradycardia

*and*

at least 1 of the following:

- a. organisms cultured from material obtained by deep tracheal aspirate or bronchoscopy
- b. positive antigen test on respiratory secretions
- c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

### Reporting instruction

- Do *not* report chronic bronchitis in a patient with chronic lung disease as an infection unless there is evidence of an acute secondary infection, manifested by change in organism.

### LUNG-Other infections of the lower respiratory tract

Other infections of the lower respiratory tract must meet at least 1 of the following criteria:

1. Patient has organisms seen on smear or cultured from lung tissue or fluid, including pleural fluid.
2. Patient has a lung abscess or empyema seen during a surgical operation or histopathologic examination.
3. Patient has an abscess cavity seen on radiographic examination of lung.

### Reporting instructions

- Report concurrent lower respiratory tract infection and pneumonia with the same organism(s) as PNEU.
- Report lung abscess or empyema without pneumonia as LUNG.

### REPR-REPRODUCTIVE TRACT INFECTION

#### EMET-Endometritis

Endometritis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from fluid or tissue from endometrium obtained during surgical operation, by needle aspiration, or by brush biopsy.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever

(>38°C), abdominal pain, uterine tenderness, or purulent drainage from uterus.

### Reporting instruction

- Report postpartum endometritis as a health care–associated infection *unless* the amniotic fluid is infected at the time of admission or the patient was admitted 48 hours after rupture of the membrane.

### EPIS-Episiotomy

Episiotomy infections must meet at least 1 of the following criteria:

1. Postvaginal delivery patient has purulent drainage from the episiotomy.
2. Postvaginal delivery patient has an episiotomy abscess.

### Comment

- Episiotomy is not considered an operative procedure in NHSN.

### VCUF-Vaginal cuff

Vaginal cuff infections must meet at least 1 of the following criteria:

1. Posthysterectomy patient has purulent drainage from the vaginal cuff.
2. Posthysterectomy patient has an abscess at the vaginal cuff.
3. Posthysterectomy patient has pathogens cultured from fluid or tissue obtained from the vaginal cuff.

### Reporting instruction

- Report vaginal cuff infections as SSI-VCUF.

### OREP-Other infections of the male or female reproductive tract (epididymis, testes, prostate, vagina, ovaries, uterus, or other deep pelvic tissues, excluding endometritis or vaginal cuff infections)

Other infections of the male or female reproductive tract must meet at least 1 of the following criteria:

1. Patient has organisms cultured from tissue or fluid from affected site.
2. Patient has an abscess or other evidence of infection of affected site seen during a surgical operation or histopathologic examination.

3. Patient has 2 of the following signs or symptoms with no other recognized cause: fever (>38°C), nausea, vomiting, pain, tenderness, or dysuria *and*

at least 1 of the following:

- a. organisms cultured from blood
- b. physician diagnosis.

### Reporting instructions

- Report endometritis as EMET.
- Report vaginal cuff infections as VCUF.

## SST-SKIN AND SOFT TISSUE INFECTION

### SKIN-Skin

Skin infections must meet at least 1 of the following criteria:

1. Patient has purulent drainage, pustules, vesicles, or boils.
2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: pain or tenderness, localized swelling, redness, or heat

*and*

at least 1 of the following:

- a. organisms cultured from aspirate or drainage from affected site; if organisms are normal skin flora (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp), they must be a pure culture
- b. organisms cultured from blood
- c. positive antigen test performed on infected tissue or blood (eg, herpes simplex, varicella zoster, *H influenzae*, *N meningitidis*)
- d. multinucleated giant cells seen on microscopic examination of affected tissue
- e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

### Reporting instructions

- Report omphalitis in infants as UMB.
- Report infections of the circumcision site in newborns as CIRC.
- Report pustules in infants as PUST.
- Report infected decubitus ulcers as DECU.
- Report infected burns as BURN.
- Report breast abscesses or mastitis as BRST.

## ST-Soft tissue (necrotizing fascitis, infectious gangrene, necrotizing cellulitis, infectious myositis, lymphadenitis, or lymphangitis)

Soft tissue infections must meet at least 1 of the following criteria:

1. Patient has organisms cultured from tissue or drainage from affected site.
2. Patient has purulent drainage at affected site.
3. Patient has an abscess or other evidence of infection seen during a surgical operation or histopathologic examination.
4. Patient has at least 2 of the following signs or symptoms at the affected site with no other recognized cause: localized pain or tenderness, redness, swelling, or heat  
and  
at least 1 of the following:
  - a. organisms cultured from blood
  - b. positive antigen test performed on blood or urine (eg, *H influenzae*, *S pneumoniae*, *N meningitidis*, Group B *Streptococcus*, *Candida* spp)
  - c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

### Reporting instructions

- Report infected decubitus ulcers as DECU.
- Report infection of deep pelvic tissues as OREP.

