



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

Introduction: In 2011, an estimated 157,000 healthcare-associated pneumonias occurred in acute care hospitals in U.S.¹ Patients with mechanically-assisted ventilation have a high risk of developing healthcare-associated pneumonia. In 2012, the overall ventilator use in various hospital unit types ranged from 0.01 to 0.47 per 100 patient days and the pooled incidence of VAP in in these units ranged from 0.0 to 4.4 per 1,000 ventilator days.² Prevention and control of healthcare-associated pneumonia is discussed in the CDC/HICPAC document, *Guidelines for Prevention of Healthcare-Associated Pneumonia, 2003*³. The Guideline strongly recommends that surveillance be conducted for bacterial pneumonia in ICU patients who are mechanically ventilated to facilitate identification of trends and for inter-hospital comparisons.

Settings: Surveillance may occur in any inpatient pediatric location where denominator data can be collected, such as critical/intensive care units (pedICUs), specialty care areas (SCA), step-down units, wards, and long term care units. In 2015, in-plan surveillance for ventilator-associated pneumonia (pedVAP) using the criteria found in this chapter will be restricted to patients of any age in pediatric locations (excludes neonatal locations). In 2015 in-plan surveillance conducted for mechanically-ventilated patients in adult locations (regardless of age) will use the Ventilator-Associated Event (VAE) protocol (see [VAE](#) chapter). The PNEU definitions are still available for those units seeking to conduct off-plan PNEU surveillance for mechanically-ventilated adult, pediatric and neonatal patients and non-ventilated adults, pediatric or neonatal patients. A complete listing of inpatient locations and instructions for mapping can be found in the [CDC Locations and Descriptions](#) chapter.

Note: If you are following pedVAP in your monthly reporting plan it is not required to monitor for VAPs after the patient is discharged from the facility. However, if discovered, any VAPs with event date on the day of discharge or day after discharge should be reported to NHSN (see Transfer Rule below). No additional ventilator days are reported.

Definitions:

Present on Admission (POA): Infections that are POA, as defined in [Chapter 2](#), are not considered HAIs and therefore are never reported to NHSN. **Note:** POA reporting exception for PNEU/VAP: One chest radiograph is acceptable to meet POA criteria for PNEU/VAP protocol, regardless of whether the patient has underlying pulmonary or cardiac disease.

Healthcare-associated infections (HAI): All NHSN site specific infections must first meet the HAI definition as defined in [Chapter 2](#) before a site specific infection (e.g., PNEU/VAP) can be reported to NHSN.



Note: For patients with underlying pulmonary or cardiac disease who are required to have serial imaging test results, to satisfy the PNEU/VAP definitions, the second imaging test must occur within seven days of the first but is not required to occur within the Infection Window Period. The date of the first CXR will be utilized when determining if the PNEU/VAP criteria are met within the infection window period. All other elements of PNEU/VAP definition must be present within the infection window period.

Pneumonia (PNEU) is identified by using a combination of imaging, clinical and laboratory criteria. The following pages detail the various criteria that may be used for meeting the surveillance definition of healthcare-associated pneumonia (Tables [1-4](#) and Figures [1](#) and [2](#)), general comments applicable to all site - specific criteria, and reporting instructions. [Table 5](#) shows threshold values for cultured specimens used in the surveillance diagnosis of pneumonia.

Date of event: For a PNEU/VAP the date of event is the date when the first element used to meet the PNEU infection criterion occurred for the first time within the 7-day Infection Window Period.

Ventilator: A device to assist or control respiration 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 pneumonia (VAP): A pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, 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 PNEU/VAP event (see Date of Event). See Exception of Location Attribution below.

Exception to Location of Attribution:

Transfer Rule: If the date of event for a PNEU/VAP is on the date of transfer or the next day, the infection is attributed to the transferring/discharging location. If the patient was in multiple locations within the transfer rule time frame, attribute the infection to the original location initiating the transfer. 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. The criteria for PNEU are met and the date of event is the day following the transfer. 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. The criteria for a PNEU are met and the date of event is the day of transfer. 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). The patient meets the criteria for a PNEU and the date of event is 4 days post transfer. This is reported to NHSN as a VAP for the PICU.

