Patient Safety Component Criteria Confirmed: Navigating NHSN Pneumonia (PNEU) Surveillance

2026 NHSN PSC Annual Training

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Objectives

By the end of this session, participants will be able to

- Summarize the three pneumonia (PNEU) algorithms and the requirements for each
- Describe eligible imaging test evidence, signs/symptoms, and laboratory evidence for PNEU
- Explain secondary bloodstream infection (BSI) assignment to PNEU
- Apply the PNEU surveillance definitions to case studies

Abbreviations used in PNEU presentation

PNEU – NHSN pneumonia surveillance definition

PNU1, PNU2, PNU3 – NHSN PNEU algorithms

VAP – ventilator-associated pneumonia

pedVAP – pediatric ventilator-associated pneumonia

HAI – healthcare-associated infection

POA – present on admission

DOE – date of event

IWP – infection window period

RIT – repeat infection timeframe

SBAP – secondary bloodstream infection attribution period

BSI – bloodstream infection

Abbreviations used in PNEU presentation, continued

HD – hospital day

S/S or s/s – signs/symptoms

BC – blood culture

FiO_2 – fraction of inspired oxygen

NC – nasal cannula

LRT – lower respiratory tract

ETA – endotracheal aspirate

BAL – bronchoalveolar lavage

RDS – respiratory distress syndrome

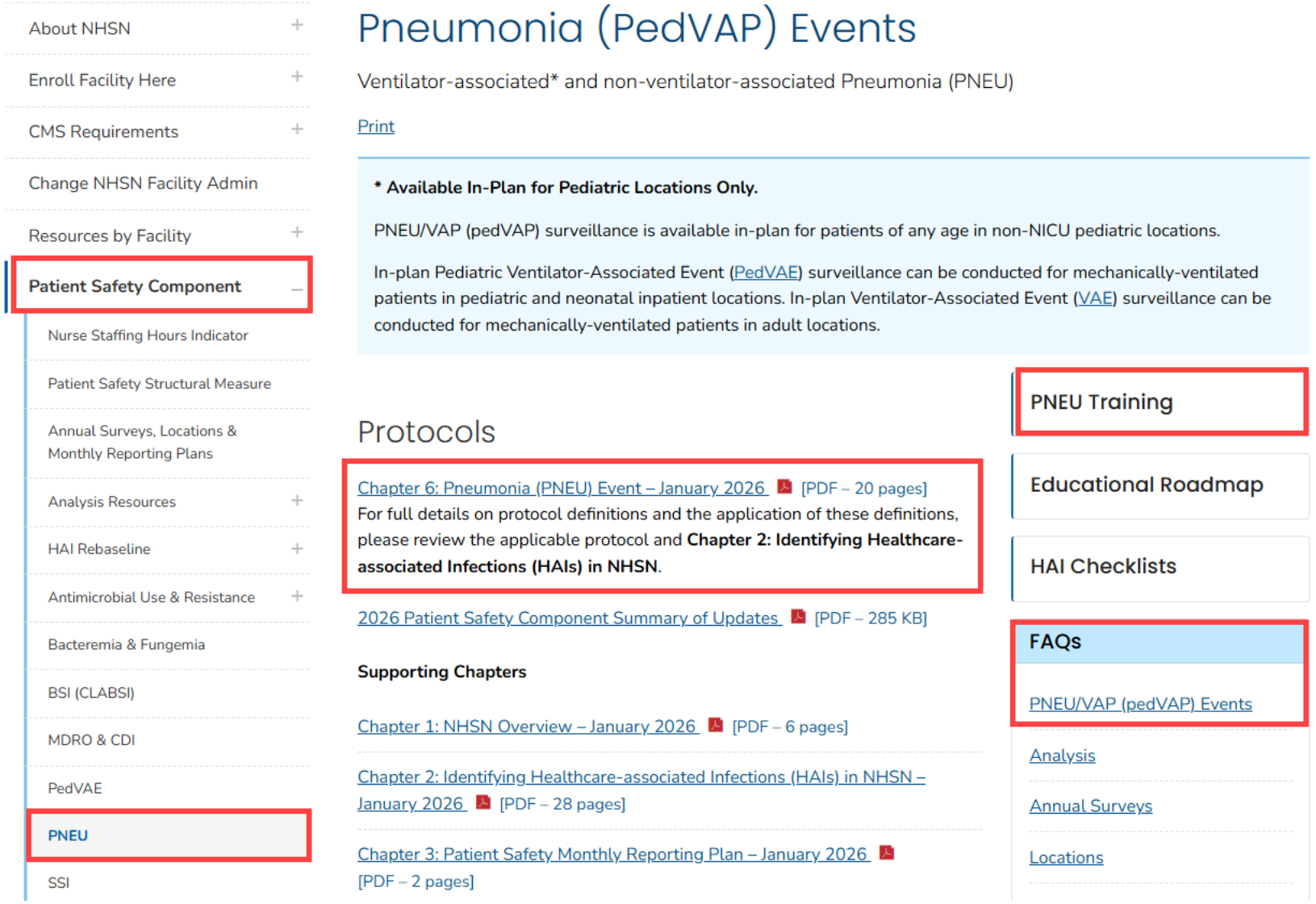
CHF – congestive heart failure

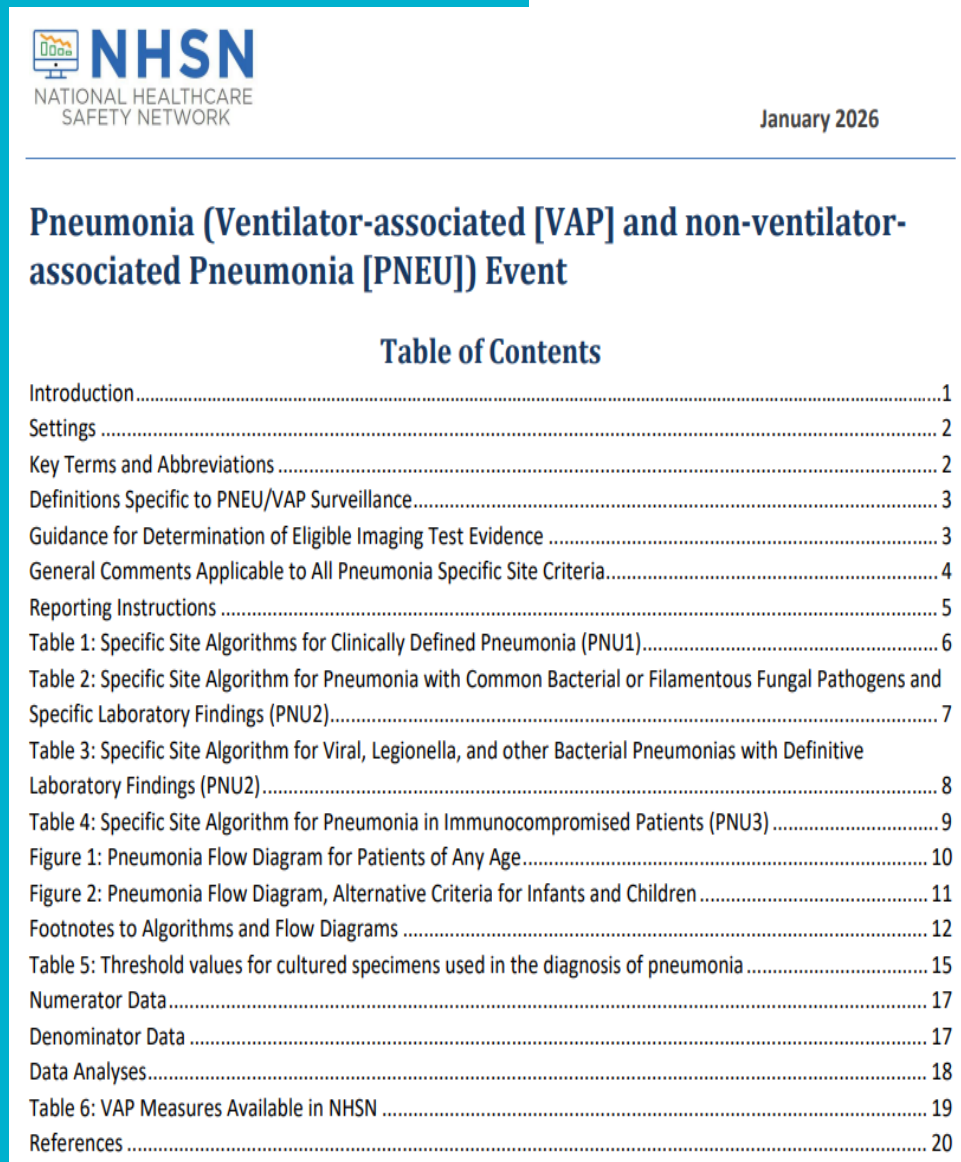
VRE – vancomycin resistant *Enterococcus*