## DECU-Decubitus ulcer, including both superficial and deep infections

Decubitus ulcer infections must meet the following criterion:

- Patient has at least 2 of the following signs or symptoms with no other recognized cause: redness, tenderness, or swelling of decubitus wound edges  
and  
at least 1 of the following:
- a. organisms cultured from properly collected fluid or tissue (see Comments)
  - b. organisms cultured from blood.

### Comments

- Purulent drainage alone is *not* sufficient evidence of an infection.
- Organisms cultured from the surface of a decubitus ulcer are *not* sufficient evidence that the ulcer is infected. A properly collected specimen from a decubitus ulcer involves needle aspiration of fluid or biopsy of tissue from the ulcer margin.

## BURN-Burn

Burn infections must meet at least 1 of 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, or edema at wound margin  
and  
histologic examination of burn biopsy shows invasion of organisms into adjacent viable tissue.
2. 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, or edema at wound margin  
and  
at least 1 of the following:
  - a. organisms cultured from blood in the absence of other identifiable infection
  - b. isolation of herpes simplex virus, histologic identification of inclusions by light or electron microscopy, or visualization of viral particles by electron microscopy in biopsies or lesion scrapings.
3. Patient with a burn has at least 2 of the following signs or symptoms with no other recognized cause: fever ( $>38^{\circ}\text{C}$ ) or hypothermia ( $<36^{\circ}\text{C}$ ), hypotension, oliguria ( $<20$  cc/hr), hyperglycemia at previously tolerated level of dietary carbohydrate, or mental confusion  
and  
at least 1 of the following:
  - a. histologic examination of burn biopsy shows invasion of organisms into adjacent viable tissue
  - b. organisms cultured from blood
  - c. isolation of herpes simplex virus, histologic identification of inclusions by light or electron microscopy, or visualization of viral particles by electron microscopy in biopsies or lesion scrapings.

### Comments

- Purulence alone at the burn wound site is *not* adequate for the diagnosis of burn infection; such purulence may reflect incomplete wound care.
- Fever alone in a burn patient is *not* adequate for the diagnosis of a burn infection because fever may be the result of tissue trauma or the patient may have an infection at another site.
- Surgeons in Regional Burn Centers who take care of burn patients exclusively may require Criterion 1 for diagnosis of burn infection.

- Hospitals with Regional Burn Centers may further divide burn infections into the following: burn wound site, burn graft site, burn donor site, burn donor site-cadaver; NHSN, however, will code all of these as BURN.

### BRST-Breast abscess or mastitis

A breast abscess or mastitis must meet at least 1 of the following criteria:

1. Patient has a positive culture of affected breast tissue or fluid obtained by incision and drainage or needle aspiration.
2. Patient has a breast abscess or other evidence of infection seen during a surgical operation or histopathologic examination.
3. Patient has fever ( $>38^{\circ}\text{C}$ ) and local inflammation of the breast  
and  
physician diagnosis of breast abscess.

### Comment

- Breast abscesses occur most frequently after childbirth. Those that occur within 7 days after childbirth should be considered health care associated.

### UMB-Omphalitis

Omphalitis in a newborn ( $\leq 30$  days old) must meet at least 1 of the following criteria:

1. Patient has erythema and/or serous drainage from umbilicus  
and  
at least 1 of the following:
  - a. organisms cultured from drainage or needle aspirate
  - b. organisms cultured from blood.
2. Patient has both erythema and purulence at the umbilicus.

### Reporting instructions

- Report infection of the umbilical artery or vein related to umbilical catheterization as VASC if there is no accompanying blood culture or a blood culture is negative.
- Report as health care associated if infection occurs in a newborn within 7 days of hospital discharge.

### PUST-Infant pustulosis

Pustulosis in an infant ( $\leq 1$  year old) must meet at least 1 of the following criteria:

1. Infant has 1 or more pustules  
and  
physician diagnosis of skin infection.

2. Infant has 1 or more pustules  
and  
physician institutes appropriate antimicrobial therapy.

### Reporting instructions

- Do *not* report erythema toxicum and noninfectious causes of pustulosis.
- Report as health care associated if pustulosis occurs in an infant within 7 days of hospital discharge.

### CIRC-Newborn circumcision

Circumcision infection in a newborn ( $\leq 30$  days old) must meet at least 1 of the following criteria:

1. Newborn has purulent drainage from circumcision site.
2. Newborn has at least 1 of the following signs or symptoms with no other recognized cause at circumcision site: erythema, swelling, or tenderness  
and  
pathogen cultured from circumcision site.
3. Newborn has at least 1 of the following signs or symptoms with no other recognized cause at circumcision site: erythema, swelling, or tenderness  
and  
skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from circumcision site  
and  
physician diagnosis of infection or physician institutes appropriate therapy.