General Comments Applicable to All Pneumonia Specific Site Criteria:

- Physician's diagnosis of pneumonia alone is not an acceptable criterion for POA (present on admission) or HAI (healthcare-associated) pneumonia.
- Although specific criteria are included for infants and children and immunocompromised patients, all patients may meet any of the other pneumonia specific site criteria.
- Pneumonia due to gross aspiration (for example, in the setting of intubation in the field, emergency department, or operating room) that meets the PNEU/VAP definition with a date of event during the HAI timeframe is considered healthcare-associated (HAI).
- 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, follow the Repeat Infection Timeframe (RIT) guidance found in [Chapter 2](#).
- Excluded organisms and culture results that cannot be used to meet the PNEU/VAP definition are as follows:
 1. "Normal respiratory flora," "normal oral flora," "mixed respiratory flora," "mixed oral flora," "altered oral flora" or other similar results indicating isolation of commensal flora of the oral cavity or upper respiratory tract
 2. The following organisms unless isolated from cultures of lung tissue or pleural fluid
 - i. *Candida* species* or yeast not otherwise specified
 - ii. coagulase-negative *Staphylococcus* species
 - iii. *Enterococcus* species

**Candida* species isolated from sputum or endotracheal aspirate specimen combined with a matching blood culture can be used to satisfy the PNEU3 definition.



3. Additionally, because organisms belonging to the following genera are typically causes of community-associated respiratory infections and are rarely or are not known to be causes of healthcare-associated infections, they are also excluded, and cannot be used to meet the PNEU/VAP definition when isolated from any eligible specimen type (to include lung and pleural fluid): *Blastomyces*, *Histoplasma*, *Coccidioides*, *Paracoccidioides*, *Cryptococcus* and *Pneumocystis*.

- Abbreviations used in the PNEU laboratory criteria:

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

Reporting Instructions:

- There is a hierarchy of specific categories within the major site pneumonia. If the patient meets criteria for more than one specific site during the infection window period or the RIT, 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.
- Secondary bloodstream infections can only be reported for PNU2 and PNU3 specific events.
- Report concurrent LUNG (e.g., abscess or empyema) and PNEU with at least one matching organism(s) as PNEU.
- Lung abscess or empyema without pneumonia is classified as LUNG



Table 1: Specific Site Algorithms for Clinically Defined Pneumonia (PNU1)

Imaging Test Evidence	Signs/Symptoms/Laboratory
<p>Two or more serial chest imaging test results with at least one of the following^{1,2}:</p> <ul style="list-style-type: none"> • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤ 1 year old <p>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 imaging test result is acceptable.¹</p>	<p>For ANY PATIENT, at least one of the following:</p> <ul style="list-style-type: none"> • Fever ($>38.0^{\circ}\text{C}$ or $>100.4^{\circ}\text{F}$) • Leukopenia (<4000 WBC/mm^3) or leukocytosis ($\geq 12,000$ WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognized cause <p>And at least two of the following:</p> <ul style="list-style-type: none"> • New onset of purulent sputum³ or change in character of sputum⁴, or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, or tachypnea⁵ • Rales⁶ or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations (e.g., $\text{PaO}_2/\text{FiO}_2 \leq 240$)⁷, increased oxygen requirements, or increased ventilator demand)
	<p>ALTERNATE CRITERIA, for infants ≤ 1 year old:</p> <p>Worsening gas exchange (e.g., O_2 desaturations [e.g. pulse oximetry $<94\%$], increased oxygen requirements, or increased ventilator demand)</p> <p>And at least three of the following:</p> <ul style="list-style-type: none"> • Temperature instability • Leukopenia (<4000 WBC/mm^3) or leukocytosis ($\geq 15,000$ WBC/mm^3) and left shift ($\geq 10\%$ band forms) • New onset of purulent sputum³ or change in character of sputum⁴, or increased respiratory secretions or increased suctioning requirements • Apnea, tachypnea⁵, nasal flaring with retraction of chest wall or nasal flaring with grunting • Wheezing, rales⁶, or rhonchi • Cough • Bradycardia (<100 beats/min) or tachycardia (>170 beats/min)
	<p>ALTERNATE CRITERIA, for child >1 year old or ≤ 12 years old, at least three of the following:</p> <ul style="list-style-type: none"> • Fever ($>38.0^{\circ}\text{C}$ or $>100.4^{\circ}\text{F}$) or hypothermia ($<36.0^{\circ}\text{C}$ or $<96.8^{\circ}\text{F}$) • Leukopenia (<4000 WBC/mm^3) or leukocytosis ($\geq 15,000$ WBC/mm^3) • New onset of purulent sputum³ or change in character of sputum⁴, or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, apnea, or tachypnea⁵. • Rales⁶ or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., pulse oximetry $<94\%$], increased oxygen requirements, or increased ventilator demand)