PNEU Event Surveillance

NHSN Pneumonia (PNEU) webpage

https://www.cdc.gov/nhsn/psc/pneu/index.html





NHSN
NATIONAL HEALTHCARE SAFETY NETWORK

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Pneumonia (Ventilator-associated [VAP] and non-ventilator-associated Pneumonia [PNEU]) Event

Table of Contents

2026 NHSN Pneumonia (PNEU) surveillance protocol

- 2026 NHSN Patient Safety Component (PSC) Manual
- Chapter 6: *Pneumonia Event*
  - https://www.cdc.gov/nhsn/pdfs/pscmanual/6pscvapcurrent.pdf
- Guidance in Chapter 2: *Identifying HAIs in NHSN* must also be followed when applying the PNEU surveillance definition
  - https://www.cdc.gov/nhsn/pdfs/pscmanual/3psc_monthlyreportingplancurrent.pdf

NHSN PNEU surveillance options

- **In-plan ventilator-associated pneumonia** surveillance for patients in **pediatric locations** only **(pedVAP)**
- **Off-plan** non-ventilator pneumonia (PNEU) and ventilator-associated pneumonia (VAP) surveillance for **any patient** regardless of age or location
- **Secondary bloodstream infection (BSI) assignment** for **all patients** regardless of age, location, or ventilation status

PNEU Definition Overview

PNEU criteria: PNU1, PNU2, PNU3

- PNEU is comprised of 3 criteria: PNU1, PNU2, and PNU3
- Must meet all elements of the criterion in the PNEU IWP
  - PNU1 – imaging, signs/symptoms
  - PNU2 – imaging, sign/symptoms, laboratory evidence
  - PNU3 – imaging, immunocompromised status, signs/symptoms, laboratory evidence
- Must meet the footnote requirements

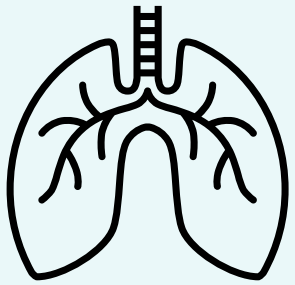
NOTE: The PNEU Algorithms (PNU1,2,3) and Flowcharts include **FOOTNOTE** references. The interpretation and guidance provided in the **FOOTNOTES** are an important part of the algorithms and must be incorporated into the decision-making process when determining if a PNEU definition is met.

PNEU: Footnotes

- Several of the elements in the PNEU algorithms are footnoted
- Footnotes only apply to the element in which they are cited
- The footnotes provide additional guidance and instructions that must be incorporated into the decision-making process to determine if a PNEU definition can be met
- The footnotes are located on pages 6-12 through 6-16 in the 2026 PNEU chapter

PNU1 algorithm: Table 1

- PNU1 is ‘clinically defined’
  - No laboratory test evidence is required
- PNU1 required elements
  - Imaging Test Evidence
  - Signs/Symptoms



PNU1 algorithm: Table 1, continued

- Signs/Symptoms – 3 sets of criteria:
  - Any Patient – patients of any age, including infants and children
  - Alternative Criteria – infants ≤ 1 year old
  - Alternative Criteria – child > 1 year old or ≤ 12 years old
- Age-specific Alternative Criteria apply to PNU1 only
  - Cannot be used for PNU2 or PNU3

PNU2 algorithm: Table 2 and Table 3

- PNU2 required elements
  - Imaging Test Evidence
  - Signs/Symptoms – no age-specific criteria
  - Laboratory evidence
- Algorithm split into 2 tables – Table 2 and Table 3
  - Imaging test evidence and signs/symptoms are the same in both tables
  - Laboratory evidence is different, but all meet PNU2

PNU3 algorithm: Table 4

- PNU3 is for immunocompromised patients
  - Immunocompromised definition in **footnote #10** must be met to apply PNU3
- PNU3 required elements
  - Imaging Test Evidence
  - Signs/Symptoms – no age-specific criteria
  - Laboratory evidence

PNEU criteria: Applicable patients

- PNU1 includes additional age-specific sign/symptom criteria for infants and children
- PNU3 is specific to immunocompromised patients of any age
- These patients may also meet the other PNEU algorithms
  - An infant can also meet PNU1 Any Patient, PNU2, or PNU3
  - An immunocompromised patient can also meet PNU1 or PNU2

PNEU hierarchy

- There is a hierarchy for reporting PNEU events if a patient meets more than one criterion during the infection window period (IWP) or the repeat infection timeframe (RIT)
- If a patient meets criteria for both
    - PNU1 and PNU2, report PNU2
    - PNU2 and PNU3, report PNU3
    - PNU1 and PNU3, report PNU3

Knowledge Check #1

Which PNEU criterion doesn’t have pathogens reported?

A. PNU1
B. PNU2
C. PNU3

Knowledge Check #1 - Rationale

- Which PNEU criterion doesn't have pathogens reported?
  - **A. PNU1**

- Rationale
  - PNU1 does not have a laboratory element and therefore does not have pathogens reported.
  - PNU2 and PNU3 require laboratory evidence from the Laboratory column in the algorithms.

Imaging Test Evidence

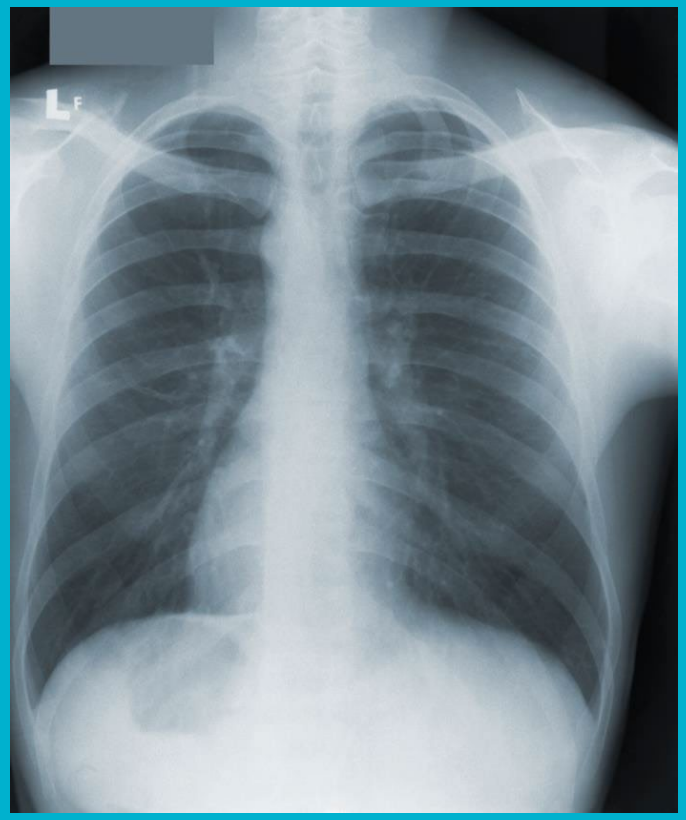


Image from phil.cdc.gov

Imaging test evidence

- Imaging requirement is the same for PNU1, PNU2, and PNU3
- Evidence of pneumonia that is

  New and persistent

  OR

  Progressive and persistent
- **Footnotes #1, #2, #13**

Two or more serial chest imaging test results with at least ***one*** of the following (1,2,13):

New and persistent
or
Progressive and persistent

- Infiltrate
- Consolidation
- Cavitation
- Pneumatoceles, in infants ≤1 year old

Note: In patients ***without*** underlying pulmonary or cardiac disease (such as respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), at least one definitive chest imaging test result is acceptable. (1)

Imaging test evidence of pneumonia

- Positive findings listed in the PNEU criteria
  - Infiltrate
  - Consolidation
  - Cavitation
  - Pneumatoceles, in infants ≤ 1 year old

Imaging test evidence of pneumonia: Footnote #2

- Alternative ("potentially positive") findings
  - Examples: opacities, densities, airspace disease
  - These are non-specific findings – may be representative of any number of disease processes
  - Considered to be potentially positive findings if not documented as something other than pneumonia
    - Eligible findings examples: bibasilar opacities, opacities compatible with pneumonia
    - Ineligible findings examples: opacities consistent with atelectasis, opacities most likely pulmonary edema

New and persistent or Progressive and persistent

Why is New and persistent or Progressive and persistent evidence of pneumonia required?

