Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**APRV**	If a patient is receiving mechanical ventilator support using Airway Pressure Release Ventilation (APRV) or a related type of mechanical ventilation intermittently (i.e., for less than an entire calendar day), how do I determine the daily minimum FiO2 and PEEP values? Do I totally disregard PEEP?	You would only disregard PEEP values on calendar days when the patient was mechanically ventilated using APRV or a related type of mechanical ventilation for the entire calendar day (i.e. from midnight through 11:59 pm). On calendar days when the patient was on APRV for the entire day, you will not record a daily minimum PEEP—you will enter "Not applicable" in your worksheet column for daily minimum PEEP for that particular day. Likewise, when using the online VAE Calculator, do not enter a daily minimum PEEP value on days when the patient was on APRV for the entire calendar day. Leave the PEEP field in the VAE Calculator empty/blank for these days. Note that while patients are mechanically ventilated using APRV or a related strategy (including modes such as BiLevel, Bi Vent, BiPhasic, PCV+, and DuoPAP), they are not excluded from VAE surveillance—but when assessing these patients for VAE, you will use only FiO2 data to identify periods of stabilization or improvement and worsening. In some cases, patients may be mechanically ventilated using APRV or a related strategy for a portion of a calendar day, but not for the entire calendar day. In these instances, you should look at all FiO2 data recorded for the entire calendar day when selecting the daily minimum FiO2, and you should look at the portion of the calendar day when the patient was NOT on APRV or a related mechanical ventilation (strategy) to select the daily minimum PEEP. In other words, when recording the daily minimum PEEP for a patient who spent part of the day on APRV and part of the day on a conventional type of mechanical ventilation (e.g., Assist Control Ventilation, Intermittent Mandatory Ventilation, etc.), you will review PEEP values just from the portion of the day when the patient was on a conventional type of mechanical ventilation. For example, on January 1 a patient is switched from conventional mechanical ventilation at 11:00 am to APRV. The patient stays on APRV until January 2 at 11 pm, when he is switched back to conventional mechanical ventilation. You will review the FiO2 data from the entire day on January 1 and January 2, and the PEEP data that were recorded for the period from midnight to 10:59 am on January 1 (since the patient was on conventional mechanical ventilation during this time) and from 11:00 pm to 11:59 pm on January 2 (since the patient was back on conventional mechanical ventilation at this time). You will be able to assign a daily minimum PEEP for each of these days, based on the time spent on conventional mechanical ventilation, and a daily minimum FiO2, based on each entire calendar day, and review both PEEP and FiO2 data to determine whether there is a VAE. Here is another example: On January 1 a patient is switched from conventional mechanical ventilation at 11:00 am to APRV. The patient stays on APRV all day on January 2, and on January 3 until 11 pm, when he is switched back to conventional mechanical ventilation. In this example, you will (as above) have PEEP data to review for January 1 and for January 3, based on the amount of time the patient was on conventional mechanical ventilation. But because the patient was on APRV all day on January 2, the reality is that you will need to rely on the FiO2 to determine whether there is a VAE during that period of days (because there is a gap in PEEP data, you'd have to start over looking for a baseline period in PEEP on January 3).