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

Imaging Test Evidence	Signs/Symptoms	Laboratory
<p>Two or more serial chest imaging test results with at least one of the following^{1,2}:</p> <ul style="list-style-type: none"> • New or progressive <u>and</u> persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤ 1 year old <p>Note: In patients <i>without</i> underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), <u>one definitive</u> chest imaging test result is acceptable.¹</p>	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Fever ($>38.0^{\circ}\text{C}$ or $>100.4^{\circ}\text{F}$) • Leukopenia (<4000 WBC/mm^3) or leukocytosis ($\geq 12,000$ WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognized cause <p>And at least one of the following:</p> <ul style="list-style-type: none"> • New onset of purulent sputum³ or change in character of sputum⁴, or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea or tachypnea⁵ • Rales⁶ or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., $\text{PaO}_2/\text{FiO}_2 \leq 240$]⁷, increased oxygen requirements, or increased ventilator demand) 	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Positive growth in blood culture⁸ not related to another source of infection • Positive growth in culture of pleural fluid² • Positive quantitative culture⁹ from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing) • $\geq 5\%$ BAL-obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram's stain) • Positive quantitative culture⁹ of lung tissue • Histopathologic exam shows at least one of the following evidences of pneumonia: <ul style="list-style-type: none"> ○ Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli ○ Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae



Table 3: Specific Site Algorithms for Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings (PNU2)

Imaging Test Evidence	Signs/Symptoms	Laboratory
<p>Two or more serial chest imaging test results with at least one of the following^{1,2}:</p> <ul style="list-style-type: none"> • New or progressive <u>and</u> persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤ 1 year old <p>Note: In patients <i>without</i> underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), <u>one definitive</u> chest imaging test result is acceptable.¹</p>	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Fever ($>38.0^{\circ}\text{C}$ or $>100.4^{\circ}\text{F}$) • Leukopenia (<4000 WBC/mm^3) <u>or</u> leukocytosis ($\geq 12,000$ WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognized cause <p>And at least one of the following:</p> <ul style="list-style-type: none"> • New onset of purulent sputum³ or change in character of sputum⁴, or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough or dyspnea, or tachypnea⁵ • Rales⁶ or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., $\text{PaO}_2/\text{FiO}_2 \leq 240$]⁷, increased oxygen requirements, or increased ventilator demand) 	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Positive culture of virus, <i>Legionella</i> or <i>Chlamydia</i> from respiratory secretions • Positive non culture diagnostic laboratory test of respiratory secretions or tissue for virus, <i>Bordetella</i>, <i>Chlamydia</i>, <i>Mycoplasma</i>, <i>Legionella</i> (e.g., EIA, FAMA, shell vial assay, PCR, micro-IF) • Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, <i>Chlamydia</i>) • Fourfold rise in <i>Legionella pneumophila</i> serogroup 1 antibody titer to $\geq 1:128$ in paired acute and convalescent sera by indirect IFA. • Detection of <i>L. pneumophila</i> serogroup 1 antigens in urine by RIA or EIA



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

Imaging Test Evidence	Signs/Symptoms	Laboratory
<p>Two or more serial chest imaging test results with at least one of the following^{1,2}:</p> <ul style="list-style-type: none"> • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old <p>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 imaging test result is acceptable.¹</p>	<p>Patient who is immunocompromised (see definition in footnote ¹⁰ has at least one of the following:</p> <ul style="list-style-type: none"> • 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 sputum³, or change in character of sputum⁴, or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, or tachypnea⁵ • Rales⁶ or bronchial breath sounds • Worsening gas exchange (e.g., O₂ desaturations [e.g., PaO₂/FiO₂ ≤240]⁷, increased oxygen requirements, or increased ventilator demand) • Hemoptysis • Pleuritic chest pain 	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Matching positive blood and sputum or endotracheal aspirate cultures with <i>Candida</i> spp.^{11,12} • Evidence of fungi from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing) from one of the following: <ul style="list-style-type: none"> – Direct microscopic exam – Positive culture of fungi – Non-culture diagnostic laboratory test <p>Any of the following from:</p> <p>LABORATORY CRITERIA DEFINED UNDER PNU2</p>



