

2022 NHSN Ventilator-Associated Event (VAE) Checklist

Ventilator-Associated Event (VAE) Summary		
Criterion	Criterion Met	Date of Event (DOE)
VAC	<input type="checkbox"/>	
IVAC	<input type="checkbox"/>	
PVAP	<input type="checkbox"/>	
<p>Please refer to Chapter 10 Ventilator-Associated Event (VAE) of the Patient Safety Manual for additional information.</p>		

Documentation Review Checklist			
Ventilator Associated Event (VAE)			
Ventilator-Associated Condition (VAC)			
Element	Element Met	Date	
Patient has at least <i>one</i> of the following:			
• Baseline period of stability* on the ventilator	<input type="checkbox"/>		
• Baseline period of improvement* on the ventilator	<input type="checkbox"/>		
AND immediately following a period of stability or improvement (as above), patient has at least <i>one</i> of the following indicators of worsening oxygenation:			
1. Increase in daily minimum** FiO ₂ of ≥ 0.20 (20 points) over daily minimum FiO ₂ of the first day in the baseline period, sustained for ≥ 2 calendar days	<input type="checkbox"/>		
2. Increase in daily minimum** PEEP values of ≥ 3 cm H ₂ O [†] over daily minimum PEEP of the first day in the baseline period, sustained for ≥ 2 calendar days	<input type="checkbox"/>		
<p>Note: *Stability or improvement is defined by ≥ 2 calendar days of stable or decreasing daily minimum FiO₂ or PEEP values. The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO₂. **Daily minimum defined by lowest value of FiO₂ or PEEP during a calendar day that is maintained for > 1 hour. †Daily minimum PEEP values of 0-5 cm H₂O are considered equivalent for the purposes of VAE surveillance.</p>			
<p>Comments/Notes:</p>			



Ventilator Associated Event (VAE)

Infection-related Ventilator-Associated Complication (IVAC)

Element	Element Met	Date
Patient must meet VAC to be eligible for IVAC	<input type="checkbox"/>	
On or after calendar day 3 of mechanical ventilation (MV) and within 2 calendar days before or after the onset of worsening oxygenation, the patient meets <i>both</i> of the following:		
Patient has <i>one</i> of the following:		
• Temperature > 38°C (>100.4°F)	<input type="checkbox"/>	
• Temperature < 36°C (<96.8°F)	<input type="checkbox"/>	
• White blood cell count ≥ 12,000 cells/mm ³	<input type="checkbox"/>	
• White blood cell count ≤ 4,000 cells/mm ³	<input type="checkbox"/>	
<u>AND</u> Patient meets <i>all</i> of the following:		
• A new antimicrobial agent(s)* is started	<input type="checkbox"/>	
• The new antimicrobial agent(s)** is continued for ≥ 4 qualifying antimicrobial days (QAD)	<input type="checkbox"/>	
<p>Note: <i>*The agent is considered new for the purposes of this definition if it was NOT given to the patient on either of the 2 days preceding the current start date.</i> <i>**See table titled "List of Antimicrobial Agents Eligible for IVAC, PVAP"</i></p>		
Comments/Notes:		



Ventilator Associated Event (VAE)

Possible Ventilator-Associated Pneumonia (PVAP)

Element	Element Met	Date
Patient must meet VAC and IVAC to be eligible for PVAP	<input type="checkbox"/>	
AND Patient must meet one of following criteria on or after calendar day 3 of MV and within 2 calendar days before or after the onset of worsening oxygenation (Refer to VAE Protocol for organisms excluded from meeting PVAP):		
1. Criterion 1: Positive culture of one of the following specimens, meeting quantitative or semi-quantitative [†] thresholds as outlined in protocol, <u>without</u> requirement for purulent respiratory secretions:		
• Endotracheal aspirate, $\geq 10^5$ CFU/ml or corresponding semi-quantitative result	<input type="checkbox"/>	
• Bronchoalveolar lavage, $\geq 10^4$ CFU/ml or corresponding semi-quantitative result	<input type="checkbox"/>	
• Lung tissue, $\geq 10^4$ CFU/g or corresponding semi-quantitative result	<input type="checkbox"/>	
• Protected specimen brush, $\geq 10^3$ CFU/ml or corresponding semi-quantitative result	<input type="checkbox"/>	
2. Criterion 2: Purulent respiratory secretions (defined as secretions from the lungs, bronchi, or trachea that contain ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field [lpf, x100]) [†] PLUS organism identified from one of the following specimens (to include qualitative culture, or quantitative/semi-quantitative culture without sufficient growth to meet Criterion 1):		
• Sputum	<input type="checkbox"/>	
• Endotracheal aspirate	<input type="checkbox"/>	
• Bronchoalveolar lavage	<input type="checkbox"/>	
• Lung tissue	<input type="checkbox"/>	
• Protected specimen brush	<input type="checkbox"/>	
3. Criterion 3: One of the following positive tests:		
• Organism identified from pleural fluid (where specimen was obtained during thoracentesis or within 24 hours of chest tube placement; pleural fluid specimens collected after a chest tube is repositioned or from a chest tube in place > 24 hours are not eligible for PVAP)	<input type="checkbox"/>	
• Lung histopathology, defined as: 1) abscess formation or foci of consolidation with intense neutrophil accumulation in bronchioles and alveoli; 2) evidence of lung parenchyma invasion by fungi (hyphae, pseudohyphae or yeast forms); 3) evidence of infection with the viral pathogens listed below based on results of immunohistochemical assays, cytology, or microscopy performed on lung tissue	<input type="checkbox"/>	
• Diagnostic test for <i>Legionella</i> species	<input type="checkbox"/>	
• Diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus	<input type="checkbox"/>	
Note: <i>†If the laboratory reports semi-quantitative results, those results must correspond to the quantitative thresholds. Refer to Table 2 and Table 3.</i>		
Comments/Notes:		

