



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



(Last updated January 1, 2014)

IMPORTANT UPDATE: *(Last updated January 1, 2014)*

1. In 2014, in-plan surveillance for ventilator-associated pneumonia (PNEU) will be restricted to patients of any age in non-NICU pediatric locations. In 2014, in-plan surveillance conducted for mechanically-ventilated patients in adult locations (regardless of age) will use the Ventilator-associated Event (VAE) protocol (See VAE checklist). The PNEU definitions are still available for those units seeking to conduct off-plan PNEU surveillance for mechanically-ventilated adult and neonatal patients and non-ventilated adults or children.

Healthcare-associated infections (HAI): All NHSN site specific infections must first meet the HAI definition as defined in the “Additional Information” checklist before a site specific infection (e.g., VAP) can be reported to NHSN.

Present on Admission (POA): Infections that are POA, as defined in the “Additional Information” checklist, are not considered HAIs and therefore are never reported to NHSN.

Present on Admission (POA) reporting exception for PNEU/VAP: If all other elements are present per the POA criteria, one chest radiograph alone is acceptable to meet POA criteria for PNEU/VAP, protocol, regardless of whether the patient has underlying pulmonary or cardiac disease

How to Apply HAI Definition to the PNEU/VAP Protocol: A serial chest radiograph (CXR) on or after day 3 of admission (HAI) and a second later CXR may be used to meet the radiology finding requirement in a patient with underlying disease. The second CXR must occur within 7 days of the first. These findings can be used to fulfill the current HAI pneumonia/VAP criteria for the required 2 CXR findings are considered 1 element of the VAP/PNEU criteria. All other elements of the PNEU/VAP should be met per the HAI definition. The VAP PNEU HAI criteria are met even if all other elements required for PNEU/VAP are not present at the time of the second CXR is obtained.

Pneumonia (PNEU) is identified by using a combination of radiologic, clinical and laboratory criteria. The following checklist details the various criteria that may be used for meeting the surveillance definition of healthcare-associated pneumonia, general comments applicable to all specific site criteria, reporting instructions, and threshold values for cultured specimens used in the surveillance diagnosis of pneumonia.

Date of event: For VAP the date of event is the date when the last element used to meet the Pneumonia (PNEU) criteria occurred. Synonyms: infection date.

Ventilator: A device to assist or control respiration continuously, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.

NOTE: Lung expansion devices such as intermittent positive-pressure breathing (IPPB); nasal positive end-expiratory pressure (PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).

Ventilator-associated PNEU (VAP): A pneumonia where



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



- The patient is on mechanical ventilation for >2 calendar days when all elements of the PNEU infection criterion were first present together, with day of ventilator placement being Day 1

AND

- The ventilator was in place on the date of event or the day before. If the patient is admitted or transferred into a facility on a ventilator, the day of admission is considered Day 1.

Location of attribution: The inpatient location where the patient was assigned on the date of the VAP event, which is further defined as the date when the last element used to meet the PNEU criterion occurred (see exception below).

EXCEPTION TO LOCATION OF ATTRIBUTION:

Transfer Rule: If all elements of a VAP are present within 2 days of transfer from one inpatient location to another in the same facility or a new facility (i.e., on the day of transfer or the next day), the infection is attributed to the transferring location or facility. Receiving facilities should share information about such HAIs with the transferring facility to enable reporting. This is called the Transfer Rule and examples are shown below:

- Child has been on a ventilator for 7 days in the PICU and is transferred on the ventilator to the pediatric surgical ward. On the next day, the patient meets the criteria for PNEU. This is reported to NHSN as a VAP for the PICU.
- Child has been on a ventilator for 5 days and is transferred in the morning to the pediatric medical ward from the pediatric medical critical care unit after having ventilator discontinued. Later that night, the child meets criteria for a PNEU. This is reported to NHSN as a VAP for the pediatric medical critical care unit.
- Pediatric patient on a ventilator is transferred from the neonatal intensive care unit (NICU) to the pediatric intensive care unit (PICU). After 4 days in the PICU, the patient meets the criteria for a PNEU. This is reported to NHSN as a VAP for the PICU.
- Pediatric patient on the Respiratory ICU (RICU) of Hospital A had the endotracheal tube and ventilator removed after being on the ventilator for 5 days and is discharged home a few hours later. The IP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a PNEU. This VAP should be reported to NHSN for, and by, Hospital A and attributed to the RICU. No additional ventilator days for the RICU are reported.

EXCEPTION TO TRANSFER RULE:

Locations that do not house patients overnight (e.g., Emergency Department or Operating Room) will have no denominator data, i.e., patient days or catheter days. Therefore VAPs cannot be attributed to these locations. Instead, the VAP must be attributed to the next inpatient location in which the patient stays.



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



Algorithms for Clinically Defined Pneumonia

DEFINITION: Patient must meet **ONE** ☐ of the following criteria for Pneumonia 1:

Patients in Any Age Group
(Last updated June, 2008)

☐ Criterion:

- Patient has two or more serial chest radiographs with at least **ONE** ☐ of the following:

- △ infiltrate is **ONE** ☐ of the following^{1, 2}:

- ☐ new

- ☐ progressive and persistent

- △ consolidation

- △ cavitation

- △ pneumatoceles, in infants ≤ 1 year old

NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable¹.