Figure 1: Pneumonia Flow Diagram for Patients of Any Age

Facility ID# _____ Event # _____ Event Date ____/____/____

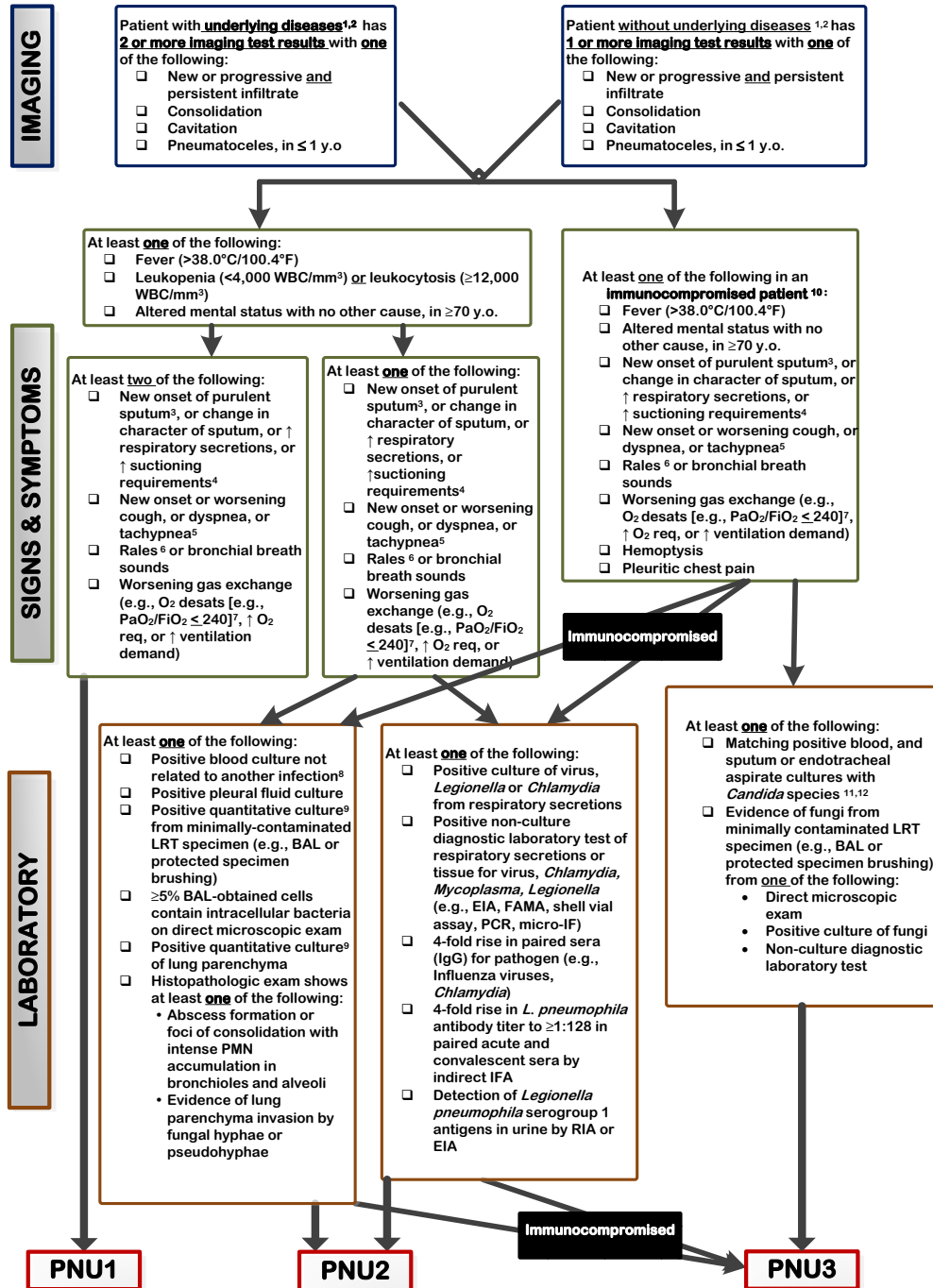
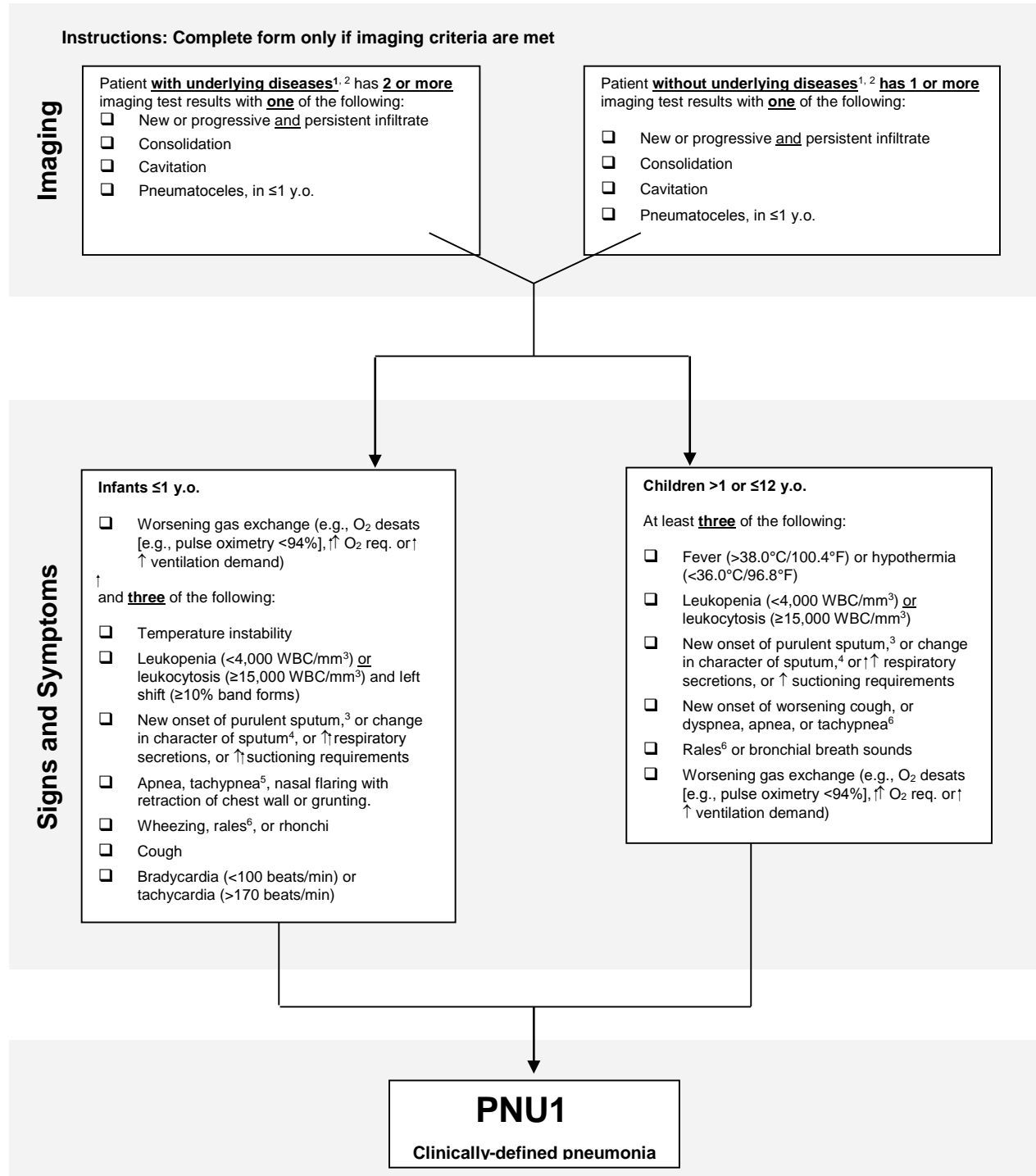