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Excluded Ventilator Modes**	I know patients on high frequency ventilation (HFV) and extracorporeal life support (ECLS, such as ECMO) are excluded from VAE surveillance—but what if they are on HFV or ECLS for part (but not all) of a calendar day? How do I determine when such patients are eligible for inclusion in VAE surveillance?	In some cases, patients may be on HFV or ECLS for a portion of a calendar day, but not for the entire calendar day. In these instances, the patient is eligible for inclusion in VAE surveillance during the portion of the calendar day when the patient was being mechanically ventilated using a conventional type of mechanical ventilation (not HFV) and was not on ECLS. You should review the FiO2 and PEEP data recorded for the portion of the calendar day when the patient was NOT on HFV or ECLS to select the daily minimum FiO2 and PEEP. Once the patient has been switched to HFV or placed on ECLS, he/she is no longer included in VAE surveillance. On calendar days when the patient was on HFV or ECLS for the entire day (i.e., midnight to 11:59 pm), you will not record a daily minimum FiO2 or PEEP—you will enter "Not applicable" or "Not eligible for surveillance" in your worksheet column for daily minimum FiO2 and PEEP for that particular day. Once the patient has been switched back from HFV to a conventional type of mechanical ventilation, or once the patient is no longer on ECLS, VAE surveillance may resume. If the patient has been on HFV or ECLS for one or more calendar days (such that there is a gap in recording of the daily minimum FiO2 and PEEP), then you will essentially need to start over with VAE surveillance and identify a baseline period of stability or improvement on the ventilator before you can detect a VAE. For example, if the patient was on conventional mechanical ventilation on January 10 until 10:00 am, switched to HFV at 10:00 am, remained on HFV till 1:00 pm on January 11 and was then placed back on a conventional mode of mechanical ventilation, you would be able to evaluate the PEEP and FiO2 values recorded for the patient from midnight to 10:00 am on January 10 (period on conventional mechanical ventilation) and from 1:00 pm to 11:59 pm on January 11 (period on conventional mechanical ventilation) when looking for VAEs. If a patient was on HFV for the entire calendar day on January 10 and January 11, then you would exclude them from VAE surveillance. Once the patient returns to conventional mechanical ventilation for some portion of each calendar day you could again begin to include in VAE surveillance and once again begin daily assessment for the minimum daily PEEP and FiO2 values obtained when the patient was on the conventional mode of ventilation. Upon return to conventional mode of mechanical ventilation, note that a new episode of mechanical ventilation would begin. To meet VAE during this new episode of mechanical ventilation, the patient would have to have at least 2 days of stability or improvement and at least 2 days of worsening oxygenation on the ventilator identified.
	VAE and Weaning	Are patients included in VAE surveillance during periods of time when they are undergoing weaning/mechanical ventilation liberation trials?	Yes. As long as the patient is receiving support from a mechanical ventilator and is eligible for VAE surveillance, then you should review all FiO2 and PEEP data that are recorded each day to identify the daily minimum FiO2 and PEEP values—including FiO2 and PEEP values that are recorded during periods of time when the patient is undergoing spontaneous awakening or spontaneous breathing trials (or other forms of weaning from mechanical ventilation). The only periods of time that are not taken into consideration when identifying the daily minimum PEEP and FiO2 values are times when the patient is on HFV, ECLS, or times when the patient is not receiving mechanical ventilation support (e.g., a T-piece trial, or a trach collar trial, where the patient continues to receive supplemental oxygen, but is receiving no additional support from the mechanical ventilator). Keep in mind, too, that during periods of time when the patient is being mechanically-ventilated using APRV or a related strategy (see the APRV FAQ), you will only review FiO2 data (not PEEP).

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Temperature and WBC**	I have a patient who meets the VAC definition, and I am now assessing the patient's information to see if the IVAC definition is met. The patient has had an elevated temperature (or white blood cell count) since admission. The patient also has an elevated temperature (or white blood cell count) during the VAE Window Period. Since the abnormal temperature (or white blood cell count) was present on admission, do I still count the abnormal temperature (or white blood cell count) during the VAE Window Period when determining if the patient meets the IVAC definition?	Yes. As long as there is an abnormal temperature (> 38 °C or < 36°C) or white blood cell count (≥ 12,000 cells/mm3 or ≤ 4,000 cells/mm3) documented during the VAE Window Period, it should be used in determining whether the patient meets the IVAC definition or not, regardless of whether the temperature or white blood cell count was also present on admission.
Jan-14	**QADs**	What happens if a patient dies before ≥ 4 Qualifying Antimicrobial Days (QADs) are met? If the antimicrobial agent was intended to be given such that the requirement for ≥4 QADs would have been satisfied, do I report an IVAC or VAC?	No. In a patient who has met the VAC definition and has additionally met the temperature and/or WBC requirement for IVAC but dies prior to meeting the requirement for ≥4 Qualifying Antimicrobial Days, the IVAC criteria are not fulfilled. In this instance a VAC (not an IVAC) would be reported to NHSN.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