Table 2: Instructions for using the purulent respiratory secretions criterion, based on laboratory reporting of respiratory secretion direct examination results.

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 <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 (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.

REPORTING INSTRUCTIONS (additional guidance may be found in the FAQs in the [VAE Protocol](#)):

- Conducting in-plan VAE surveillance means assessing patients for the presence of ALL events included in the algorithm—from VAC to IVAC to PVAP. At this time, a unit conducting in-plan VAE surveillance cannot decide, for example, that only surveillance for VAC (and not for IVAC or PVAP) will be performed.
- There is a hierarchy of definitions within VAE:
 - If a patient meets criteria for VAC and IVAC, report as IVAC.
 - If a patient meets criteria for VAC, IVAC, and PVAP, report PVAP.
- Do not upgrade an event using findings that occur outside the VAE Window Period.
- If the date of event (date of onset of worsening oxygenation) is on or after the date of documentation of evidence of consent AND the patient is being supported for organ donation purposes, the event should not be reported as a VAE.
- Pathogens are not reported for VAC or IVAC events.
- Secondary BSIs are not reported for VAC or IVAC events (see FAQ no. 11 in the [VAE Protocol](#)).
- Pathogens may be reported for PVAP events, provided they are isolated or identified from appropriate specimen types according to the requirements of the algorithm and are NOT on the list of excluded organisms and culture or non-culture based microbiologic testing method results:
 - Excluded organisms and culture or non-culture based microbiologic testing method results that cannot be used to meet the PVAP definition are as follows:
 - “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
 - Any *Candida* species or yeast not otherwise specified; any coagulase-negative *Staphylococcus* species; and any *Enterococcus* species, when identified from sputum, endotracheal aspirates, bronchoalveolar lavage, or protected specimen brushings specimens. These organisms can be reported as PVAP pathogens if identified from lung tissue or pleural fluid (where specimen was obtained during thoracentesis or within 24 hours of chest tube placement; pleural fluid specimens collected after a chest tube is repositioned or from a chest tube in place > 24 hours are not eligible for PVAP).
 - 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 PVAP definition when isolated from any eligible specimen type (to include lung tissue and pleural fluid): *Blastomyces*, *Histoplasma*, *Coccidioides*, *Paracoccidioides*, *Cryptococcus*, and *Pneumocystis*.
- There are three criteria that can be used to meet the PVAP definition:
 - Criterion 1: Positive culture meeting specific quantitative or semi-quantitative threshold ([Table 3](#));
 - Criterion 2: Purulent respiratory secretions AND identification of organisms NOT meeting the quantitative or semi-quantitative thresholds specified in [Table 3](#);
 - Criterion 3: One of the following:
 - Organisms identified from pleural fluid specimen (where specimen was obtained during thoracentesis or within 24 hours of chest tube placement; pleural fluid specimens collected after a chest tube is repositioned or from a chest tube in place > 24 hours are not eligible for PVAP)
 - Positive lung histopathology
 - Lower respiratory specimen cytology findings suggestive of infection
 - Positive diagnostic test for *Legionella* species or selected respiratory viruses.
- See [Table 3](#) for the required quantitative culture thresholds meeting the PVAP definition (Criterion 1). Note that if your laboratory reports semi-quantitative culture results, you should check with your laboratory to confirm that semi-quantitative results match the quantitative thresholds noted in Table 3 (see FAQ no. 24 in the [VAE Protocol](#)).

Table 3: Threshold values for cultured specimens used in the PVAP definition

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

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

*Or corresponding semi-quantitative result.