### SYS-SYSTEMIC INFECTION

#### DI-Disseminated infection

Disseminated infection is infection involving multiple organs or systems, without an apparent single site of infection, usually of viral origin, and with signs or symptoms with no other recognized cause and compatible with infectious involvement of multiple organs or systems.

### Reporting instructions

- Use this code for viral infections involving multiple organ systems (eg, measles, mumps, rubella, varicella, erythema infectiosum). These infections often can be identified by clinical criteria alone. Do *not* use this code for health care-associated

infections with multiple metastatic sites, such as with bacterial endocarditis; only the primary site of these infections should be reported.

- Do not report fever of unknown origin (FUO) as DI.
- Report neonatal "sepsis" as CSEP.
- Report viral exanthems or rash illness as DI.

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## APPENDIX. PNEU-PNEUMONIA

There are 3 specific types of pneumonia: clinically defined pneumonia (PNU1), pneumonia with specific laboratory findings (PNU2), and pneumonia in immunocompromised patients (PNU3). Listed below are general comments applicable to all specific types of pneumonia, along with abbreviations used in the algorithms (Tables 4-7) and reporting instructions. Table 8 shows threshold values for cultured specimens used in the surveillance diagnosis of pneumonia. Figures 1 and 2 are flow diagrams for the pneumonia algorithms that may be used as data collection tools.

### General comments

1. Physician diagnosis of pneumonia alone is not an acceptable criterion for health care-associated pneumonia.
2. Although specific criteria are included for infants and children, pediatric patients may meet any of the other pneumonia specific site criteria.
3. Ventilator-associated pneumonia (ie, pneumonia in persons who had a device to assist or control respiration continuously through a tracheostomy or by endotracheal intubation within the 48-hour period before the onset of infection, inclusive of the weaning period) should be so designated when reporting data.
4. When assessing a patient for presence of pneumonia, it is important to distinguish between changes in clinical status due to other conditions such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, etc. Also, care must be taken when assessing intubated patients to distinguish between tracheal colonization, upper respiratory tract infections (eg, tracheobronchitis), and early onset pneumonia. Finally, it should be recognized that it may be difficult to determine health care-associated pneumonia in the elderly, infants, and immunocompromised patients because such conditions may mask typical signs or symptoms associated with pneumonia. Alternate specific criteria for the elderly, infants and immunocompromised patients have been included in this definition of health care-associated pneumonia.
5. Health care-associated pneumonia can be characterized by its onset: early or late. Early onset pneumonia occurs during the first 4 days of hospitalization and is often caused by *Moraxella catarrhalis*, *H influenzae*, and *S pneumoniae*. Causative agents of late onset pneumonia are frequently gram negative bacilli or *S aureus*, including methicillin-resistant *S aureus*. Viruses (eg, influenza A and B or respiratory syncytial virus) can cause early and late onset nosocomial pneumonia, whereas yeasts, fungi, legionellae, and *Pneumocystis carinii* are usually pathogens of late onset pneumonia.
6. Pneumonia due to gross aspiration (for example, in the setting of intubation in the emergency room or operating room) is considered health care associated if it meets any specific criteria and was not clearly present or incubating at the time of admission to the hospital.
7. Multiple episodes of health care-associated pneumonia may occur in critically ill patients with lengthy hospital stays. When determining whether to report multiple episodes of health care-associated pneumonia in a single patient, look for evidence of resolution of the initial infection. The addition of or change in pathogen alone is not indicative of a new episode of pneumonia. The combination of new signs and symptoms and radiographic evidence or other diagnostic testing is required.
8. Positive Gram stain for bacteria and positive KOH (potassium hydroxide) mount for elastin fibers and/or fungal hyphae from appropriately collected sputum specimens are important clues that point toward the etiology of the infection. However, sputum samples are frequently contaminated with airway colonizers and therefore must be interpreted cautiously. In particular, *Candida* is commonly seen on stain, but infrequently causes healthcare-associated pneumonia.