<table>
<tr><th>Date</th><th>Topic</th><th>Question</th><th>Response</th></tr>
<tr><td>Jan-14</td><td>Minimum Daily Values</td><td>What is meant by “minimum daily value” when referring to PEEP and FiO2?</td><td>Definitions of “minimum daily PEEP” and “minimum daily FiO2” have been added to the VAE Protocol. Please refer to the VAE Protocol for details. There will be multiple FiO2 and PEEP measurements documented each calendar day on mechanically ventilated patients. These FiO2 and PEEP values are typically recorded in the paper or electronic medical record, on respiratory therapy and/or nursing flow sheets, in the section of the flow sheet that pertains to respiratory status/mechanical ventilation. Please note that the VAE surveillance protocol specifies to use the daily minimum FiO2 and PEEP values when assessing for both the period of stability or improvement and the period that indicates worsening oxygenation. From the multiple readings that will be documented each calendar day, you will identify the minimum (i.e., lowest) value for that calendar day that is maintained for at least 1 hour. To determine whether a PEEP or FiO2 setting has been maintained for at least 1 hour, you will need multiple consecutive recordings of that PEEP or FiO2 setting. For example, if PEEP/FiO2 settings are monitored and recorded every 15 minutes, you would need 5 consecutive recordings of a particular PEEP/FiO2 setting for that setting to be identified as the daily minimum setting (e.g., at 09:00, 09:15, 09:30, 09:45 and 10:00). If PEEP/FiO2 settings are monitored and recorded every 30 minutes, you would need 3 consecutive recordings (e.g., at 09:00, 09:30 and 10:00). If PEEP/FiO2 settings are monitored and recorded hourly, you would need 2 consecutive recordings (e.g., at 09:00 and 10:00).
You are not comparing values that occur within a calendar day to determine stability, improvement or worsening. Operationally you will always be collecting/recording/evaluating those values, at the earliest, one day in arrears so that you can allow for the values obtained for the full 24 hour calendar day to be assessed.</td></tr>
<tr><td></td><td></td><td></td><td>Consider the following examples:

Example # 1 (Mechanical ventilator data from a single day, May 10):

<table>
<tr><td></td><td>12 am</td><td>3 am</td><td>6 am</td><td>9 am</td><td>12 pm</td><td>3 pm</td><td>6 pm</td><td>9 pm</td></tr>
<tr><td>MV mode</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td></tr>
<tr><td>FiO2</td><td>1.0</td><td>1.0</td><td>0.80</td><td>0.80</td><td>0.80</td><td>0.75</td><td>0.80</td><td>0.70</td></tr>
<tr><td>PEEP</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>5</td><td>5</td><td>8</td></tr>
</table>

In this example, the daily minimum FiO2 for May 10 would be recorded as 0.70 (70%), and the daily minimum PEEP would be recorded as 5 cmH2O. Note that the daily minimum FiO2 may have been documented at a different time than the daily minimum PEEP (as in the example above).

Example # 2 (Mechanical ventilator data from a single day, May 11):

<table>
<tr><td></td><td>12 am</td><td>1:30 am</td><td>2 am</td><td>3 am</td><td>6 am</td><td>9 am</td><td>12pm</td><td>3pm</td><td>6pm</td><td>9 pm</td></tr>
<tr><td>MV mode</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td><td>ACV</td></tr>
<tr><td>FiO2</td><td>0.80</td><td>0.60</td><td>0.80</td><td>0.80</td><td>0.80</td><td>0.75</td><td>0.75</td><td>0.75</td><td>0.70</td><td>0.70</td></tr>
<tr><td>PEEP</td><td>5</td><td>5</td><td>10</td><td>10</td><td>10</td><td>5</td><td>5</td><td>5</td><td>5</td><td>5</td></tr>
</table>

In this example, the daily minimum FiO2 for May 11 would be recorded as 0.70 (70%), and the daily minimum PEEP would be recorded as 5 cmH2O. Note that even though the lowest recorded FiO2 value for the day was 0.60, it was only recorded at a single time point, with an interval indicating that it was not maintained for at least 1 hour.

You will compare the minimum daily value from day to day within the individual parameters (PEEP and FiO2), looking for a period of stabilization or improvement in PEEP followed by a period of worsening oxygenation in PEEP, or a period of stabilization or improvement in FiO2 followed by a period of worsening in FiO2.</td></tr>
</table>