- Secondary BSIs may be reported for PVAP events, provided that at least one organism identified from the blood matches an organism isolated from an appropriate respiratory tract specimen (including respiratory secretions, pleural fluid, and lung tissue). The respiratory tract specimen must have been collected on or after the 3rd day of mechanical ventilation and within 2 calendar days before or after the day of onset of worsening oxygenation to be considered as a criterion for meeting the PVAP definition. In addition, the organisms identified from blood must have been collected during the 14-day event period, where day 1 is the day of onset of worsening oxygenation (see FAQ no. 13 in the [VAE Protocol](#)).
 - In cases where PVAP is met with only the histopathology criterion and no culture or non-culture based testing is performed on an eligible respiratory specimen, and there is also a positive blood specimen a secondary BSI is not reported.
 - In cases where a culture or non-culture based testing of respiratory secretions, pleural fluid or lung tissue is performed and does not identify an organism that matches an organism identified from blood, a secondary BSI is not reported.
 - A matching organism is defined as one of the following:
 1. If genus and species are identified in both specimens, they must be the same.
 - a. Example: A blood specimen resulted with *Enterobacter cloacae* and a BAL specimen resulted with *Enterobacter cloacae* are matching organisms.
 - b. Example: A blood specimen resulted with *Enterobacter cloacae* and a BAL specimen resulted with *Enterobacter agglomerans* are NOT matching organisms as the species are different.
 2. If the organism is less definitively identified in one specimen than the other, the lesser identified organism must be identified to at least the genus level and at that level the organisms must be the same.
 - a. Example: A BAL resulted with *Pseudomonas spp.* and a blood specimen resulted with *Pseudomonas aeruginosa* are considered a match at the genus level and therefore the BSI can be reported as secondary BSI to VAE
Exception: In cases where an organism is identified only as “yeast” or “yeast not otherwise specified”, the organism can be considered a match to other yeasts, when collected during the required timeframe, whether more fully identified or not.
 - b. Example: A blood specimen reported as *Candida albicans* and a lung tissue resulted with yeast not otherwise specified are considered to have matching organisms. In this example the two organisms are considered matching organisms because the organisms are complementary (specifically *Candida* is a type of yeast). NOTE: This exception is limited to yeast. It does not apply to identification of organisms as Gram positive cocci, Gram negative rods, etc.
NOTE: Any *Candida* species or yeast not otherwise specified, any coagulase-negative *Staphylococcus* species, and any *Enterococcus* species identified from blood cannot be deemed secondary to a PVAP, unless the organism was also identified from pleural fluid or lung tissue.

List of Antimicrobial Agents Eligible for IVAC, PVAP

Antimicrobial Agent	Antimicrobial Agent (cont.)	Antimicrobial Agent (cont.)
AMIKACIN	CLINDAMYCIN	NAFCILLIN
AMPHOTERICIN B	COLISTIMETHATE	OMADACYCLINE
AMPHOTERICIN B LIPOSOMAL	DALBAVANCIN	ORITAVANCIN
AMPICILLIN	DELAFLOXACIN	OSELTAMIVAR
AMPICILLIN/SULBACTAM	DOXYCYCLINE	OXACILLIN
ANIDULAFUNGIN	ERAVACYCLINE	PENICILLIN G
AZITHROMYCIN	ERTAPENEM	PERAMIVIR
AZTREONAM	FLUCONAZOLE	PIPERACILLIN/TAZOBACTAM
BALOXAVIR MARBOXIL	FOSFOMYCIN	PLAZOMICIN
CASPOFUNGIN	GEMIFLOXACIN	POLYMYXIN B
CEFAZOLIN	GENTAMICIN	POSACONAZOLE
CEFEPIME	IMIPENEM/CILASTATIN	QUINUPRISTIN/DALFOPRISTIN
CEFIDEROCOL	IMIPENEM/CILASTATIN/RELEBACTAM	REMDESIVIR
CEFOTAXIME	ISAVUCONAZONIUM	RIFAMPIN
CEFOTETAN	ITRACONAZOLE	SULFAMETHOXAZOLE/TRIMETHOPRIM
CEFOXITIN	LEFAMULIN	TEDIZOLID
CEFTAROLINE	LEVOFLOXACIN	TELAVANCIN
CEFTAZIDIME	LINEZOLID	TETRACYCLINE
CEFTAZIDIME/AVIBACTAM	MEROPENEM	TIGECYCLINE
CEFTOLOZANE/TAZOBACTAM	MEROPENEM/VABORBACTAM	TOBRAMYCIN
CEFTRIAZONE	METRONIDAZOLE	VANCOMYCIN (IV ONLY)
CEFUROXIME	MICAFUNGIN	VORICONAZOLE
CIPROFLOXACIN	MINOCYCLINE	ZANAMIVIR
CLARITHROMYCIN	MOXIFLOXACIN	