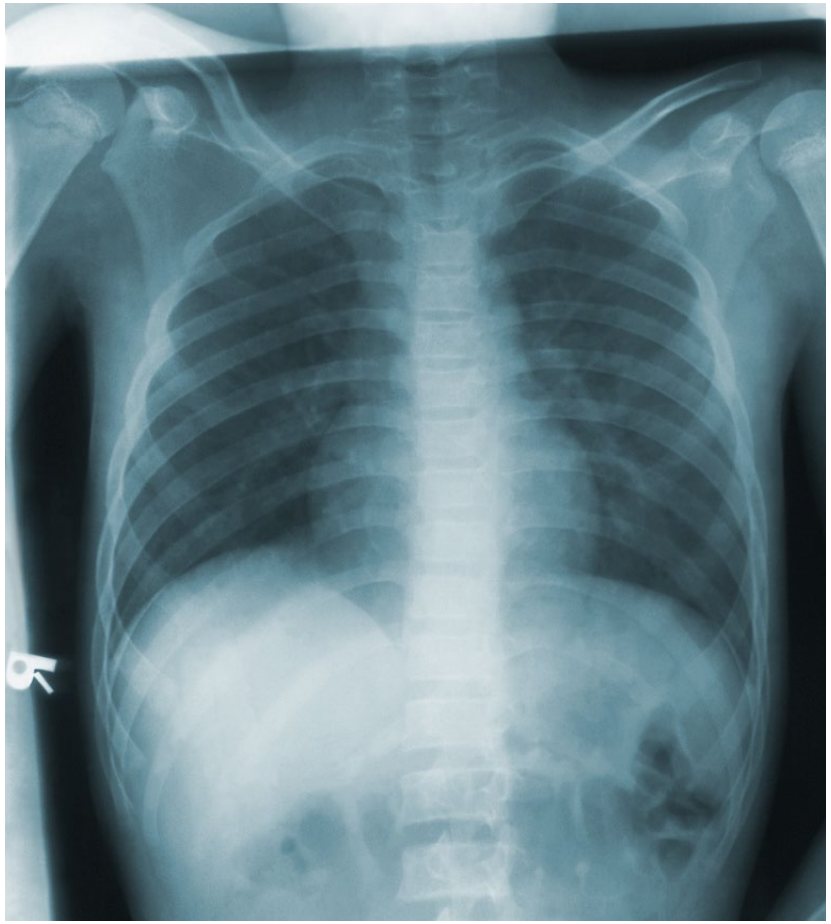
- Pneumonia may have rapid onset or progression
  - New or Progressive findings may indicate a new onset of pneumonia
- Pneumonia does not resolve quickly
  - Persistence of findings differentiates pneumonia from non-infectious processes, such as atelectasis or congestive heart failure

New or Progressive

- New or Progressive is determined in comparison to prior imaging test findings
- New – findings were not present in prior imaging test
  - 3/10 imaging finding: lungs are clear
  - 3/12 imaging finding: infiltrates **New**
- Progressive – findings are worse in comparison to prior imaging test
  - 3/10 imaging finding: infiltrates
  - 3/12 imaging finding: increased infiltrates compared to prior **Worse**

Pneumonia – rapid onset/progression

Day 1 – lungs clear



Day 2 – infiltrates

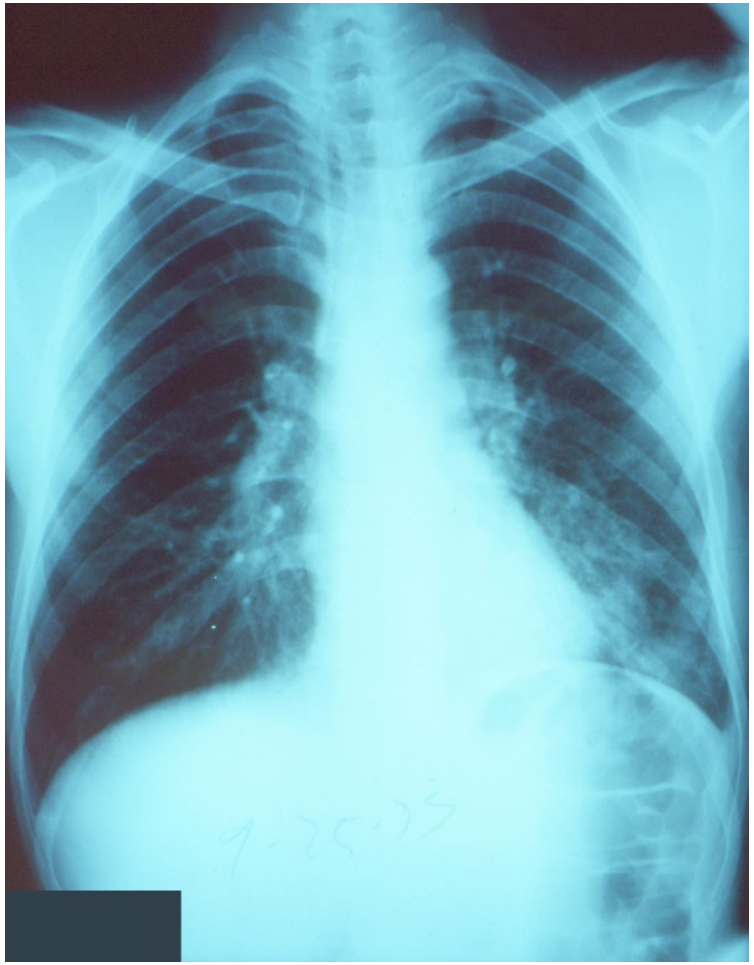
Images from phil.cdc.gov

Persistent: Footnote #1

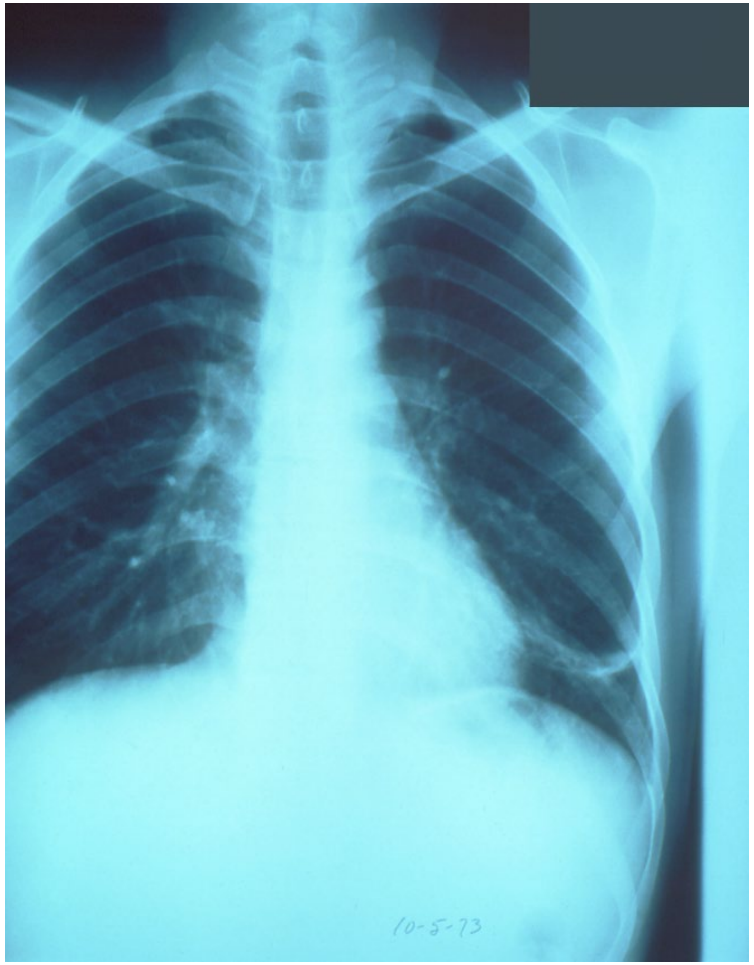
- Persistence is assessed by reviewing multiple imaging tests spanning over several calendar days
- Recommend following imaging tests for at least 7 days (if available) to determine persistence
  - Imaging tests used to determine persistence are not required to occur within the PNEU IWP
- Evidence of pneumonia will persist in subsequent imaging tests
  - If subsequent imaging indicates rapid resolution or attributes the findings to another condition, persistence is not met
- Persistence of findings of pneumonia is required for all patients

Pneumonia - persistence

Consolidation



Consolidation persists 10 days later



Images from phil.cdc.gov

Persistence: Examples

HD	Imaging Results	Determination
1	Lungs clear	No evidence of pneumonia
2	Developing infiltrates	New evidence of pneumonia
3	Worsening infiltrates	Progressive, persistent
4	Infiltrates	Persistent
5	Infiltrates similar to prior	Persistent
6	Infiltrates improving	Persistent
7	Infiltrates slightly worse	Progressive, persistent
8	No change in infiltrates	Persistent

HD	Imaging Results	Determination
1	Bibasilar opacities, likely pneumonia	New evidence of pneumonia
2	Bibasilar opacities	Persistent
3	Similar bibasilar infiltrates	Persistent
4	Worsening airspace disease	Progressive, persistent
5	Slight improvement bilateral opacities	Persistent
6	Bibasilar densities persist	Persistent
7	Bibasilar opacities	Persistent
8	Improving infiltrates	Persistent

No persistence: Examples

Rapid resolution

HD	Imaging Results	Determination
1	Lungs clear	No evidence of pneumonia
2	Developing opacities	New non-specific finding
3	Worsening opacities	Progressive, persistent
4	Significantly improved airspace disease	Persistent
5	Lungs clear bilaterally	Resolution
6	No acute cardiopulmonary process	No evidence of pneumonia