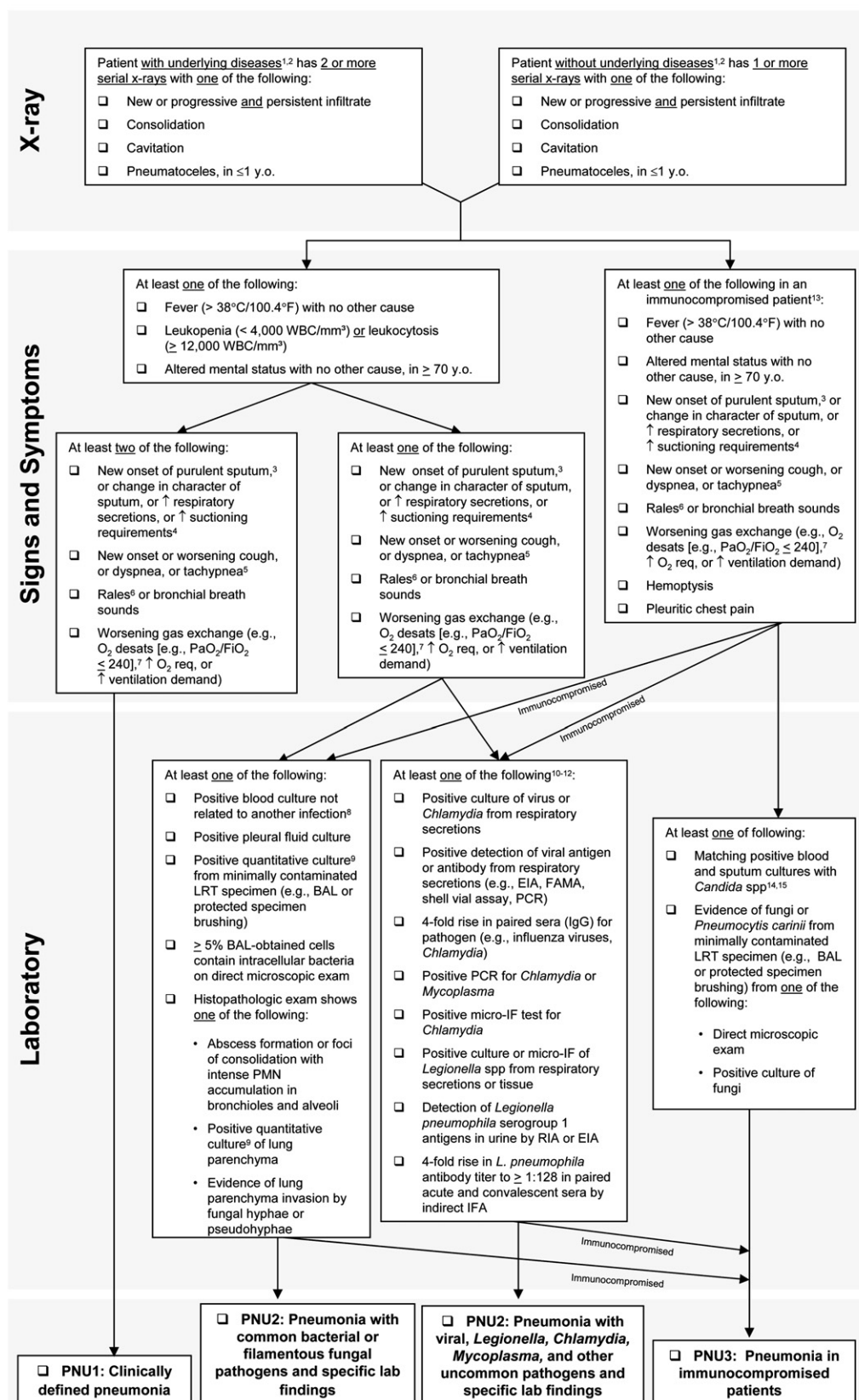
