2021 NHSN Pneumonia (PNEU) Checklist

Pneumonia (PNEU) Summary		
Criterion	**Criterion Met**	**Date of Event (DOE)**
PNU1 (patients of any age)	☐	
PNU1 (infants ≤1 year old)	☐	
PNU1 (child >1 year old or ≤12 years old)	☐	
PNU2 (Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings)	☐	
PNU2 (Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings)	☐	
PNU3 (Immunocompromised Patients)	☐	
Please refer to Chapter 6 Pneumonia (PNEU) Event of the Patient Safety Manual for additional information.		

Documentation Review Checklist		
Pneumonia 1 (PNU1) **Must meet at least *one* of the following criteria:**		
PNU1: ANY PATIENT, any age group		
Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either 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 (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient has at least ***one*** of the following:		
• Fever (>38.0°C or >100.4°F)	☐	
• Leukopenia (≤4,000 WBC/mm^3)	☐	
• Leukocytosis (≥12,000 WBC/mm^3)	☐	
• Adults ≥70 years old, altered mental status with no other recognized cause	☐	
AND Patient has at least ***two*** of the following:		
• New onset of purulent sputum[3] or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements	☐	
• New onset or worsening cough, or dyspnea, or tachypnea[5]	☐	
• 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)	☐	
PNU1: ALTERNATE CRITERIA, for infants ≤1 year old		
Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either 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 (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient has:		
Worsening gas exchange (for example: O_2 desaturations [for example pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand)	☐	
AND Patient has at least ***three*** of the following:		

• Temperature instability	☐	
• Leukopenia (≤4000 WBC/mm3) or leukocytosis (≥15,000 WBC/mm3) 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)	☐	

PNU1: ALTERNATE CRITERIA, for child >1 year old or ≤12 years old

Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either new and persistent **OR** progressive and persistent		
• Infiltrate	☐	
• Consolidation	☐	
• Cavitation	☐	
*NOTE: In patients **without** underlying pulmonary or cardiac disease (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient has at least ***three*** of the following:		
• 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	☐	
• New onset or worsening cough, or dyspnea, apnea, or tachypnea[5]	☐	
• 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)	☐	
Notes/Comments:		

Documentation Review Checklist		
Pneumonia 2 (PNU2)		
PNU2: Specific Site Algorithms for Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings		
Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either 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 (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient has at least ***one*** of the following:		
• Fever (>38.0°C or >100.4°F)	☐	
• Leukopenia (≤4,000 WBC/mm^3)	☐	
• Leukocytosis (≥12,000 WBC/mm^3)	☐	
• Adults ≥70 years old, altered mental status with no other recognized cause	☐	
AND Patient has 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	☐	
• New onset or worsening cough, or dyspnea, or tachypnea[5]	☐	
• 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)	☐	
AND Patient has at least ***one*** of the following:		
• Organism identified from blood[8,13]	☐	
• Organism identified from pleural fluid[9,13]	☐	
• Positive quantitative culture or corresponding semi-quantitative culture result[9] from minimally-contaminated LRT specimen (specifically BAL, protected specimen brushing, or endotracheal aspirate)	☐	
• ≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic exam (for example: Gram's stain)	☐	
• Positive quantitative culture or corresponding semi-quantitative culture result[9] of lung tissue	☐	
• Histopathologic exam shows at least ***one*** of the following evidences of pneumonia:		
o Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli	☐	
o Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae	☐	
Notes/Comments:		

Documentation Review Checklist		
Pneumonia 2 (PNU2)		
PNU2: Specific Site Algorithms for Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings		
Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either 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 (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient has at least ***one*** of the following:		
• Fever (>38.0°C or >100.4°F)	☐	
• Leukopenia (≤4,000 WBC/mm^3)	☐	
• Leukocytosis (≥12,000 WBC/mm^3)	☐	
• Adults ≥70 years old, altered mental status with no other recognized cause	☐	
AND Patient has 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	☐	
• New onset or worsening cough, or dyspnea, or tachypnea[5]	☐	
• 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)	☐	
AND Patient has at least ***one*** of the following:		
• 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))	☐	
• Fourfold rise in paired sera (IgG) for pathogen (for example: influenza viruses, *Chlamydia*)	☐	
• Fourfold rise in *Legionella pneumophila* serogroup 1 antibody titer to ≥1:128 in paired acute and convalescent sera by indirect IFA	☐	
• Detection of *L. pneumophila* serogroup 1 antigens in urine by RIA or EIA	☐	
Notes/Comments:		

Documentation Review Checklist		
Pneumonia 3 (PNU3)		
PNU3: Specific Site Algorithms for Pneumonia in Immunocompromised Patients		
Element	**Element Met**	**Date**
Patient has ***one of the following*** found in two or more serial chest imaging test results[1, 2, 14]:		
Either 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 (for example, respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest imaging test result is acceptable[1].*		
AND Patient is immunocompromised[10]	☐	
AND Patient has at least ***one*** of the following:		
• Fever (>38.0°C or >100.4°F)	☐	
• 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	☐	
• New onset or worsening cough, or dyspnea, or tachypnea[5]	☐	
• 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)	☐	
• Hemoptysis	☐	
• Pleuritic chest pain	☐	
AND Patient has at least ***one*** of the following:		
• Identification of matching *Candida* spp. from blood and one of the following: sputum, endotracheal aspirate, BAL, or protected specimen brushing[11,12,13]	☐	
• Evidence of fungi (excluding any Candida and yeast not otherwise specified) from minimally-contaminated LRT specimen (specifically BAL, protected specimen brushing, or endotracheal aspirate) from one of the following: o Direct microscopic exam o Positive culture of fungi o Non-culture diagnostic laboratory test	☐	
OR Any of the following from:		
• **LABORATORY CRITERIA DEFINED UNDER PNU2**	☐	
Notes/Comments:		