Figure 2: Pneumonia Flow Diagram, Alternative Criteria for Infants and Children

Facility ID# _____ Event # _____ Event Date ___/___/___





Footnotes to Algorithms and Flow Diagrams:

1. Occasionally, in non-ventilated patients, the diagnosis of healthcare-associated pneumonia may be quite clear on the basis of symptoms, signs, and a single definitive chest imaging test result. However, in patients with pulmonary or cardiac disease (e.g., interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other non-infectious conditions (e.g., pulmonary edema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest imaging test results must be examined to help separate infectious from non-infectious pulmonary processes. To help confirm difficult cases, it may be useful to review multiple imaging test results spanning over several calendar days. 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.
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.
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 (e.g., “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 (e.g., “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: heavy, 4+, or ≥ 25 neutrophils per low power field (lpf) [x100], AND rare, occasional, few, 1+ or 2+, or ≤ 10 squamous epithelial cells per lpf [x100] [19].
My laboratory reports <u>only</u> 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 (i.e., heavy, 4+, or ≥ 25 neutrophils per lpf [x100]).
My laboratory uses different reporting thresholds for neutrophils and squamous epithelial cells (e.g., 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 (e.g., “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. Coagulase-negative *Staphylococcus* species, *Enterococcus* species and *Candida* species or yeast not otherwise specified that are cultured from blood cannot be deemed secondary to a PNEU, unless the organism was also cultured 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. *Candida* species isolated from sputum or endotracheal aspirate specimen combined with a matching blood culture can be used to satisfy the PNU3 definition for immunocompromised patients.