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**VAE and Pneumonia POA**	If a patient is admitted with community-acquired pneumonia requiring intubation and mechanical ventilation, is that patient exempt from VAE surveillance until the pneumonia has resolved?	No. Tracking of daily minimum PEEP and FiO2 should be done for all patients who are eligible for VAE surveillance in units in which in-plan VAE surveillance is being conducted, regardless of the reason for which the patient was admitted.
Jan-14	**Lower Respiratory Tract Events**	I am confused about the different lower respiratory tract events that have definitions in NHSN—PNEU, LRI and VAE. Can you explain to me how these do (or do not) relate to one another?	We know this can be an area of confusion. Revising surveillance definitions for respiratory events is a big undertaking, because we need to consider events occurring in patients on mechanical ventilation and events occurring in patients NOT on mechanical ventilation, and we have to consider events that occur in adults and events that occur in neonates and in children. The first area that we decided to work on is respiratory events in adult patients on mechanical ventilation. We still have a lot of work to do to revamp surveillance for respiratory events occurring in patients not on mechanical ventilation, and respiratory events occurring in neonates and children. Let's review what is available for in-plan or off-plan surveillance of lower respiratory tract events in NHSN. Keep in mind that "in-plan" surveillance means that you have committed to following the NHSN surveillance protocol for that particular event in your NHSN monthly reporting plan. "Off-plan" surveillance is surveillance that is done because you/your facility has decided to track a particular event for internal use. Data that are entered into NHSN "off-plan" are not used or reported on in NSHN annual reports or other NHSN publications. A facility makes no commitment to follow the protocol for "off-plan" events. *What lower respiratory tract event surveillance can be done "in-plan"* ? 1) VAE: In 2014, the VAE algorithm is ONLY applicable to mechanically-ventilated patients housed in adult inpatient units (regardless of the age of the patient). Pediatric and neonatal units are excluded from VAE surveillance (even in circumstances where a pediatric unit may occasionally care for patients who are 18 years of age and older). VAE is currently the ONLY in-plan respiratory event surveillance for adult locations. 2) Pediatric VAP: Pediatric VAP surveillance using the PNEU/VAP definitions continues to be available for in-plan surveillance of VAP in pediatric locations (regardless of the age of the patient). This is currently the ONLY in-plan respiratory event surveillance for pediatric locations. In 2014, in-plan surveillance for ventilator-associated PNEU is no longer available for neonatal patients. *What lower respiratory tract event surveillance can be done "off-plan"* ? 1) VAE: VAE surveillance can also be done "off-plan" in adult patient locations. 2) VAP: Surveillance for PNEU/VAP (using the "old" definitions) continues to be available for off-plan surveillance in all mechanically-ventilated patients (adults, children or neonates). NHSN encourages facilities to switch to VAE for surveillance in adult patient locations. 3) PNEU: Surveillance for PNEU (using the "old" definitions) is available for off-plan surveillance in non-mechanically-ventilated adults, children and neonates. 4) LRI: Surveillance for non-pneumonia lower respiratory infections (using the BRON and LUNG definitions) continues to be available in 2014 for off-plan surveillance in adults, children and neonates. *Can I conduct surveillance for VAE and PNEU and LRI in the same unit* ? In theory, yes, although you may wish to consider whether this is the best use of resources. For example, it is possible for a particular unit to be conducting simultaneous in-plan VAE surveillance and off-plan PNEU and LRI surveillance. These are considered separate events; in other words, detection of one type of event (such as a VAE) in a particular patient would have no bearing on the conduct of surveillance for the other event types in the same patient. Keep in mind that there are specific reporting requirements for the older definitions, PNEU and LRI, such that patients with radiographic evidence of pneumonia are not eligible to meet the LRI-BRON definition, and patients who meet a PNEU definition as well as the LRI-LUNG definition are to be reported as PNEU. Patients who meet a VAE definition and a PNEU definition, or a VAE definition and an LRI definition, would have both events entered into NHSN in units where surveillance for multiple respiratory events is occurring.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Secondary BSI and Lower Respiratory Tract Events**	How do I identify a secondary BSI for lower respiratory events in 2014 in ventilated patients in adult locations?	We understand this is an area of confusion. Please note, for purposes of NHSN, for a bloodstream infection to be determined to be secondary to a primary infection site, (i.e. related to an infection at another site, such that primary site of infection may have seeded the bloodstream secondarily) the patient must first meet one of the NHSN site specific definitions. For example, for a secondary bloodstream infection to be deemed secondary to PNEU, one of the NHSN PNEU definitions must be met first. You cannot call a bloodstream infection secondary to PNEU based on a clinical diagnosis of pneumonia. To figure out whether a positive blood culture can be called a secondary bloodstream infection (BSI) related to a lower respiratory tract event, consider the following steps: 1) Does the patient meet any of the VAE definitions? a. If the Possible or Probable VAP definition is met, then you may attribute the blood culture to the VAE (as a secondary BSI) IF the blood culture meets the various requirements as outlined in the VAE protocol—the organism isolated from blood must match an organism isolated from the respiratory tract culture used in meeting the Possible or Probable VAP definition AND the blood culture must be collected during the 14-day VAE event period. b. If only the VAC or IVAC definition is met, then the positive blood culture CANNOT be secondary to the VAE (because recall that according to the VAE surveillance protocol, BSIs cannot be deemed secondary to VAC or to IVAC). 2) If the Possible VAP or Probable VAP definition is met, a positive blood culture can either be secondary to the VAE (if it meets the VAE secondary BSI criteria outlined in the protocol and summarized in 1a, above), or secondary to one of the other major HAI sites (e.g., if another Chapter 17 definition is met, including PNEU or LRI), or it may be a primary BSI/CLABSI. 3) If only the VAC or IVAC definition is met, or if no VAE definition is met, then the positive blood culture can be evaluated to see if it is secondary to any of the major sites as defined in Chapter 17—including PNEU or LRI. If the patient does not meet one of these other definitions, the BSI may need to be reported as a primary BSI/CLABSI.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**PEEP Protocol Change**	Why was the VAE surveillance protocol changed so that PEEP values between 0 cmH20 and 5 cmH20 are now considered equivalent for surveillance purposes, and how will I know if I meet VAC definitions when I have PEEP values in that range?	After receiving feedback from users citing circumstances where VAC was detected in certain clinical scenarios or circumstances as a result of usual processes of care or ventilator management strategy differences between providers rather than an actual clinical worsening of the patient, the VAE Surveillance Definition Working Group re-convened and reached the conclusion that a modification to the protocol was indicated. This change means that patients with a daily minimum PEEP in the range of 0-5 cmH2O must have an increase in the daily minimum PEEP to at least 8 cmH20, sustained at or above 8 cmH20 for at least 2 calendar days, in order for the VAC definition to be met. In essence, think of values between 0-5 as all being equal to 5, and therefore an increase to 8 cm H20 is necessary to satisfy the required increase in daily minimum PEEP ≥ 3 cmH20 over the daily minimum PEEP in the baseline period. Consider the following examples (VAE window periods shaded in gray):