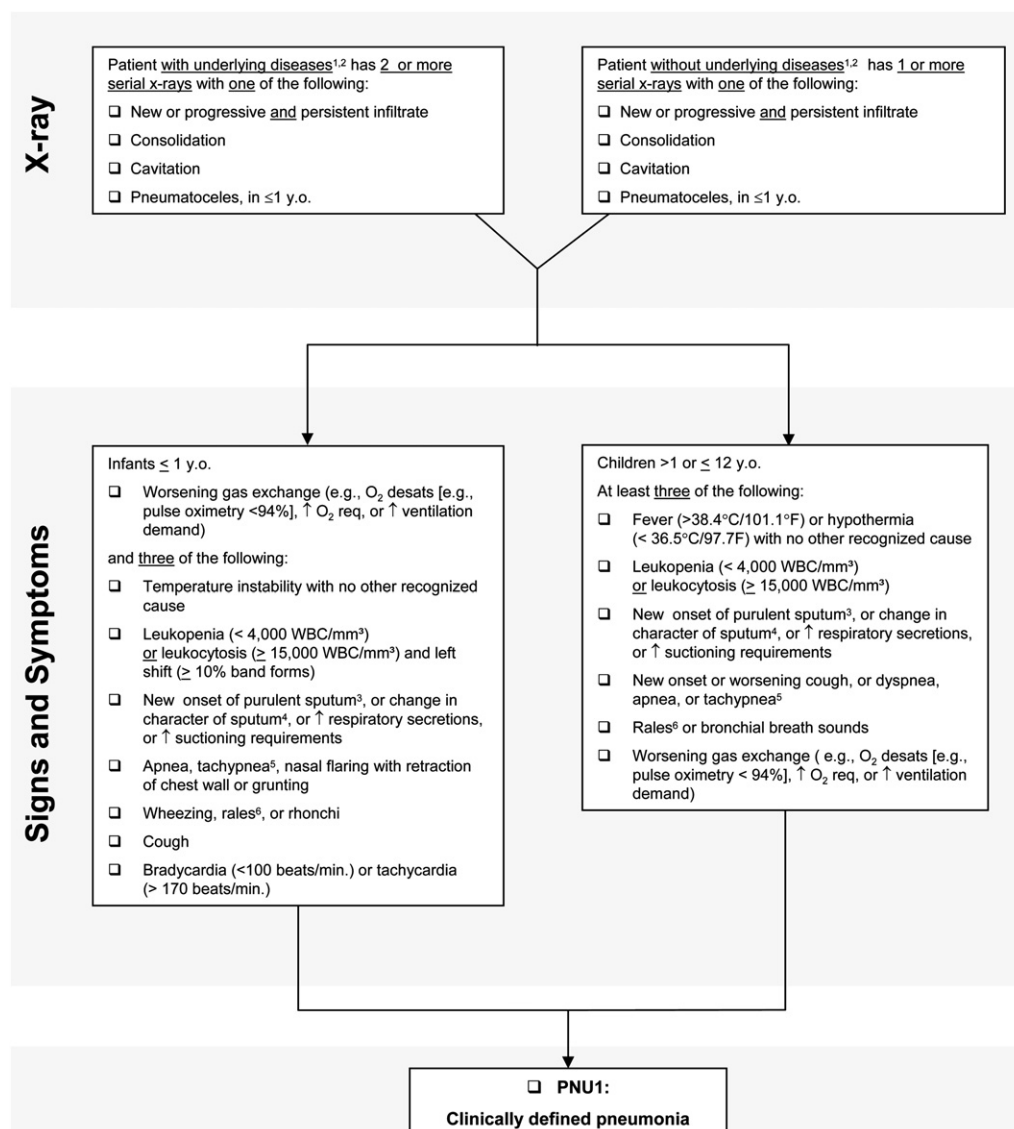