9. Refer to threshold values for cultured specimens with growth of eligible pathogens. ([Table 5](#)).

Note: a sputum and endotracheal aspirate are not minimally- contaminated specimens and therefore, organisms isolated from these specimens do not meet the laboratory criteria for PNU2.

Because they are an indication of commensal flora of the oral cavity or upper respiratory tract, the following organisms can only be used to meet PNEU definitions when isolated from pleural fluid obtained during thoracentesis or initial placement of chest tube (not from an indwelling chest tube) or lung tissue:

- Coagulase-negative *Staphylococcus* species
- *Enterococcus* species
- *Candida* species or yeast not otherwise specified. *Candida* species combined with a matching blood culture can be used to meet the PNU3 definition.

10. Immunocompromised patients include those with neutropenia (absolute neutrophil count or total white blood cell count (WBC) $<500/\text{mm}^3$), leukemia, lymphoma, HIV with CD4 count <200 , or splenectomy; those who are early post-transplant, are on cytotoxic chemotherapy, or are on high dose steroids (e.g., $>40\text{mg}$ of prednisone or its equivalent ($>160\text{mg}$ hydrocortisone, $>32\text{mg}$ methylprednisolone, $>6\text{mg}$ dexamethasone, $>200\text{mg}$ cortisone) daily for $>2\text{weeks}$).

11. Cultures of blood and sputum or endotracheal aspirate 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. If quantitative culture results from minimally-contaminated LRT specimen are available, refer to criteria that include such specific laboratory findings.

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



<u>Specimen collection/technique</u>	<u>Values</u> [†]
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

CFU = colony forming units
g = gram
ml = milliliter

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

† 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” growth, or 2+, 3+ or 4+ growth is considered to correspond.

Numerator Data: The *Pneumonia (PNEU)* form ([CDC 57.111](#)) is used to collect and report each VAP that is identified during the month selected for surveillance. The [Instructions for Completion of Pneumonia \(PNEU\) form](#) contains brief instructions for collection and entry of each data element on the form. The pneumonia form includes patient demographic information and information on whether or not mechanically-assisted ventilation was present. Additional data include the specific criteria met for identifying pneumonia, whether the patient developed a secondary bloodstream infection, whether the patient died, the organisms isolated from cultures, and the organisms’ antimicrobial susceptibilities.

Reporting Instruction:



If no VAPs are identified during the month of surveillance, the “*Report No Events*” box must be checked on the appropriate denominator summary screen, e.g., Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC), etc.

Denominator Data: Device days and patient days are used for denominators (see [Key Terms](#) chapter). Ventilator days, which are the number of patients managed with a ventilatory device, are collected daily, at the same time each day, according to the chosen location using the appropriate form (CDC [57.116](#), [57.117](#), and [57.118](#)). These daily counts are summed and only the total for the month is entered into NHSN. Ventilator days and patient days are collected for each of the locations where VAP is monitored. When denominator data are available from electronic sources (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, validated for a minimum of three months.

Data Analyses: The VAP rate per 1000 ventilator days is calculated by dividing the number of VAPs by the number of ventilator days and multiplying the result by 1000. The Ventilator Utilization Ratio is calculated by dividing the number of ventilator days by the number of patient days. These calculations will be performed separately for the different types of ICUs, SCAs, and other locations in the institution.

The Standardized Infection Ratio ([SIR](#)⁴) is another measure of VAP incidence that can be calculated by dividing the number of observed infections by the number of predicted infections. The number of predicted infections can be calculated using VAP rates from a standard population during a baseline time period, which represents a standard population’s VAP experience.⁵

Note: The SIR should be calculated only if the number of expected HAIs (numExp) is ≥ 1 in order to enforce a minimum precision criterion

Note: The VAP SIR is not available from within the NHSN application, but can be calculated using the methods described above.

While the VAP SIR can be calculated for single locations, the measure also allows you to summarize your data by multiple locations, adjusting for differences in the incidence of infection among the location types. For example, you can calculate one VAP SIR adjusting for all locations reported. Similarly, you can calculate one VAP SIR for all oncology locations in your facility.

Descriptive analysis options of numerator and denominator data are available in the NHSN application, such as line listings, frequency tables, and bar and pie charts. VAP rates and run charts are also available. Guides on using NHSN analysis features are available from: <http://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html>.