AND

- Patient has at least **ONE** ☐ of the following:

- △ fever ($>38^{\circ}\text{C}$ or $>100.4^{\circ}\text{F}$)

- △ choose **ONE** ☐ of the following:

- ☐ leukopenia ($<4000 \text{ WBC/mm}^3$)

- ☐ leukocytosis ($\geq 12,000 \text{ WBC/mm}^3$)

- △ For adults ≥ 70 years old, altered mental status with no other recognized cause

AND

- Patient has at least **TWO** ☐ of the following:

- △ change in sputum production including **ONE** ☐ of the following:

- ☐ new onset of purulent sputum³

- ☐ change in character of sputum⁴

- ☐ increased respiratory secretions

- ☐ increased suctioning requirements

- △ symptoms of **ONE** ☐ of the following:

- ☐ new onset cough

- ☐ worsening cough

- ☐ dyspnea

- ☐ tachypnea⁵

- △ exam findings of **ONE** ☐ of the following:



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



- ☐ rales⁶
- ☐ bronchial breath sounds

△ worsening gas exchange indicated by **ONE** ☐ of the following:

- ☐ O₂ desaturations (e.g., PaO₂/FiO₂ ≤ 240)⁷
- ☐ increased oxygen requirements
- ☐ increased ventilator demand

Infants ≤1 Year Old
(Last updated January 1, 2013)

Criterion:

- Patient has two or more serial chest radiographs with at least **ONE** △ of the following:

△ infiltrate is **ONE** ☐ of the following^{1, 2}:

- ☐ new
- ☐ progressive and persistent
- △ consolidation
- △ cavitation
- △ pneumatoceles, in infants ≤ 1 year old

NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable¹.

AND

- Patient has worsening gas exchange indicated by **ONE** △ of the following:

- △ O₂ desaturations [e.g. pulse oximetry <94%]
- △ increased oxygen requirements
- △ increased ventilator demand

AND

- Patient has at least **THREE** △ of the following:

- △ temperature instability
- △ choose **ONE** ☐ of the following:
 - ☐ leukopenia (<4000 WBC/mm³)
 - ☐ leukocytosis (≥15,000 WBC/mm³) with left shift (≥10% band forms)
- △ change in sputum production including **ONE** ☐ of the following:
 - ☐ new onset of purulent sputum³
 - ☐ change in character of sputum⁴
 - ☐ increased respiratory secretions



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



- ☐ increased suctioning requirements
- △ symptoms of **ONE** ☐ of the following:
 - ☐ apnea
 - ☐ tachypnea⁵
 - ☐ nasal flaring with retraction of chest wall
 - ☐ nasal flaring with grunting
- △ exam findings of **ONE** ☐ of the following:
 - ☐ wheezing
 - ☐ rales ⁶
 - ☐ rhonchi
- △ choose **ONE** ☐ of the following:
 - ☐ bradycardia (<100 beats/min)
 - ☐ tachycardia (>170 beats/min)

Child >1 Year Old and ≤ 12 Years Old
(Last updated June, 2008)

Criterion:

- Patient has two or more serial chest radiographs with at least **ONE** △ of the following:
 - △ infiltrate is **ONE** ☐ of the following^{1, 2}:
 - ☐ new
 - ☐ progressive and persistent
 - △ consolidation
 - △ cavitation
 - △ pneumatoceles, in infants ≤ 1 year old

NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable¹.

AND

- Patient has at least **THREE** △ of the following:
 - △ patient has at least **ONE** ☐ of the following:
 - ☐ choose **ONE** ○ of the following:
 - fever (>38.4°C or >101.1°F)
 - hypothermia (<36.5°C or <97.7°F)
 - ☐ choose **ONE** ○ of the following:

- leukopenia (<4000 WBC/mm³)
- leukocytosis ($\geq 15,000$ WBC/mm³)
- △ change in sputum production including **ONE** ☐ of the following:
 - ☐ new onset of purulent sputum³
 - ☐ change in character of sputum⁴
 - ☐ increased respiratory secretions
 - ☐ increased suctioning requirements
- △ symptoms of **ONE** ☐ of the following:
 - ☐ new onset cough
 - ☐ worsening cough
 - ☐ dyspnea
 - ☐ apnea
 - ☐ tachypnea⁵
- △ exam findings of **ONE** ☐ of the following:
 - ☐ rales⁶
 - ☐ bronchial breath sounds
- △ worsening gas exchange indicated by **ONE** ☐ of the following:
 - ☐ O₂ desaturations (e.g., pulse oximetry $<94\%$)
 - ☐ increased oxygen requirements
 - ☐ increased ventilator demand

Footnotes to Algorithms: (Last updated June, 2008)

¹Occasionally, in non-ventilated 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 non-infectious conditions (for example, pulmonary edema from decompensated congestive heart failure) may simulate the presences 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.