Fig 1. Pneumonia flow diagram.



**Fig 2.** Pneumonia flow diagram alternate criteria for infants and children.

## Abbreviations

BAL–bronchoalveolar lavage  
 EIA–enzyme immunoassay  
 FAMA–fluorescent-antibody staining of membrane antigen  
 IFA–immunofluorescent antibody  
 LRT–lower respiratory tract  
 PCR–polymerase chain reaction  
 PMN–polymorphonuclear leukocyte  
 RIA–radioimmunoassay

## Reporting instructions

- There is a hierarchy of specific categories within the major type pneumonia (PNEU). Even if a

patient meets criteria for more than 1 specific site, report only 1:

- If a patient meets criteria for both PNU1 and PNU2, report PNU2.
- If a patient meets criteria for both PNU2 and PNU3, report PNU3.
- If a patient meets criteria for both PNU1 and PNU3, report PNU3.
- Report concurrent lower respiratory tract infection (eg, abscess or empyema) and pneumonia with the same organism(s) as pneumonia.
- Lung abscess or empyema *without* pneumonia are classified as LUNG.
- Bronchitis, tracheitis, tracheobronchitis, or bronchiolitis *without* pneumonia are classified as BRON.

**Table 4.** Algorithms for clinically defined pneumonia (PNUI)

| Radiology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Signs/Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <p>Two or more serial chest radiographs with at least 1 of the following<sup>1,2</sup>:</p> <ul style="list-style-type: none"> <li>• New or progressive and persistent infiltrate</li> <li>• Consolidation</li> <li>• Cavitation</li> <li>• Pneumatoceles, in infants <math>\leq 1</math> year old</li> </ul> <p>NOTE: In patients without underlying pulmonary or cardiac disease (eg, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), 1 definitive chest radiograph is acceptable.<sup>1</sup></p> | <p>FOR ANY PATIENT, at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Fever (<math>&gt;38^{\circ}\text{C}</math> or <math>&gt;100.4^{\circ}\text{F}</math>) with no other recognized cause</li> <li>• Leukopenia (<math>&lt;4000</math> WBC/mm<sup>3</sup>) or leukocytosis (<math>\geq 12,000</math> WBC/mm<sup>3</sup>)</li> <li>• For adults <math>\geq 70</math> years old, altered mental status with no other recognized cause</li> </ul> <p>and</p> <p>at least 2 of the following:</p> <ul style="list-style-type: none"> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• New onset or worsening cough, or dyspnea, or tachypnea<sup>5</sup></li> <li>• Rales<sup>6</sup> or bronchial breath sounds</li> <li>• Worsening gas exchange (eg, O<sub>2</sub> desaturations [eg, PaO<sub>2</sub>/FiO<sub>2</sub> <math>\leq 240</math>],<sup>7</sup> increased oxygen requirements, or increased ventilator demand)</li> </ul> <p>ALTERNATE CRITERIA, for infants <math>\leq 1</math> year old:</p> <p>Worsening gas exchange (eg, O<sub>2</sub> desaturations, increased oxygen requirements, or increased ventilator demand)</p> <p>and</p> <p>at least 3 of the following:</p> <ul style="list-style-type: none"> <li>• Temperature instability with no other recognized cause</li> <li>• Leukopenia (<math>&lt;4000</math> WBC/mm<sup>3</sup>) or leukocytosis (<math>\geq 15,000</math> WBC/mm<sup>3</sup>) and left shift (<math>\geq 10\%</math> band forms)</li> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• Apnea, tachypnea,<sup>5</sup> nasal flaring with retraction of chest wall or grunting</li> <li>• Wheezing, rales,<sup>6</sup> or rhonchi</li> <li>• Cough</li> <li>• Bradycardia (<math>&lt;100</math> beats/min) or tachycardia (<math>&gt;170</math> beats/min)</li> </ul> <p>ALTERNATE CRITERIA, for child <math>&gt;1</math> year old or <math>\leq 12</math> years old, at least 3 of the following:</p> <ul style="list-style-type: none"> <li>• Fever (<math>&gt;38.4^{\circ}\text{C}</math> or <math>&gt;101.1^{\circ}\text{F}</math>) or hypothermia (<math>&lt;36.5^{\circ}\text{C}</math> or <math>&lt;97.7^{\circ}\text{F}</math>) with no other recognized cause</li> <li>• Leukopenia (<math>&lt;4000</math> WBC/mm<sup>3</sup>) or leukocytosis (<math>\geq 15,000</math> WBC/mm<sup>3</sup>)</li> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• New onset or worsening cough or dyspnea, apnea, or tachypnea<sup>5</sup></li> <li>• Rales<sup>6</sup> or bronchial breath sounds</li> <li>• Worsening gas exchange (eg, O<sub>2</sub> desaturations [eg, pulse oximetry <math>&lt;94\%</math>], increased oxygen requirements, or increased ventilator demand)</li> </ul> |

## Footnotes to Algorithms:

1. Occasionally, in nonventilated patients, the diagnosis of health care–associated pneumonia may be quite clear on the basis of symptoms, signs, and a single definitive chest radiograph. However, in patients with pulmonary or cardiac disease (for example, interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other noninfectious conditions (for example, pulmonary edema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest radiographs must be examined to help separate infectious from noninfectious pulmonary processes. To help confirm difficult cases, it may be useful to review radiographs on the day of diagnosis, 3 days prior to the diagnosis and on days 2 and 7 after the diagnosis. Pneumonia may have rapid onset and progression, but does not resolve quickly. Radiographic changes of pneumonia persist for several weeks. As a result, rapid radiographic resolution suggests that the patient does not have pneumonia but rather a noninfectious process such as atelectasis or congestive heart failure.
2. Note that there are many ways of describing the radiographic appearance of pneumonia. Examples include, but are not limited to, “air-space disease,” “focal opacification,” “patchy areas of increased density.” Although perhaps not specifically delineated as pneumonia by the radiologist, in the appropriate clinical setting these alternative descriptive wordings should be seriously considered as potentially positive findings.
3. Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain  $\geq 25$  neutrophils and  $\leq 10$  squamous epithelial cells per low power field ( $\times 100$ ). If your laboratory reports these data qualitatively (eg, “many WBCs” or “few squames”), be sure their descriptors match this definition of purulent sputum. This laboratory confirmation is required because written clinical descriptions of purulence are highly variable.
4. A single notation of either purulent sputum or change in character of the sputum is not meaningful; repeated notations over a 24-hour period would be more indicative of the onset of an infectious process. Change in character of sputum refers to the color, consistency, odor, and quantity.

**Table 5.** Algorithms for pneumonia with common bacterial or filamentous fungal pathogens and specific laboratory findings (PNU2)