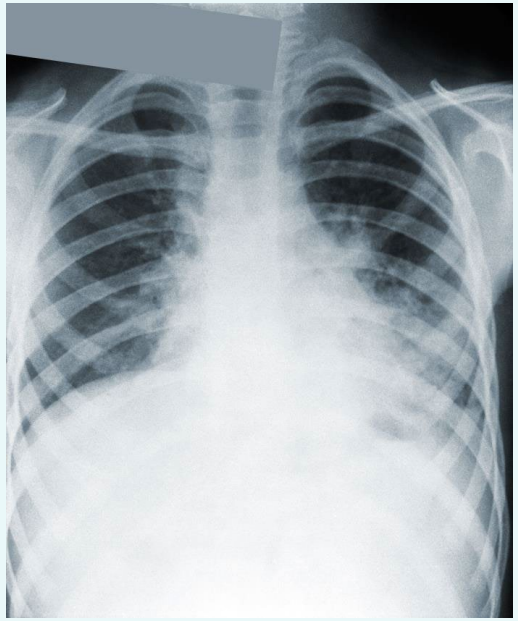
Attribution to something other than pneumonia

HD	Imaging Results	Determination
1	Diffuse opacites	New non-specific finding
2	Opacities, likely respiratory distress syndrome (RDS)	Attribution to something other than pneumonia
3	Opacities similar to prior	Persistent
4	Worsening opacities	Progressive, persistent
5	Worsening RDS	No evidence of pneumonia
6	Opacities reflect RDS	Attribution to something other than pneumonia

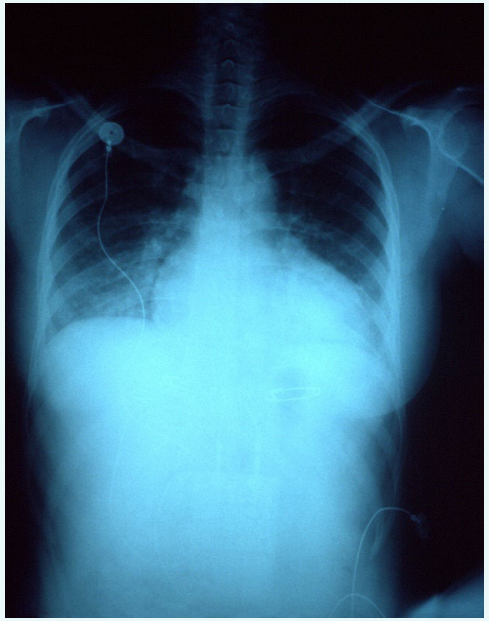
Underlying pulmonary or cardiac disease

- Some underlying pulmonary and cardiac diseases/conditions can simulate the presentation of pneumonia on imaging test, which may make it difficult to interpret imaging test findings

Pneumonia



Congestive Heart Failure (CHF)



Images from phil.cdc.gov

Patients without underlying pulmonary or cardiac disease

For patients without underlying cardiac or pulmonary disease, "*at least one definitive chest imaging test result*…"

- When multiple imaging tests are available, the subsequent imaging tests must be reviewed for persistence
- However… if only one imaging test is available and the findings are definitive for pneumonia, the single imaging test will meet the imaging requirement

Patients with underlying pulmonary or cardiac disease

For patients with underlying pulmonary or cardiac disease, "*two or more serial chest imaging test results*…"

- Two or more serial imaging test results demonstrating persistent evidence of pneumonia are required
- Imaging findings of some pulmonary and cardiac diseases may look like pneumonia
  - Subsequent imaging tests must be reviewed to ensure the findings reflect pneumonia and not the underlying disease process
- Exception: if only one definitive imaging test is available, it can be used to meet the imaging requirement for present on admission (POA) determinations only

Definitive vs. Equivocal imaging findings

- Definitive imaging – finding identifies pneumonia
- Equivocal imaging – finding does not conclusively identify an infection or infectious process (finding can be attributed to either a non-infectious process or an infectious process)
  - Infiltrate vs. atelectasis
  - Opacity could be pulmonary edema and/or pneumonia
  - Consolidation may represent pulmonary hemorrhage
- Equivocal imaging findings can be considered for use in meeting the PNEU imaging requirement, if the requirements in **footnote #13** are met

Clarifying equivocal imaging findings: Footnote #13

- First, look for further imaging test evidence that clarifies the equivocal imaging finding:
  - Subsequent imaging findings are definitive for pneumonia – verifies the equivocal finding is **representative** of pneumonia, and therefore the equivocal finding is **eligible** for use

OR

  - Subsequent imaging findings no longer show evidence of pneumonia – verifies the finding is **not** representative of pneumonia, and therefore the equivocal finding **not** eligible for use

Equivocal imaging: Clinical correlation

- What if the imaging findings continue to be equivocal?
- In the absence of clarification of equivocal findings by subsequent imaging, then and only then can clinical correlation be used
  - Clinical correlation for PNEU is specifically physician documentation of antimicrobial treatment for pneumonia
- If the imaging does not demonstrate eligible findings of pneumonia, clinical correlation cannot be used

Equivocal imaging: Examples

Eligible

HD	Imaging Results	Determination
1	New infiltrate or atelectasis	Equivocal
2		
3	Infiltrate or atelectasis	Equivocal
4	Infiltrate or atelectasis	Equivocal
5		
6	Infiltrate	Definitive
7	Infiltrate	Definitive

Not eligible

HD	Imaging Results	Determination
1	New infiltrate	Definitive
2		
3	Infiltrate or pulmonary edema	Equivocal
4		
5		
6	Pulmonary edema	No evidence of pneumonia
7	Pulmonary edema	No evidence of pneumonia

Eligible with clinical correlation

HD	Imaging Results	Determination
1	Consolidation vs. atelectasis	Equivocal
2		
3	Consolidation vs. atelectasis	Equivocal
4		
5	Consolidation vs. atelectasis	Equivocal
6		
7	Consolidation vs. atelectasis	Equivocal

Imaging (radiology) reports

- Documentation of the radiologist's review of the imaging test
  - Clinical documentation to review for determination if PNEU imaging element is met
- Imaging reports typically contain "findings" and "impressions"
  - Findings - what the radiologist sees
  - Impressions - the radiologist's assessment of what the findings represent
- Both the findings and impressions - the "whole imaging picture" - must be considered when determining if the imaging test results are eligible for use in meeting PNEU

Summary: Eligible imaging findings for PNEU

- Positive findings listed in the PNEU algorithms
  - Infiltrates, consolidation, cavitation, pneumatoceles (in infants)
- Alternative (non-specific) findings that are not attributed to something other than pneumonia (**footnote #2**)
  - Examples: opacities, densities, airspace disease
- Equivocal findings that have been clarified to represent pneumonia (**footnote #13**)
  - Clarified by subsequent imaging findings definitive for pneumonia
  - In absence of imaging clarification, clinical correlation is required

Summary: Imaging test evidence of pneumonia

- Imaging evidence of pneumonia must be New and persistent or Progressive and persistent
- Simply finding key words such as infiltrate, consolidation, or opacity in an imaging report is not sufficient
  - the findings must be considered in the context of the complete imaging report
- Unlike imaging for other NHSN events, due to the persistence requirement, all available imaging tests that are temporally related must be considered (**footnote #1**)
- **Footnotes #1, #2, and #13** must be followed when determining if the imaging requirement is met

Knowledge Check #2

True or False: The PNEU imaging requirement is met with the following imaging test findings.

3/14 – Lungs are clear bilaterally

3/15 – Interval development of bibasilar infiltrates

3/18 – Infiltrates persist

3/20 – Bilateral infiltrates

3/21 – Some improvement in bilateral infiltrates

Knowledge Check #2 - Rationale

Answer: **True**

Rationale

- The PNEU imaging requirement is met with imaging tests demonstrating new definitive findings that are persistent.
  - 3/14 – Lungs are clear bilaterally **No evidence of pneumonia (ineligible)**
  - 3/15 – Interval development of bibasilar infiltrates **New, definitive**
  - 3/18 – Infiltrates persist **Persistent, definitive**
  - 3/20 – Bilateral infiltrates **Persistent, definitive**
  - 3/21 – Some improvement in bilateral infiltrates **Persistent, definitive**

Knowledge Check #3

True or False: The PNEU imaging requirement is met with the following imaging test findings.

5/2 – Increasing bibasilar opacities

5/3 – Opacities, may represent infiltrates or pulmonary edema

5/4 – Similar bibasilar opacities

5/5 – Worsening bibasilar opacities, most likely worsening pulmonary edema

5/6 – Persistent opacities

5/7 – Bibasilar pulmonary edema

No additional imaging tests performed

Knowledge Check #3 - Rationale

Answer: **False**

Rationale

- The PNEU imaging requirement is NOT met. Evidence of pneumonia is not persistent.