References:

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- ³Centers for Disease Control and Prevention. Guidelines for preventing health-care-associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. *MMWR* 2004; 53(No. RR-3).
- ⁴Your guide to the Standardized Infection Ratio (SIR). October 2010.
http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf
- ⁵ Edwards, JR., Peterson, KD., Mu, Y., et al. National Healthcare Safety Network (NHSN) Report: Data Summary for 2006 through 2008, issued December 2009. *American Journal of Infection Control* 37: (2009):783-805. Available at:
<http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF>.



Instructions for Completion of Pneumonia (PNEU) Form (CDC 57.111)

Data Field	Instructions for Data Collection
Facility ID	The NHSN-assigned facility ID will be auto entered by the computer.
Event #	Event ID number will be auto entered by the computer.
Patient ID	Required. Enter the alphanumeric patient ID number. This is the patient identifier assigned by the hospital and may consist of any combination of numbers and/or letters.
Social Security #	Optional. Enter the 9-digit numeric patient Social Security Number.
Secondary ID	Optional. Enter the alphanumeric ID number assigned by the facility.
Medicare #	Conditionally required. Enter the patient's Medicare number for all events reported as part of a CMS Quality Reporting Program.
Patient name	Optional. Enter the last, first, and middle name of the patient.
Gender	Required. Check Female, Male, or Other to indicate the gender of the patient.
Date of birth	Required. Record the date of the patient birth using this format: MM/DD/YYYY.
Ethnicity	Optional. Specify if the patient is either Hispanic or Latino, or Not Hispanic or Not Latino.
Race	Optional. Specify one or more of the choices below to identify the patient's race: American Indian/Alaska Native Asian Black or African American Native Hawaiian/Other Pacific Islander White
Event type	Required. PNEU.
Date of event	Required. The date of event is the date when the <u>first</u> element used to meet the PNEU infection criterion occurred for the first time, during the Infection Window Period. Enter date of this event using this format: MM/DD/YYYY. Note: If a device has been pulled on the first day of the month in a location where there are no other device days in that month, and a device-associated infection develops after the device is pulled, attribute the infection to the previous month.
Post-procedure PNEU	Optional. Check Y if this event occurred after an NHSN- defined procedure but before discharge from the facility, otherwise check N.
Date of procedure	Conditionally required. If Post-procedure PNEU = Y, then enter the date the procedure was done.



<p>NHSN procedure code</p>	<p>Conditionally required. Answer this question only if this patient developed the PNEU during the same admission as an operative procedure. Enter the appropriate NHSN procedure code.</p> <p>Note: A PNEU cannot be “linked” to an operative procedure unless that procedure has already been added to NHSN. If the procedure was previously added, and the “Link to Procedure” button is clicked, the fields pertaining to the operation will be auto entered.</p>
<p>ICD-9-CM procedure code</p>	<p>Optional. The ICD-9-CM code may be entered here instead of (or in addition to) the NHSN Procedure Code. If the ICD-9-CM code is entered, the NHSN code will be auto entered by the computer. If the NHSN code is entered first, you will have the option to select the appropriate ICD-9-CM code. In either case, it is optional to select the ICD-9-CM code. Only those ICD-9-CM codes identified in Table 1 of the Surgical Site Infection Event protocol are allowed.</p> <p>Note: ICD-10-CM/PCS codes will replace ICD-9-CM codes on October 1, 2015 however NHSN will not have the ability to receive these codes until the January 2016 release.</p> <p>The NHSN guidance for entry of surgical denominator data for the last quarter of 2015 data is to enter the NHSN Procedure Code (e.g. COLO or HYST) but do not enter any ICD-10-CM/PCS codes associated with the procedure.</p>
<p>MDRO Infection Surveillance</p>	<p>Required. Enter “Yes”, if the pathogen is being followed for Infection Surveillance in the MDRO/CDI Module in that location as part of your Monthly Reporting Plan: MRSA, MSSA (MRSA/MSSA), VRE, CephR-<i>Klebsiella</i>, CRE (<i>E. coli</i>, <i>Klebsiella pneumoniae</i>, <i>Klebsiella oxytoca</i>, or <i>Enterobacter</i>), MDR-<i>Acinetobacter</i>, or <i>C. difficile</i>.</p> <p>If the pathogen for this infection happens to be an MDRO but your facility is not following the Infection Surveillance in the MDRO/CDI Module in your Monthly Reporting Plan, answer “No” to this question.</p>
<p>Location</p>	<p>Required. Enter the inpatient location to which the patient was assigned on the date of the PNEU event. If the PNEU occurs on the day of transfer/discharge or the next day, indicate the transferring/ discharging location, not the current location of the patient, in accordance with the Transfer Rule (see Key Terms section).</p>
<p>Date admitted to facility</p>	<p>Required. Enter date patient admitted to an inpatient location using this format: MM/DD/YYYY.</p> <ul style="list-style-type: none"> When determining a patient’s admission dates to both the facility and specific inpatient location, the NHSN user must take into account all such days, including any days spent in an inpatient