| Radiology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Signs/Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <p>Two or more serial chest radiographs with at least 1 of the following<sup>1,2</sup>:</p> <ul style="list-style-type: none"> <li>• New or progressive and persistent infiltrate</li> <li>• Consolidation</li> <li>• Cavitation</li> <li>• Pneumatoceles, in infants <math>\leq 1</math> year old</li> </ul> <p>NOTE: In patients without underlying pulmonary or cardiac disease (eg, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), 1 definitive chest radiograph is acceptable.<sup>1</sup></p> | <p>At least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Fever (<math>&gt;38^{\circ}\text{C}</math> or <math>&gt;100.4^{\circ}\text{F}</math>) with no other recognized cause</li> <li>• Leukopenia (<math>&lt;4000</math> WBC/<math>\text{mm}^3</math>) or leukocytosis (<math>\geq 12,000</math> WBC/<math>\text{mm}^3</math>)</li> <li>• For adults <math>\geq 70</math> years old, altered mental status with no other recognized cause</li> </ul> <p>and</p> <p>at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• New onset or worsening cough or dyspnea or tachypnea<sup>5</sup></li> <li>• Rales<sup>6</sup> or bronchial breath sounds</li> <li>• Worsening gas exchange (eg, <math>\text{O}_2</math> desaturations [eg, <math>\text{PaO}_2/\text{FiO}_2 \leq 240</math>]<sup>7</sup>, increased oxygen requirements, or increased ventilator demand)</li> </ul> | <p>At least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Positive growth in blood culture<sup>8</sup> not related to another source of infection</li> <li>• Positive growth in culture of pleural fluid</li> <li>• Positive quantitative culture<sup>9</sup> from minimally contaminated LRT specimen (eg, BAL or protected specimen brushing)</li> <li>• <math>\geq 5\%</math> BAL-obtained cells contain intracellular bacteria on direct microscopic exam (eg, Gram stain)</li> <li>• Histopathologic exam shows at least 1 of the following evidences of pneumonia:</li> <li>• Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli</li> <li>• Positive quantitative culture<sup>9</sup> of lung parenchyma</li> <li>• Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae</li> </ul> |

**Table 6.** Algorithms for pneumonia with viral, *Legionella*, *Chlamydia*, *Mycoplasma*, and other uncommon pathogens and specific laboratory findings (PNU2)

| Radiology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Signs/Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <p>Two or more serial chest radiographs with at least 1 of the following<sup>1,2</sup>:</p> <ul style="list-style-type: none"> <li>• New or progressive and persistent infiltrate</li> <li>• Consolidation</li> <li>• Cavitation</li> <li>• Pneumatoceles, in infants <math>\leq 1</math> year old</li> </ul> <p>NOTE: In patients without underlying pulmonary or cardiac disease (eg, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), 1 definitive chest radiograph is acceptable.<sup>1</sup></p> | <p>At least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Fever (<math>&gt;38^{\circ}\text{C}</math> or <math>&gt;100.4^{\circ}\text{F}</math>) with no other recognized cause</li> <li>• Leukopenia (<math>&lt;4000</math> WBC/<math>\text{mm}^3</math>) or leukocytosis (<math>\geq 12,000</math> WBC/<math>\text{mm}^3</math>)</li> <li>• For adults <math>\geq 70</math> years old, altered mental status with no other recognized cause</li> </ul> <p>and</p> <p>at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• New onset or worsening cough or dyspnea or tachypnea<sup>5</sup></li> <li>• Rales<sup>6</sup> or bronchial breath sounds</li> <li>• Worsening gas exchange (eg, <math>\text{O}_2</math> desaturations [eg, <math>\text{PaO}_2/\text{FiO}_2 \leq 240</math>]<sup>7</sup>, increased oxygen requirements, or increased ventilator demand)</li> </ul> | <p>At least 1 of the following<sup>10-12</sup>:</p> <ul style="list-style-type: none"> <li>• Positive culture of virus or <i>Chlamydia</i> from respiratory secretions</li> <li>• Positive detection of viral antigen or antibody from respiratory secretions (eg, EIA, FAMA, shell vial assay, PCR)</li> <li>• Four-fold rise in paired sera (IgG) for pathogen (eg, influenza viruses, <i>Chlamydia</i>)</li> <li>• Positive PCR for <i>Chlamydia</i> or <i>Mycoplasma</i></li> <li>• Positive micro-IF test for <i>Chlamydia</i></li> <li>• Positive culture or visualization by micro-IF of <i>Legionella</i> spp. from respiratory secretions or tissue</li> <li>• Detection of <i>Legionella pneumophila</i> serogroup 1 antigens in urine by RIA or EIA</li> <li>• Four-fold rise in <i>L. pneumophila</i> serogroup 1 antibody titer to <math>\geq 1:128</math> in paired acute and convalescent sera by indirect IFA</li> </ul> |

5. In adults, tachypnea is defined as respiration rate  $>25$  breaths per minute. Tachypnea is defined as  $>75$  breaths per minute in premature infants born at  $<37$  weeks gestation and until the 40th week;  $>60$  breaths per minute in infants  $<2$  months old;  $>50$  breaths per minute in infants 2 to 12 months old; and  $>30$  breaths per minute in children  $>1$  year old.

6. Rales may be described as "crackles."

7. This measure of arterial oxygenation is defined as the ratio of the arterial tension ( $\text{PaO}_2$ ) to the inspiratory fraction of oxygen ( $\text{FiO}_2$ ).

8. Care must be taken to determine the etiology of pneumonia in a patient with positive blood cultures and radiographic evidence of pneumonia, especially if the patient has invasive devices in place such as intravascular lines or an indwelling urinary catheter. In general, in an immunocompetent patient, blood cultures positive for coagulase-negative staphylococci, common skin contaminants, and yeasts will not be the etiologic agent of the pneumonia.