5/2 – Increasing bibasilar opacities **Progressive, non-specific**

5/3 – Opacities, may represent infiltrates or pulmonary edema **Equivocal**

5/4 – Similar bibasilar opacities **Non-specific**

5/5 – Worsening bibasilar opacities, most likely worsening pulmonary edema **Finding attributed to something other than pneumonia (ineligible)**

5/6 – Persistent opacities **Non-specific**

5/7 – Bibasilar pulmonary edema **No evidence of pneumonia (ineligible)**

Signs/Symptoms

Image from phil.cdc.gov

PNU1: Any patient (Table 1)

For ANY PATIENT, at least ***one*** of the following:

- Fever (> 38.0°C or > 100.4°F)
- Leukopenia (≤ 4000 WBC/mm^3) or leukocytosis (≥ 12,000 WBC/mm^3)
- For adults ≥ 70 years old, altered mental status with no other recognized cause

And at least ***two*** of the following (from separate bullets):

- New onset of purulent sputum (3) or change in character of sputum (4), or increased respiratory secretions, or increased suctioning requirements
- Dyspnea, or tachypnea (5), or new onset or worsening cough
- Rales (6) or bronchial breath sounds
- Worsening gas exchange (for example, O_2 desaturations [for example, PaO_2/FiO_2 ≤ 240] (7), increased oxygen requirements, or increased ventilator demand)

One (1) of these

PLUS

At least two (2) of these

The 2 signs/symptoms must be from different bullets

PNU1: Infants ≤ 1 year old (Table 1)

ALTERNATE CRITERIA, for infants ≤ 1 year old:

Worsening gas exchange (for example, O_2 desaturations [for example, pulse oximetry < 94%], increased oxygen requirements, or increased ventilator demand)

And at least ***three*** of the following (from separate bullets):

- Temperature instability
- Leukopenia (≤ 4000 WBC/mm^3) or leukocytosis (≥ 15,000 WBC/mm^3) ***and*** left shift (≥ 10% band forms)
- New onset of purulent sputum (3) or change in character of sputum (4), or increased respiratory secretions, or increased suctioning requirements
- Apnea, tachypnea (5), nasal flaring with retraction of chest wall, or nasal flaring with grunting
- Wheezing, rales (6), or rhonchi
- Cough
- Bradycardia (< 100 beats/min) or tachycardia (> 170 beats/min)

This

PLUS

At least three (3) of these

The 3 signs/symptoms must be from different bullets

PNU1: Child > 1 year old or ≤ 12 years old (Table 1)

ALTERNATE CRITERIA, for child > 1 year old or ≤ 12 years old, at least ***three*** of the following (from separate bullets):

- Fever (> 38. 0°C or > 100. 4°F) or hypothermia (< 36. 0°C or < 96.8°F)
- Leukopenia (≤ 4000 WBC/mm^3) or leukocytosis (≥ 15,000 WBC/mm^3)
- New onset of purulent sputum (3) or change in character of sputum (4), or increased respiratory secretions, or increased suctioning requirements
- Dyspnea, or apnea, or tachypnea (5), or new onset or worsening cough
- Rales (6) or bronchial breath sounds
- Worsening gas exchange (for example, O_2 desaturations [for example, pulse oximetry < 94%], increased oxygen requirements, or increased ventilator demand)

At least three (3) of these

The 3 signs/symptoms must be from different bullets

PNU2 (Table 2 and Table 3)

One (1) of these PLUS At least one (1) of these

At least ***one*** of the following:

- Fever (> 38.0°C or > 100.4°F)
- Leukopenia (≤ 4000 WBC/mm^3) or leukocytosis (≥ 12,000 WBC/mm^3)
- For adults ≥ 70 years old, altered mental status with no other recognized cause

And at least ***one*** of the following:

- New onset of purulent sputum (3) or change in character of sputum (4), or increased respiratory secretions, or increased suctioning requirements
- Dyspnea, or tachypnea (5), or new onset or worsening cough
- Rales (6) or bronchial breath sounds
- Worsening gas exchange (for example, O_2 desaturations [for example, $PaO_2/FiO_2 \leq 240$] (7), increased oxygen requirements, or increased ventilator demand)

- Same criteria apply to all patients of all ages
- No age-specific criteria (cannot apply age-specific criteria from PNU1 to meet PNU2)

PNU3: Immunocompromised Patients (Table 4)

Must meet the PNEU immunocompromised definition (footnote #10)

Patient who is immunocompromised (see definition in footnote 10) has at least ***one*** of the following:

PLUS At least one (1) of these

- Fever (> 38.0°C or > 100.4°F)
- For adults ≥ 70 years old, altered mental status with no other recognized cause
- New onset of purulent sputum (3), or change in character of sputum (4), or increased respiratory secretions, or increased suctioning requirements
- Dyspnea, or tachypnea (5), or new onset or worsening cough
- Rales (6) or bronchial breath sounds
- Worsening gas exchange (for example, O_2 desaturations [for example, $PaO_2/FiO_2 \leq 240$] (7), increased oxygen requirements, or increased ventilator demand)
- Hemoptysis
- Pleuritic chest pain

Footnote #10

- Immunocompromised patients

10. **Immunocompromised** patients include *only*

    - those with neutropenia defined as absolute neutrophil count or total white blood cell count (WBC) < 500/mm^3
    - those with leukemia, lymphoma, or who are HIV positive with CD4 count < 200 cells/mm^3
    - those who have undergone splenectomy
    - those who have a history of solid organ or hematopoietic stem cell transplant
    - those on cytotoxic chemotherapy
    - those on enteral or parenteral administered steroids (excludes inhaled and topical steroids) daily for > 14 consecutive days on the date of event

Signs/Symptoms: Key points to remember

- Fever, leukopenia, and leukocytosis must meet the defined parameters
  - Leukocytosis parameters for PNU1 are age-specific
    - Any patient: leukocytosis ≥ 12,000 WBC/mm^3
    - Infants: leukocytosis ≥ 15,000 WBC/mm^3 ***and*** left shift ≥ 10% band forms
    - Child: leukocytosis ≥ 15,000 WBC/mm^3
- Breath sounds
  - Wheezing and rhonchi are only eligible to meet PNU1, Alternative criteria for infants ≤ 1 year old
  - Not eligible for PNU1 any patient, PNU1 child, PNU2, or PNU3
- Don’t forget about the **FOOTNOTES**

Footnote #3

- New onset of purulent sputum (3):
  - purulent secretions must meet the quantitative laboratory definition
  - clinical documentation of “purulent” does not meet the criterion

3. **New onset of purulent sputum:** Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field (x100). Refer to the table below if your laboratory reports these data semi-quantitatively or uses a different format for reporting Gram stain or direct examination results (for example, “many WBCs” or “few squamous epithelial cells”). This laboratory confirmation is required since written clinical descriptions of purulence are highly variable.

Footnote #5

- Tachypnea (5):
  - documented respiratory rate (breaths per minute) must meet the age-based parameters
  - clinical documentation of “tachypnea” does not meet the criterion

5. **Tachypnea:** Defined by age-based respiration rates (breaths per minute) in the table below.

Age Group	Respiration Rate
Adults	> 25 breaths per minute
Children > 1 year old	> 30 breaths per minute
Children 2 months – 12 months old	> 50 breaths per minute
Infants < 2 months old	> 60 breaths per minute
Premature infants born at < 37 weeks gestation and until the 40th week	> 75 breaths per minute

Knowledge Check #4

The PNU1 Alternative Criteria for infants ≤ 1 year old can be used with the PNU2 and PNU3 algorithms.

A. True
B. False

Knowledge Check #4 - Rationale

Answer: **False**

The PNU1 Alternative Criteria for infants ≤ 1 year old cannot be used with the PNU2 and PNU3 algorithms.

Rationale

- The PNU1 Alternative Criteria for infants and for children can only be used with the PNU1 criterion
- PNU2 and PNU3 do not have age-specific sign/symptom criteria

Laboratory Test Evidence

PNEU pathogen exclusions

All *Candida* species or yeast not otherwise specified

All coagulase-negative *Staphylococcus* species

All *Enterococcus* species

- Excluded as a site-specific pathogen
  - unless isolated from *lung tissue or pleural fluid*
- If identified from *blood*
  - the excluded pathogens can only be attributed as secondary to PNEU if PNU2 or PNU3 is met with a *matching organism* isolated from *lung tissue or pleural fluid* and the blood specimen is collected in the *secondary BSI attribution period*

PNEU pathogen exclusions, continued

Exception: *Candida* species are eligible for use in meeting PNU3

IF

- Patient meets the *immunocompromised definition* (**footnote #10**)
- Matching *Candida* species are identified from a *blood specimen and respiratory specimen*, and both specimens have a collection date in the *same infection window period*

PNU2 laboratory evidence: Blood specimen

- PNU2, Table 2, p. 6-7:

  - Organism identified from blood (8,12)

Corresponding footnotes:

8. **Organism identified from blood:** Any coagulase-negative *Staphylococcus* species, any *Enterococcus* species, and any *Candida* species or yeast not otherwise specified that are identified from blood cannot be deemed secondary to a PNEU event unless the organism was also identified from lung tissue or pleural fluid (where specimen was obtained during thoracentesis or within 24 hours of chest tube placement; a pleural fluid specimen collected after a chest tube is repositioned or from a chest tube in place > 24 hours is not eligible). This applies when meeting PNU2 or when meeting PNU3 (for patients meeting the immunocompromised definition) with the laboratory findings found in PNU2.