	<p>location as an “observation” patient before being officially admitted as an inpatient to the facility, as these days contribute to exposure risk. Therefore, all such days are included in the counts of admissions and patient days for the facility and specific location, and facility and admission dates must be moved back to the first day spent in the inpatient location.</p> <ul style="list-style-type: none"> • When reporting a PNEU which occurs on the day of or day after discharge use the previous date of admission as admission date.
<p>Risk Factors</p> <p style="padding-left: 40px;">Ventilator</p> <p style="padding-left: 40px;">Birth weight</p>	<p>Required. Check Y if the patient with PNEU had a device to assist or control respiration through a tracheostomy or by endotracheal intubation that had been in place for more than two calendar days on the date of the event inclusive of the weaning period, otherwise check N. Date of device insertion = Day 1.</p> <p>Optional. For <i>off-plan</i> reporting in a NICU patient, enter the patient’s birth weight in grams, <u>not</u> the weight on the date of event.</p>
Location of device insertion	Optional. Enter the patient location where the intubation and ventilation procedure was performed
Date of device insertion	Optional. Enter the date the intubation and ventilation procedure was performed.
Event Details: PNEU Specific event	Required. Check one: Clinically Defined Pneumonia (PNU1), Pneumonia with specific laboratory findings (PNU2), or Pneumonia in immunocompromised patients (PNU3), whichever criteria are met for this event.
Event Details: Specify criteria used	Required. Check each of the elements that were used to identify the specific type of PNEU being reported..
Event Details: Secondary bloodstream infection	<p>Required. Check Y if there is a culture-confirmed bloodstream infection (BSI) and a related PNEU, otherwise check N. For detailed instructions on identifying whether a blood culture represents a secondary BSI, refer to the Secondary BSI Guide (Appendix 1) of the BSI Event protocol.</p> <p>Note: Secondary BSI is N if the specific event is PNU1</p>
Event Details: Died	Required. Check Y if patient died during the hospitalization, otherwise check N.
Event Details: PNEU contributed to death	Conditionally required. If the patient died, check Y if such evidence is available (e.g., death/discharge note, autopsy report, etc.) otherwise check N.
Event Details: Discharge date	Optional. Date patient discharged from facility.
Event Details: Pathogens identified	Required. Enter Y if Pathogen Identified, N otherwise; if Yes, specify organism.



	<p>Note: Pathogens identified defaults to N if the specific event is PNU1</p>
<p>Pathogen # for specified Gram-positive Organisms, Gram-negative Organisms, Fungal Organisms, or Other Organisms</p>	<p>Up to three pathogens may be reported. If multiple pathogens are identified, enter the pathogen judged to be the most important cause of infection as #1, the next most as #2, and the least as #3 (usually this order will be indicated on the laboratory report). If secondary BSI pathogens are entered, they should be entered only after site-specific pathogens are entered.. If the species is not given on the lab report or is not found on the NHSN organism list, then select the “spp” choice for the genus (e.g., <i>Bacillus natto</i> is not on the list so would be reported as <i>Bacillus</i> spp.).</p>
<p>Antimicrobial agent and susceptibility results</p>	<p>Conditionally required if Pathogen Identified = Y.</p> <ul style="list-style-type: none"> • For those organisms shown on the back of an event form, susceptibility results are required only for the agents listed. • For organisms that are not listed on the back of an event form, the entry of susceptibility results is optional. <p>Circle the pathogen’s susceptibility result using the codes on the event forms.</p> <p>For each box listing several drugs of the same class, at least one drug susceptibility must be recorded.</p>
<p>Custom Fields</p>	<p>Optional. Up to 50 fields may be customized for local or group use in any combination of the following formats: date (MM/DD/YYYY), numeric, or alphanumeric.</p> <p>Note: Each Custom Field must be set up in the Facility/Custom Options section of the application before the field can be selected for use.</p>
<p>Comments</p>	<p>Optional. Enter any information on the event.</p>