²Note 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 are alternative descriptive wording should be seriously considered as potentially positive findings.

³Purulent 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). If your laboratory reports these data qualitatively (e.g., “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.

⁴A 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. A change in character of sputum refers to color, consistency, odor, and quantity.

⁵In 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.

⁶Rales may be described as “crackles”.

⁷This measure of arterial oxygenation is defined as the ratio of the arterial tension (PaO_2) to the inspiratory fraction of oxygen (FiO_2).

GENERAL COMMENTS: (Last updated January 1, 2014)

1. Physician’s diagnosis of pneumonia alone is not an acceptable criterion for healthcare-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. 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 (e.g., tracheobronchitis), and early onset pneumonia. Finally, it should be recognized that it may be difficult to determine healthcare-associated pneumonia in the elderly, infants, and immunocompromised patients since 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 healthcare-associated pneumonia.
4. Healthcare-associated pneumonia can be characterized by its onset: early or late. Early-onset pneumonia occurs during the first four 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 (e.g., Influenza A and B or Respiratory Syncytial Virus) can cause early- and late-onset healthcare-associated pneumonia, whereas yeasts, fungi, legionellae, and *Pneumocystis carinii* are usually pathogens of late-onset pneumonia.
5. Pneumonia due to gross aspiration (for example, in the setting of intubation in the field, emergency room, or operating room) is considered healthcare-associated if it meets any specific criteria and the infection itself was not clearly present at the time of admission to the hospital.



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



6. Multiple episodes of healthcare-associated pneumonia may occur in critically ill patients with lengthy hospital stays. When determining whether to report multiple episodes of healthcare-associated pneumonia in a single patient, look for evidence of resolution of the initial infection. (See note following the HAI definition in the Additional Information checklist.) The addition of or change in pathogen alone is not indicative of a new episode of pneumonia.
7. Positive Gram's 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, especially in immunocompetent patients.

Abbreviations used in PNEU laboratory criteria: (Last updated June, 2008)

BAL	Bronchioalveolar lavage	LRT	Lower respiratory tract
EIA	Enzyme immunoassay	PCR	Polymerase chain reaction
FAMA	Fluorescent-antibody staining of membrane antigen	PMN	Polymorphonuclear leukocyte
IFA	Immunofluorescent antibody	RIA	radioimmunoassay

REPORTING INSTRUCTIONS: (Last updated June, 2008)

- There is a hierarchy of specific categories within the major site pneumonia. Even if a patient meets criteria for more than one specific site, report only one:
 - 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 (e.g., abscess or empyema) and pneumonia with the same organism(s) as PNEU.
- Lung abscess or empyema without pneumonia is classified as LUNG.
- Bronchitis, tracheitis, tracheobronchitis, or bronchiolitis without pneumonia are classified as BRON.

Patient Safety Component Protocol FAQs: (Last updated October 31, 2012)

- **New or progressive and persistent infiltrate:**
Please offer a specific definition for "new or progressive and persistent infiltrate."

This phrase is meant to ensure that there has been a change in the chest x-ray and that it is not a change that is due to some acute reason such as fluid overload. A true pneumonia would not be seen on a single CXR and then resolve the next day.

- **Tracheostomy ventilation:**



TENNESSEE DEPARTMENT OF HEALTH
HEALTHCARE-ASSOCIATED INFECTIONS AND ANTIMICROBIAL RESISTANCE PROGRAM
HAI Surveillance Definitions
PNEUMONIA 1 (PNEU1)



I just recently ran into two cases of people that were on a vent and vent documentation was done. Sometime later they were put on a T-piece with an ET tube documented, but no vent documentation. Documentation was done this way for multiple days. How should these patients be addressed and should they be included in the vent days?

These patients are similar to patients with tracheostomies that are undergoing weaning from the ventilator. They may have periods of “rest” on the ventilator, and also periods where they are not ventilated during the same calendar day. In short, if the patient is off vent at the time the vent day count is being done, they are not included in the vent day count. But they would still remain very much eligible for a VAP since they are experiencing some period of mechanical ventilation every day.

- **Patients on ventilator for a portion of the day:**

Some of our patients are on the ventilator only at night. We count our ventilator days at noon. Are these patients eligible for VAP? If so, we are not getting an accurate number ventilator days to account for the risk of VAP on this unit.

We recognize certain patient populations will use the ventilator only for a portion of the day. We recommend you count ventilator days in this unit at night, perhaps 12 midnight to include this patient population in your denominator for the unit.

- **Distinguishing serial reporting infections from single, unresolved infection:**

Is there a time period following the identification of an infection during which another of the same type of infection cannot be reported?

No. At present time NHSN does not have a set time period during which only 1 infection of the same event type may be reported for the same patient (with the exception of VAE and LabID Event reporting for which there is a 14-day window [see individual protocols for VAE and LabID Events]) following an infection which is present on admission (POA) or a healthcare-associated infection (HAI). Discussions are underway regarding creating such a rule, however no final decisions have been made and no changes would be made before 2014. In the meantime, use the clinical information you have available to determine if the original infection has resolved before reporting a second.