   Exception: Identification of matching *Candida* spp. from blood and sputum, endotracheal aspirate, BAL, or protected specimen brushing with specimen collection dates in the same IWP can be used to satisfy PNU3 definition for patients meeting the immunocompromised definition (see footnote 10).

12. **Organism identified from blood (Table 2), organism identified from pleural fluid (Table 2), and identification of matching *Candida* spp. from blood and respiratory specimens for PNU3 (Table 4):** Identification of organism by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).

PNU2 laboratory evidence: Lower respiratory tract (LRT) specimen

- PNU2, Table 2, p. 6-7

- Positive quantitative culture or corresponding semi-quantitative culture result (9) from minimally contaminated LRT specimen (***specifically, BAL, protected specimen brushing, or endotracheal aspirate***)

Corresponding footnote:

9. **Organism identified from minimally contaminated LRT specimens, pleural fluid, and lung tissue (Table 2):**

   Refer to threshold values in Table 5 for cultured specimens (lung tissue, BAL, protected specimen brushing, or endotracheal aspirate) with growth of eligible pathogens.

   Notes:

   - A specimen that is not obtained through an artificial airway (specifically an endotracheal tube or a tracheostomy) from a ventilated patient is not considered minimally contaminated and is not eligible for use in meeting the laboratory criteria for PNEU (PNU2 or PNU3 when using the laboratory findings found in PNU2). Sputum or tracheal secretions collected from a non-ventilated patient are not minimally contaminated specimens.
   - The following organisms can only be used to meet PNEU definitions when identified from lung tissue or pleural fluid obtained during thoracentesis or within 24 hours of chest tube placement (not from a chest tube that has been repositioned or from a chest tube that has been in place > 24 hours):
     - Any coagulase-negative *Staphylococcus* species
     - Any *Enterococcus* species
     - Any *Candida* species or yeast not otherwise specified
       - Exception: Identification of matching *Candida* spp. from blood and sputum, endotracheal aspirate, BAL, or protected specimen brushing with specimen collection dates in the same IWP can be used to satisfy PNU3 definition for immunocompromised patients (see footnote 10).

PNU2 laboratory evidence: Table 5

Table 5: Threshold values for cultured specimens used in the diagnosis of pneumonia

Specimen collection/technique	Values*
Lung tissue†	≥ 10^4 CFU/g tissue
Bronchoscopically (B) obtained specimens	
Bronchoalveolar lavage (B-BAL)	≥ 10^4 CFU/ml
Protected BAL (B-PBAL)	≥ 10^4 CFU/ml
Protected specimen brushing (B-PSB)	≥ 10^3 CFU/ml
Nonbronchoscopically (NB) obtained (blind) specimens	
NB-BAL	≥ 10^4 CFU/ml
NB-PSB	≥ 10^3 CFU/ml
Endotracheal aspirate (ETA)	≥ 10^5 CFU/ml

CFU = colony forming units, g = gram, ml = milliliter

*Consult with your laboratory to determine if reported semi-quantitative results match the quantitative thresholds. In the absence of additional information available from your laboratory, a semi-quantitative result of “moderate” or “heavy” or “many” or “numerous” growth, or 2+, 3+, or 4+ growth is considered to correspond.

†Lung tissue specimens obtained by either open or closed lung biopsy methods. For post-mortem specimens, only lung tissue specimens obtained by transthoracic or transbronchial biopsy that are collected immediately post-mortem are eligible for use.

PNU2 laboratory evidence: Lung tissue & pleural fluid

- PNU2, Table 2, p. 6-7

- Organism identified from pleural fluid (9,12)

- Positive quantitative culture or corresponding semi-quantitative culture result (9) of lung tissue

- Eligible specimens for *Candida*, *Enterococcus*, and coagulase-negative *Staphylococcus* species
- Pleural fluid – organisms can be identified with any amount of growth
- Lung tissue – organisms must be identified on culture with growth that meets the threshold values in Table 5
- Review corresponding footnotes for additional requirements for pleural fluid and lung tissue

PNU2 laboratory evidence: Viruses

- PNU2, Table 3, p. 6-8

> - Virus, *Bordetella, Legionella, Chlamydia, or Mycoplasma* identified from respiratory secretions or tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)

- Posterior nasal and nasopharyngeal (NP) swab specimens are eligible specimens
- Both culture and non-culture-based test results are eligible

PNU3 laboratory evidence: Matching *Candida* species

- PNU3, Table 4, p. 6-9:

- Identification of matching *Candida* spp. from blood and one of the following respiratory specimens: sputum, endotracheal aspirate, BAL, or protected specimen brushing (11,12); blood specimen and respiratory specimen must have collection dates that occur within the same IWP

Corresponding footnotes:

11. **Identification of matching *Candida* spp. from blood and respiratory specimens for PNU3 (Table 4):** Sputum obtained by any method (such as deep cough, induction, aspiration, or lavage) are acceptable specimens. Any quantity of organism identified is acceptable, to include all non-quantitative, semi-quantitative, and quantitative results.

12. **Organism identified from blood (Table 2), organism identified from pleural fluid (Table 2), and identification of matching *Candida* spp. from blood and respiratory specimens for PNU3 (Table 4):** Identification of organism by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).

PNU3 laboratory evidence: Using PNU2 criteria

- PNU3, Table 4, p. 6-9

OR

Any of the following from:

LABORATORY CRITERIA DEFINED UNDER PNU2

- Any of the laboratory criteria listed in PNU2 (Tables 2 and 3) can be used to meet PNU3 for immunocompromised patients
- **Footnotes** associated with the PNU2 laboratory criteria still apply when using them to meet PNU3

Knowledge Check #5

An endotracheal aspirate specimen with a final culture result *Klebsiella pneumoniae* identified can be used to meet PNEU (PNU2 or PNU3) criteria.

A. True
B. False

- Positive quantitative culture or corresponding semi-quantitative culture result (9) from minimally contaminated LRT specimen (***specifically, BAL, protected specimen brushing, or endotracheal aspirate***)

Knowledge Check #5 - Rationale

Answer: **False**

An endotracheal aspirate (ETA) culture result of *Klebsiella pneumoniae* does not meet PNEU criteria.

Rationale

There are 3 parts for meeting this laboratory element:

1. ✓ Specimen – endotracheal aspirate (ETA) is an eligible specimen
2. ✓ Organism – *Klebsiella pneumoniae* is an eligible organism for meeting PNEU
3. ✗ Growth on culture – identifying an eligible organism is not sufficient – must meet the required quantitative/semi-quantitative growth requirements in Table 5

Knowledge Check #6

A blood specimen with *Enterococcus faecalis* identified can be used to meet PNEU (PNU2 or PNU3).

A. True
B. False

Knowledge Check #6 - Rationale

Answer: **False**

A blood specimen with *Enterococcus faecalis* identified cannot be used as the laboratory element in the IWP to meet PNU2 or PNU3.

Rationale

Enterococcus faecalis is an excluded organism from meeting PNU2 and PNU3 criteria unless identified from lung tissue or pleural fluid.