9. Refer to threshold values for cultured specimens (Table 8). An endotracheal aspirate is not a minimally contaminated specimen. Therefore, an endotracheal aspirate does not meet the laboratory criteria.

10. Once laboratory-confirmed due to pneumonia because of respiratory syncytial virus (RSV), adenovirus, or influenza virus have been identified in a hospital, clinician's presumptive diagnosis of these pathogens in subsequent cases with similar clinical signs and symptoms is an acceptable criterion for presence of health care-associated infection.

**Table 7.** Algorithms for pneumonia in immunocompromised patients (PNU3)

| Radiology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Signs/Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Two or more serial chest radiographs with at least 1 of the following<sup>1,2</sup>:</p> <ul style="list-style-type: none"> <li>• New or progressive <i>and</i> persistent infiltrate</li> <li>• Consolidation</li> <li>• Cavitation</li> <li>• Pneumatoceles, in infants <math>\leq 1</math> year old</li> </ul> <p>NOTE: In patients without underlying pulmonary or cardiac disease (eg, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), 1 <i>definitive</i> chest radiograph is acceptable.<sup>1</sup></p> | <p>Patient who is immunocompromised<sup>13</sup> has at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Fever (<math>&gt;38^{\circ}\text{C}</math> or <math>&gt;100.4^{\circ}\text{F}</math>) with no other recognized cause</li> <li>• For adults <math>\geq 70</math> years old, altered mental status with no other recognized cause</li> <li>• New onset of purulent sputum<sup>3</sup> or change in character of sputum<sup>4</sup> or increased respiratory secretions or increased suctioning requirements</li> <li>• New onset or worsening cough or dyspnea or tachypnea<sup>5</sup></li> <li>• Rales<sup>6</sup> or bronchial breath sounds</li> <li>• Worsening gas exchange (eg, <math>\text{O}_2</math> desaturations [eg, <math>\text{PaO}_2/\text{FiO}_2 \leq 240</math>],<sup>7</sup> increased oxygen requirements, or increased ventilator demand)</li> <li>• Hemoptysis</li> <li>• Pleuritic chest pain</li> </ul> | <p>At least 1 of the following:</p> <ul style="list-style-type: none"> <li>• Matching positive blood and sputum cultures with <i>Candida</i> spp<sup>14,15</sup></li> <li>• Evidence of fungi or <i>Pneumocystis carinii</i> from minimally contaminated LRT specimen (eg, BAL or protected specimen brushing) from 1 of the following: <ul style="list-style-type: none"> <li>○ Direct microscopic exam</li> <li>○ Positive culture of fungi</li> </ul> </li> <li>• Any of the laboratory criteria defined under PNU2</li> </ul> |

1. Scant or watery sputum is commonly seen in adults with pneumonia due to viruses and *Mycoplasma* although sometimes the sputum may be mucopurulent. In infants, pneumonia due to RSV or influenza yields copious sputum. Patients, except premature infants, with viral or *Mycoplasmal* pneumonia may exhibit few signs or symptoms, even when significant infiltrates are present on radiographic exam.
2. Few bacteria may be seen on stains of respiratory secretions from patients with pneumonia due to *Legionella* spp, mycoplasma, or viruses.
3. Immunocompromised patients include those with neutropenia (absolute neutrophil count  $<500/\text{mm}^3$ ), leukemia, lymphoma, HIV with CD4 count  $<200$ , or splenectomy; those who are early posttransplantation, are on cytotoxic chemotherapy, or are on high-dose steroids (e.g.,  $>40\text{mg}$  of prednisone or its equivalent [ $>160\text{mg}$  hydrocortisone,  $>32\text{mg}$  methylprednisolone,  $>6\text{mg}$  dexamethasone,  $>200\text{mg}$  cortisone] daily for  $>2$  weeks).
4. Blood and sputum specimens must be collected within 48 hours of each other.
5. Semiquantitative or nonquantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable. If quantitative culture results are available, refer to algorithms that include such specific laboratory findings.

**Table 8.** Threshold values for cultured specimens used in the diagnosis of pneumonia

| Specimen collection/technique                   | Values                   |
|-------------------------------------------------|--------------------------|
| Lung parenchyma*                                | $\geq 10^4$ cfu/g tissue |
| Bronchoscopically obtained specimens            |                          |
| Bronchoalveolar lavage                          | $\geq 10^4$ cfu/mL       |
| Protected BAL                                   | $\geq 10^4$ cfu/mL       |
| Protected specimen brushing                     | $\geq 10^4$ cfu/mL       |
| Nonbronchoscopically obtained (blind) specimens |                          |
| Bronchoalveolar lavage                          | $\geq 10^4$ cfu/mL       |
| Protected BAL                                   | $\geq 10^4$ cfu/mL       |

cfu, colony-forming units.

\*Open-lung biopsy specimens and immediate post-mortem specimens obtained by transthoracic or transbronchial biopsy.