Example #1:

MV Day	PEEP	FiO2	Under the **"old"** VAE protocol, what is the VAE determination?	Under the **new** VAE protocol, what is the VAE determination?
1	0	30		
2	0	35		
3	5	30	VAC	(no VAC)
4	5	40		
5	5	40		
6	8	40		**VAC**
7	8	40		
8	8	40		
9	6	40		
10	6	40		

Example #2:

MV Day	PEEP	FiO2	Under the **"old"** VAE protocol, what is the VAE determination?	Under the **new** VAE protocol, what is the VAE determination?
1	0	30		
2	0	35		
3	3	30	VAC	(no VAC)
4	3	40		
5	4	40		
6	8	40		**VAC**
7	8	40		
8	8	40		
9	6	40		
10	6	40		

Frequently Asked Questions: Ventilator-Associated Event (VAE)

<table>
<tr><th>Date</th><th>Topic</th><th>Question</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td>Example #3:
<table>
<tr><th>MV Day</th><th>PEEP</th><th>FiO2</th><th>Under the “old” VAE protocol, what is the VAE determination?</th><th>Under the new VAE protocol, what is the VAE determination?</th></tr>
<tr><td>1</td><td>3</td><td>30</td><td></td><td></td></tr>
<tr><td>2</td><td>5</td><td>35</td><td></td><td></td></tr>
<tr><td>3</td><td>3</td><td>30</td><td></td><td></td></tr>
<tr><td>4</td><td>5</td><td>40</td><td></td><td></td></tr>
<tr><td>5</td><td>3</td><td>40</td><td></td><td></td></tr>
<tr><td>6</td><td>8</td><td>40</td><td>VAC</td><td>VAC</td></tr>
<tr><td>7</td><td>8</td><td>40</td><td></td><td></td></tr>
<tr><td>8</td><td>8</td><td>40</td><td></td><td></td></tr>
<tr><td>9</td><td>6</td><td>40</td><td></td><td></td></tr>
<tr><td>10</td><td>6</td><td>40</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td><td>Example #4:
<table>
<tr><th>MV Day</th><th>PEEP</th><th>FiO2</th><th>Under the “old” VAE protocol, what is the VAE determination?</th><th>Under the new VAE protocol, what is the VAE determination?</th></tr>
<tr><td>1</td><td>0</td><td>30</td><td></td><td></td></tr>
<tr><td>2</td><td>0</td><td>35</td><td></td><td></td></tr>
<tr><td>3</td><td>0</td><td>30</td><td></td><td></td></tr>
<tr><td>4</td><td>5</td><td>40</td><td>VAC</td><td>(no VAC)</td></tr>
<tr><td>5</td><td>5</td><td>40</td><td></td><td></td></tr>
<tr><td>6</td><td>6</td><td>40</td><td></td><td></td></tr>
<tr><td>7</td><td>5</td><td>40</td><td></td><td></td></tr>
<tr><td>8</td><td>10</td><td>40</td><td></td><td>VAC</td></tr>
<tr><td>9</td><td>10</td><td>40</td><td></td><td></td></tr>
<tr><td>10</td><td>8</td><td>40</td><td></td><td></td></tr>
<tr><td>11</td><td>8</td><td>40</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Jan-14</td><td>Culture Results</td><td>Can you explain exactly what qualitative, semi-quantitative and quantitative mean in the VAE criteria that are based on purulent respiratory secretions and respiratory culture results (in the Possible and Probable VAP definitions)?</td><td>For purposes of the VAE surveillance protocol, qualitative refers to identification of an organism or cells without a quantity descriptor: for example, “Staphylococcus aureus present” or “white blood cells seen”. Semi-quantitative refers to a text description of the amount or quantity of organism or cells present, without a specific numeric value: for example, “occasional,” “few,” “moderate,” “many,” “heavy” or 1+, 2+, 3+, 4+. An example of semi-quantitative reporting would be a result indicating “many Pseudomonas aeruginosa” or “few epithelial cells.” Quantitative refers to a specific numeric description of the amount of organism or cells present: for example, 10^5 cfu/ml Klebsiella pneumoniae .</td></tr>
</table>

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Specimen**	If I have a culture result from a specimen that was labeled and reported by the laboratory as a "bronchial wash," can this specimen be used to satisfy the Possible or Probable VAP definition criteria?	Yes. For the purposes of VAE surveillance, a "bronchial wash" is considered the same type of specimen as a bronchoalveolar lavage (BAL).