Secondary BSI Assignment to PNEU

PNEU and Secondary BSI assignment

A PNEU criterion (PNU2 or PNU3) must be met

AND

One of the following scenarios must be met

Scenario 1: Blood specimen organism matches organism used to meet the PNU2 or PNU3 criterion, AND the blood specimen has a collection date in the PNEU secondary BSI attribution period (SBAP)

OR

Scenario 2: Blood specimen has a collection date in the PNEU infection window period (IWP), AND the blood specimen organism is used as an element to meet the PNU2 or PNU3 criterion

BSI Protocol https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf Appendix: Secondary BSI Guide

Key concepts for Secondary BSI assignment to PNEU

- Pathogens cannot be reported for PNU1 events
  - PNU1 criterion does not include a site-specific specimen or a blood specimen
  - Therefore, a secondary BSI cannot be assigned to PNU1

- Pathogens can be reported for PNU2 and PNU3 events
  - Therefore, a secondary BSI can be assigned to PNU2 and PNU3, if one of the secondary BSI scenarios is met

HD	SBAP	RIT	IWP	Element
1				
2	1		1	
3	2		2	
4 DOE	3	1	3	Worsening cough
5	4	2	4	Imaging: New infiltrate
6	5	3	5	Fever >38.0°C
7	6	4	6	Imaging: Infiltrate
8	7	5	7	BAL: many *E. coli*
9	8	6		Imaging: Infiltrate
10	9	7		
11	10	8		Blood Culture: *E. coli*
12	11	9		Imaging: Infiltrate

BSI secondary to PNEU: Scenario 1, Example 1

- PNU2 is met with an eligible site-specific specimen and culture result
- Blood specimen collection date is within the PNEU SBAP
- Cultures have matching organisms
- Determination:
  - HAI PNU2 with a Secondary BSI
  - Date of Event = Hospital Day 4
  - Pathogen: *E. coli*

Secondary BSI to PNEU – Excluded pathogens

Candida species or yeast not otherwise specified

Coagulase-negative *Staphylococcus* species

Enterococcus species

- When applying Secondary BSI Scenario 1, excluded pathogens identified from blood can only be attributed as a secondary BSI to PNEU
  - If PNU2 or PNU3 is met with a matching organism identified from lung tissue or pleural fluid
  - And the blood specimen with a matching organism has a collection date in the PNEU SBAP

HD	SBAP	RIT	IWP	Element
1				
2	1		1	
3	2		2	
4 DOE	3	1	3	Rales
5	4	2	4	Imaging: New infiltrate
6	5	3	5	Fever >38.0°C
7	6	4	6	Imaging: Infiltrate
8	7	5	7	Pleural fluid: *Enterococcus faecalis*
9	8	6		Imaging: Infiltrate
10	9	7		
11	10	8		Blood Culture: *Enterococcus faecalis*
12	11	9		Imaging: Infiltrate

BSI secondary to PNEU: Scenario 1, Example 2

- PNU2 is met with an eligible site-specific specimen and culture result
- Blood specimen collection date is within the PNEU SBAP
- Cultures have matching organisms
- *Enterococcus* species are not excluded when identified from lung tissue or pleural fluid
- *Enterococcus* BSI can be assigned as secondary to PNU2 in this case
- Determination:
  - HAI PNU2 with a Secondary BSI
  - Date of Event = Hospital Day 4
  - Pathogen: *Enterococcus faecalis*

Secondary BSI to PNEU – Excluded pathogens, continued

- Pathogens excluded from site-specific infection definitions are also excluded as pathogens for BSIs secondary to that type of infection
- The excluded pathogens cannot be assigned to one of these infections as a pathogen, even if identified in the same blood specimen as an eligible pathogen
- Pathogen Assignment Guidance, Chapter 2, p. 2-22

HD	SBAP	RIT	IWP	Element
1				
2	1		1	
3	2		2	
4 DOE	3	1	3	Fever >38.0°C
5	4	2	4	Imaging: New infiltrate
6	5	3	5	Dyspnea
7	6	4	6	Imaging: Infiltrate
8	7	5	7	ETA: 4+ *K. oxytoca*
9	8	6		Imaging: Infiltrate
10	9	7		
11	10	8		Blood Culture: *K. oxytoca* and VRE
12	11	9		Imaging: Infiltrate

BSI secondary to PNEU: Scenario 1, Example 3

- PNU2 is met with an eligible site-specific specimen and culture result
- Blood specimen collection date is within the PNEU SBAP
- Cultures have at least one matching organism: *K. oxytoca*
- BUT – VRE (vancomycin-resistant *Enterococcus*) is an excluded pathogen and cannot be assigned as a secondary BSI pathogen to PNEU since no matching organism identified from pleural fluid or lung tissue
- Determination:
  - HAI PNU2 with a Secondary BSI
  - Date of Event = Hospital Day 4
  - Pathogen: *K. oxytoca*
  - HAI LCBI 1, DOE HD 4, pathogen VRE

BSI Secondary to PNEU: Scenario 2

Blood specimen as an element of the PNEU criteria

Table 2: Specific Site Algorithm for Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings (PNU2)

NOTE: The PNEU Algorithms (PNU1,2,3) and Flowcharts include **FOOTNOTE** references. The interpretation and guidance provided in the **FOOTNOTES** are an important part of the algorithms and must be incorporated into the decision-making process when determining if a PNEU definition is met.

Imaging Test Evidence	Signs/Symptoms	Laboratory
Two or more serial chest imaging test results with at least ***one*** of the following (1,2,13): New and persistent **or** Progressive and persistent	At least ***one*** of the following: • Fever (> 38.0°C or > 100.4°F) • Leukopenia (≤ 4000 WBC/mm^3) or leukocytosis (≥ 12,000 WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other	At least ***one*** of the following: • Organism identified from blood (8,12) • Organism identified from pleural fluid (9,12)

Table 4: Specific Site Algorithm for Pneumonia in Immunocompromised Patients (PNU3)

NOTE: The PNEU Algorithms (PNU1,2,3) and Flowcharts include **FOOTNOTE** references. The interpretation and guidance provided in the **FOOTNOTES** are an important part of the algorithms and must be incorporated into the decision-making process when determining if a PNEU definition is met.

Imaging Test Evidence	Signs/Symptoms	Laboratory
Two or more serial chest imaging test results with at least ***one*** of the following (1,2,13): New and persistent **or** Progressive and persistent • Infiltrate	Patient who is immunocompromised (see definition in footnote 10) has at least ***one*** of the following: • Fever (> 38.0°C or > 100.4°F) • For adults ≥ 70 years old, altered mental status with no other recognized cause • New onset of purulent sputum (3), or change in character of sputum (4), or	At least ***one*** of the following: • Identification of matching *Candida* spp. from blood and one of the following respiratory specimens: sputum, endotracheal aspirate, BAL, or protected specimen brushing (11,12); blood specimen and respiratory specimen must have collection dates that occur within the same IWP

HD	SBAP	RIT	IWP	Element
1				
2	1		1	
3	2		2	
4 DOE	3	1	3	Tachypnea
5	4	2	4	Imaging: New infiltrate
6	5	3	5	Leukopenia
7	6	4	6	Blood culture: *S. aureus*
8	7	5	7	Imaging: Infiltrate
9	8	6		Imaging: Infiltrate
10	9	7		
11	10	8		
12	11	9		Imaging: Infiltrate

BSI secondary to PNEU: Scenario 2, Example 1

- Blood specimen has a collection date in the PNEU IWP
- Organism from blood specimen is an eligible organism for meeting PNEU
- Organism identified from blood is used as an element to meet PNU2 criterion
- Determination:
  - HAI PNU2 with a Secondary BSI
  - Date of Event = Hospital Day 4
  - Pathogen: *S. aureus*

HD	SBAP	RIT	IWP	Element
1				History of splenectomy
2	1		1	Imaging: Lungs clear
3	2		2	
4 DOE	3	1	3	Fever >38.0°C
5	4	2	4	Imaging: New infiltrate
6	5	3	5	Sputum culture: *Candida* spp.
7	6	4	6	Blood culture: *Candida albicans*
8	7	5	7	Imaging: Infiltrate
9	8	6		Imaging: Infiltrate
10	9	7		
11	10	8		
12	11	9		Imaging: Infiltrate

SPECIFIC TO CANDIDA SPECIES ONLY

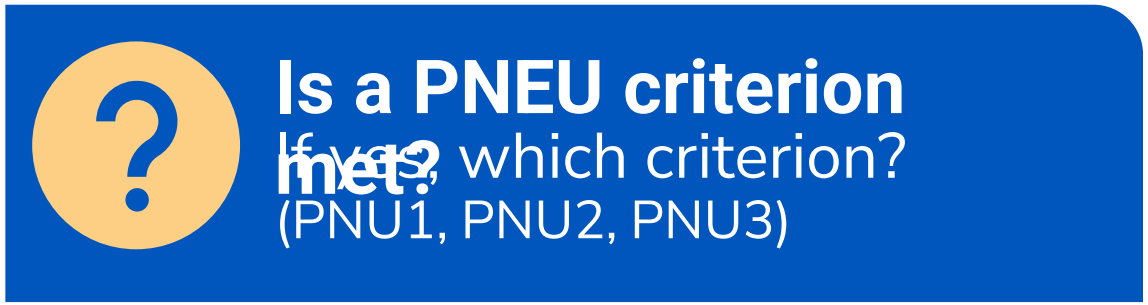
BSI secondary to PNEU: Scenario 2, Example 2

- Patient meets the PNEU immunocompromised definition (history of splenectomy)
- Blood specimen and respiratory specimen with matching *Candida* spp.
- Both specimens with collection dates in the same IWP
- Organism identified from blood is used as an element to meet PNU3 criterion
- Determination:
  - HAI PNU3 with a Secondary BSI
  - Date of Event = Hospital Day 4
  - Pathogen: *Candida albicans*

PNEU – Criteria Confirmed?