Footnotes to Algorithms:

1. To help confirm difficult cases, multiple imaging test results spanning over several calendar days must be considered when determining if there is imaging test evidence of pneumonia. Pneumonia may have rapid onset and progression but does not resolve quickly. Imaging test evidence of pneumonia will persist. Rapid imaging resolution suggests that the patient does not have pneumonia, but rather a non-infectious process such as atelectasis or congestive heart failure.
    - In non-ventilated patients, the diagnosis of healthcare-associated pneumonia may be quite clear on the basis of signs, symptoms and a single definitive chest imaging test result. Therefore, in a patient without underlying pulmonary or cardiac disease and when there is only one imaging test available, if it is an eligible finding, the imaging test evidence requirement can be met.
    - In patients without underlying disease if more than one imaging test is available serial imaging test results must also be evaluated and demonstrate persistence.
    - In patients with underlying disease, serial chest imaging test results must be examined to help separate infectious from non-infectious pulmonary processes. In patients with pulmonary or cardiac disease (for example, interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. For example: Pulmonary edema from decompensated congestive heart failure may simulate the presentation of pneumonia.

2. Note that there are many ways of describing the imaging 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. If provided and the findings are not documented as attributed to another issue (for example pulmonary edema, chronic lung disease) they are eligible for meeting imaging test evidence of pneumonia.

3. 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.

How do I use the purulent respiratory secretions criterion if …	Instruction
My laboratory reports counts of "white blood cells" or "polymorphonuclear leukocytes" or "leukocytes" rather than counts of "neutrophils"?	Assume that counts of cells identified by these other descriptors (for example, "white blood cells") are equivalent to counts of neutrophils, unless the laboratory tells you this is not the case.
My laboratory reports semi-quantitative results (not quantitative results) for numbers of neutrophils and squamous epithelial cells?	Check with the laboratory to get information about what quantitative ranges the semi-quantitative reports correspond to.
My laboratory cannot provide additional information on how its semi-quantitative reporting corresponds to quantitative reporting ranges for neutrophils and squamous epithelial cells?	Use the following direct examination results to meet the purulent respiratory secretions criterion: many, heavy, numerous, 4+, or ≥ 25 neutrophils per low power field (lpf) [x100], AND no, rare, occasional, few, 1+ or 2+, or ≤ 10 squamous epithelial cells per lpf [x100].
My laboratory reports only the numbers of neutrophils present, without reporting the number of squamous epithelial cells?	In this situation, the purulent secretions criterion may be met using the specified quantitative and semi-quantitative thresholds for neutrophils alone (specifically many, heavy, numerous, 4+, or ≥ 25 neutrophils per lpf [x100]).
My laboratory uses different reporting thresholds for neutrophils and squamous epithelial cells (for example, maximum report of ≥ 20 neutrophils per low power field [x100], or minimum report of ≤ 15 squamous epithelial cells per low power field [x100])?	In this situation, the purulent secretions criterion may be met using the laboratory's specified maximum quantitative threshold for neutrophils, and/or minimum quantitative threshold for squamous epithelial cells.
My laboratory processes respiratory specimens such as bronchoalveolar lavage fluid using a centrifugation procedure (for example, "cytospin"), and there is no quantitation or semi-quantitation of neutrophils or white blood cells in the direct examination report?	In this situation, a report indicating the presence of white blood cells, without quantitation, is sufficient to meet the purulent secretions criterion.

4. Change in character of sputum refers to the color, consistency, odor and quantity.

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 patients <2 months old; >50 breaths per minute in patients 2-12 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 (PaO_2) to the inspiratory fraction of oxygen (FiO_2).

8. 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, unless the organism was also identified from pleural fluid (where specimen was obtained during thoracentesis or initial placement of chest tube and NOT from an indwelling chest tube) or lung tissue. This applies when meeting PNU2 or when meeting PNU3 with the laboratory findings found in PNU2. Identification of matching *Candida* spp. from blood and sputum, endotracheal aspirate, BAL, or protected specimen brushing with specimen collection dates in the same IWP (see footnote 11) can be used to satisfy PNU3 definition for patients meeting the immunocompromised definition (see footnote 10).

9. Refer to threshold values for cultured specimens with growth of eligible pathogens (Table 5).
   Notes:
   - A specimen that is not obtained through an artificial airway (specifically endotracheal tube or tracheostomy) is not considered minimally contaminated and is not eligible for use in meeting the laboratory criteria for 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 pleural fluid obtained during thoracentesis or initial placement of chest tube (not from an indwelling chest tube) or lung tissue:
     - 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).

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

10. Immunocompromised patients include only
    - those with neutropenia defined as absolute neutrophil count or total white blood cell count (WBC) <500/mm3
    - those with leukemia, lymphoma or who are HIV positive with CD4 count <200
    - 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 (exclude inhaled and topical steroids) daily for >2 weeks on the date of event

11. Blood specimen and sputum, endotracheal aspirate, BAL, or protected specimen brushing specimens must have a collection date that occurs within the Infection Window Period.

12. Semi-quantitative or non-quantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable.

13. 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)).

14. If the imaging test result is equivocal for pneumonia, check to see if subsequent imaging tests are definitive. For example, if a chest imaging test result states infiltrate vs. atelectasis and a subsequent imaging test result is definitive for infiltrate — the initial imaging test would be eligible for use. In the absence of finding a subsequent imaging result that clarifies the equivocal finding, if there is clinical correlation then the equivocal imaging test is eligible for use.