Jan-14	**VAE Upgrades**	If the VAC definition is met, and later within the 14 day event period other criteria that will help to satisfy IVAC, Possible VAP or Probable VAP definitions become available, should I upgrade the VAC to the specific event that is met using the new information?	Per the VAE surveillance protocol, only one VAE can be reported during each 14 day event period (where day 1 is the onset of worsening oxygenation). A previously detected VAE cannot be "upgraded" using information obtained outside of the original VAE window period. Once the VAC definition is met the other criteria needed to satisfy the IVAC, Possible VAP or Probable VAP definitions must all be present within the VAE window period timeframe, according to the protocol. The temperature, white blood cell count, and laboratory test collection dates must occur within the VAE Window Period, and the antimicrobial agent(s) that help to satisfy the ≥ 4 qualifying antimicrobial days (QADs) criterion must be "new" within the VAE window period. Keep in mind that while the antimicrobial agent must be new within the VAE window period, QADs that count toward satisfying the IVAC antimicrobial criterion may occur outside the VAE Window Period. Here is an example: A VAC is detected in a medical ICU patient, with the day of onset of worsening oxygenation occurring on mechanical ventilation (MV) day 10. The VAE window period is therefore determined to be from MV day 8 (2 days before the onset of worsening oxygenation) through MV day 12 (2 days after the onset of worsening oxygenation). The patient has a temperature of 39°C on MV day 10, and is started on a new antimicrobial agent on MV day 11 (with that new agent continued for 7 consecutive days, from MV day 11 through MV days 18). The IVAC definition is therefore met. On MV day 15, a BAL is performed, and it grows 10^5 CFU/ml Pseudomonas aeruginosa. No Gram stain results are available. Because the BAL specimen was collected OUTSIDE of the VAE window period (even though it was collected during the 14 day event period), it cannot be used to upgrade the VAE from an IVAC to a Possible VAP.
Jan-14	**Episode of Mechanical Ventilation**	If a VAE is detected during a first episode of mechanical ventilation, and then the patient is extubated and reintubated later during the 14 day event period (defining a second episode of mechanical ventilation), can a new VAE be identified and reported?	The 14 day event period is to be observed even if a new episode of mechanical ventilation is established during that event period. The 14 day rule is governed by the event date (date of onset of worsening oxygenation), not the date of initiation of mechanical ventilation. So if a patient is removed from mechanical ventilator for one full calendar day or more and is then returned to the ventilator within the 14 day event period, a new VAE cannot be detected or reported until the 14 days have elapsed. When the patient is returned to the ventilator, a new episode of mechanical ventilation would begin, and the mechanical ventilation day count would start over again. The earliest a new VAE could be identified would be day 3 of the new episode. In the example presented in the table below, you will see that there is a VAC detected during the first episode of mechanical ventilation, on hospital day 4. The patient is extubated on hospital day 6, and remains off MV for one full calendar day (hospital day 7). On hospital day 8, the patient is re-intubated, thereby starting a second episode of MV. The patient is observed to meet VAC criteria, with a baseline period of stability or improvement on hospitals days 8 and 9 and a period of worsening on hospitals days 10 and 11—but because the patient is still within the 14 day event period for the VAE detected on hospital day 4, a new VAE cannot be detected or reported.