PNEU criteria confirmed? Case #1

- Patient: 73-year-old, status post right hip replacement surgery
- Hospital Day 2: imaging test - atelectasis
- Hospital Day 3: imaging test - increased atelectasis, new cough
- Hospital Day 4: imaging test - consolidation vs. atelectasis; room air -> 2L nasal cannula, altered mental status with no recognized cause
- Hospital Day 5: imaging test - consolidation vs. atelectasis
- Hospital Day 7: imaging test - consolidation vs. atelectasis
- Hospital Day 8: imaging test - consolidation
- Hospital Day 11: imaging test - consolidation



Case #1
PNU1 Criteria Confirmed

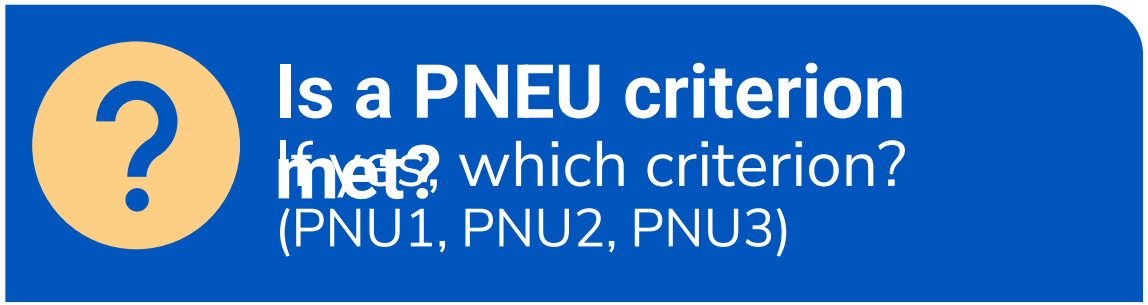
- HD 4 imaging with new equivocal finding for pneumonia
- HD 5 and HD 7 imaging tests equivocal for pneumonia
- HD 8 imaging test with definitive finding for pneumonia - clarifies prior equivocal findings to be pneumonia
- HD 11 imaging test with persistent evidence of pneumonia
- Imaging requirement is met - HD 4 imaging test with new evidence of pneumonia that is persistent
- HD 4: Date of first positive diagnostic test, sets an IWP (HD 1 - HD 7) during which all elements of the PNU1 criterion are found

Imaging tests reviewed for clarification and persistence do not have to occur in the IWP.

HD	IWP	Element
1	1	
2	2	Imaging: atelectasis
3	3 DOE	Imaging: increased atelectasis New cough
4	4 First diagnostic test	Imaging: consolidation vs. atelectasis Room air -> 2L NC Altered mental status
5	5	Imaging: consolidation vs. atelectasis
6	6	
7	7	Imaging: consolidation vs. atelectasis
8		Imaging: consolidation
9		
10		
11		Imaging: consolidation

PNEU criteria confirmed? Case #2

- Patient: 63-year-old, admitted for hemodialysis catheter infection
- Hospital Day 1: imaging test - trace pulmonary edema bilaterally
  complaint of dyspnea, placed on 2L nasal cannula
- Hospital Day 4: imaging test - increased bibasilar opacities; crackles
- Hospital Day 5: leukocytosis, dyspnea, 2L nasal cannula -> 4L nasal cannula
- Hospital Day 6: imaging test - decreased opacities
- Hospital Day 8: imaging test - trace pulmonary edema



Case #2:
No PNEU Criteria Confirmed

- Imaging requirement is not met
- HD 4 imaging - progressive non-specific finding
- HD 6 imaging - persistent non-specific finding
- HD 8 imaging - no evidence of pneumonia
- Imaging test evidence of pneumonia is not persistent

HD	IWP	Element
1		Imaging: trace pulmonary edema bilaterally Dyspnea, room air -> 2L NC
2		
3		
4		Imaging: increased bibasilar opacities, Crackles
5		Leukocytosis, dyspnea, 2L NC -> 4L NC
6		Imaging: decreased opacities
7		
8		Imaging: trace pulmonary edema
9		

For all patients, if multiple imaging tests are available, they must be reviewed for persistence.

PNEU criteria confirmed? Case #3

- Patient: Premature neonate born at 24 weeks gestation, ventilated for respiratory distress syndrome (RDS)
- Hospital Day 8: imaging test - respiratory distress syndrome (RDS)
- Hospital Day 9: imaging test - diffuse opacites, no change
- Hospital Day 10: imaging test - diffuse opacities, likely RDS
- Hospital Day 11: imaging test - RDS, superimposed pneumonia cannot be ruled out; temperature instability
- Hospital Day 12: imaging test - similar diffuse opacities; FiO2 increased from 30% to 40%, rhonchi
- Hospital Day 13: imaging test - opacities - RDS vs. developing pneumonia, confirm clinically

  MD progress note: antibiotics initiated for suspected pneumonia
- Hospital Day 14: imaging test - RDS and/or pneumonia; ETA culture - 1+ growth *S. aureus*
- Hospital Day 15: imaging test - diffuse opacities, RDS or pneumonia
- Hospital Day 16: imaging test - RDS
- Hospital Day 17: imaging test - RDS

Is a PNEU criterion met? If yes, which criterion? (PNU1, PNU2, PNU3)

Case #3:
No PNEU criteria confirmed

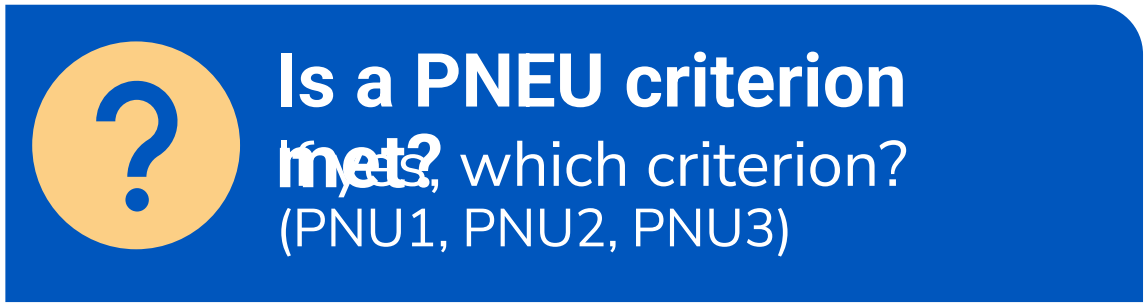
- Imaging requirement is not met
- HD 11 imaging - new equivocal finding for pneumonia
- HD 12 imaging - persistent non-specific finding
- HD 13 – HD 15 imaging - persistent equivocal findings
- HD 16 and 17 imaging - no evidence of pneumonia
- Imaging test evidence of pneumonia is not persistent
- Note:
  - S/S of temperature instability and rhonchi are only eligible for PNU1, alternate criteria for infants ≤ 1 year old
  - ETA culture result is not eligible – semi-quantitative growth threshold is not met (Table 5)

Clinical correlation can only be used if imaging test findings remain equivocal.

HD	IWP	Element
8		Imaging: RDS
9		Imaging: diffuse opacities, no change
10		Imaging: diffuse opacities, likely RDS
11		Imaging: RDS, superimposed pneumonia cannot be ruled out; temperature instability
12		Imaging: similar diffuse opacities Increased FiO2, rhonchi
13		Imaging: opacities – RDS vs. developing pneumonia, confirm clinically MD: antibiotics for suspected pneumonia
14		Imaging: RDS and/or pneumonia ETA culture - 1+ growth *S. aureus*
15		Imaging: diffuse opacities, RDS or pneumonia
16		Imaging: RDS
17		Imaging: RDS

PNEU criteria confirmed? Case #4

- Patient: 28-year-old, HIV positive with CD4 count < 200 cells/mm³
- Hospital Day 11: imaging test - new infiltrates
- Hospital Day 13: imaging test - increased infiltrates; fever
- Hospital Day 15: imaging test - infiltrates, fever
  sputum culture - *Candida* species
- Hospital Day 17: fever; blood culture - *Candida albicans*
- Hospital Day 18: imaging test - infiltrates



Case #4:
PNU3 Criteria Confirmed

- Patient is immunocompromised (footnote #10)
- Imaging requirement is met - HD 13 imaging test with progressive evidence of pneumonia that is persistent
- Matching *Candida* spp. identified from blood and respiratory specimens
- Blood and respiratory specimens have collection dates in the same IWP
- HD 15: Date of first positive diagnostic test that sets an IWP (HD 12 - HD 18) during which all elements of the PNU3 criterion are found

The IWP is set by the date of the first positive diagnostic test that allows you to meet the criterion.

HD	IWP	Element
11		Imaging: new infiltrates
12	1	
13	2 DOE	Imaging: increased infiltrates Fever
14	3	
15	4 First diagnostic test	Imaging: infiltrates Fever Sputum culture: *Candida* spp.
16	5	
17	6	Blood culture: *Candida albicans* Fever
18	7	Imaging: Infiltrates
19		

Thank you.

For any questions or concerns, contact the NHSN Helpdesk

- **NHSN-ServiceNow** to submit questions to the NHSN Help Desk
- Access the portal at **https://servicedesk.cdc.gov/nhsncsp**
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