Hosp Day No.	1	2	3	4	5	6	7	8	9	10	11	12
MV Episode	1	1	1	1	1	1	-	2	2	2	2	2
MV Day No.	1 Intubated at noon	2	3	4	5	6 Extubated at noon	-	1 Re-intubated at 0800	2	3	4	5
VAE Criterion	–	Baseline Day 1	Baseline Day 2	Worsening Day 1	Worsening Day 2		-	Baseline Day 1	Baseline Day 2	Worsening Day 1	Worsening Day 2	
VAE				VAC						NO VAC		
Event Period				1	2	3	4	5	6	7	8	9

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Reporting Requirement**	Is VAE surveillance and reporting mandatory?	We are receiving lots of questions from users about whether they must do VAE surveillance. Please note that whether or not you are required to participate in VAE surveillance depends on whether you have local or state requirements to participate. The CDC/NHSN does not determine what HAIs or other healthcare-associated events you are required to report. VAE is also not currently included in the Centers for Medicare and Medicaid Services' Hospital Inpatient Quality Reporting (IQR) program.
Jan-14	**Benchmarking**	What VAE rates are appropriate for benchmarking or making comparisons between units or facilities?	The rates that are potentially appropriate for these purposes include the overall VAE rate (where the numerator includes all events meeting at least the VAC definition) and what we are calling the "IVAC-plus" rate (where the numerator includes all events meeting at least the IVAC definition). You may find rates of the individual specific sites (e.g., VAC only, IVAC only, Possible VAP only, Probable VAP only, or Possible and Probable VAP combined) useful for internal quality improvement purposes.
Jan-14	**Home Ventilators**	My facility/unit takes care of adult patients who are on home mechanical ventilators, or who are on a BiPAP machine (or other device typically used for providing non-invasive ventilator support) via a tracheostomy tube. These patients are being cared for in units where I am conducting VAE surveillance, and they are otherwise eligible for VAE surveillance (e.g., they are not on extracorporeal life support). Should these patients be included in VAE surveillance?	The first step in determining whether such patients should be included in VAE surveillance is to decide whether the patient is on invasive mechanical ventilation, as defined by the NHSN. The NHSN definition of a ventilator is: "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 (nasal PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP)." Based on this definition, patients on home mechanical ventilators or patients supported by devices typically considered non-invasive ventilatory devices should be included in VAE surveillance if the ventilatory support is administered via an endotracheal or tracheostomy tube, even if the support is administered only for portions of each day (e.g., overnight). Patients receiving non-invasive ventilation (e.g., BiPAP via a face mask or nasal mask) should not be included in VAE surveillance. The second step in determining whether such patients can be included in VAE surveillance is to determine whether the FiO2 or PEEP can be set at a specific level on the home mechanical ventilator or other ventilatory device. Our current understanding is that some brands of home mechanical ventilators and devices typically used for non-invasive ventilation do not have the capability of setting a specific FiO2 or PEEP level. In these circumstances, a patient could not be included in VAE surveillance, because it would not be feasible to assess changes in the set level of FiO2 or PEEP. If the FiO2 or PEEP can be set at a specific value and monitored, then these patients should be included in VAE surveillance. If the patient is switched from a home mechanical ventilator or other device to a critical care unit mechanical ventilator, then they can be included in VAE surveillance at that time (taking into account that a baseline period of stability or improvement will need to be established on the critical care mechanical ventilator).
Jan-14	**Location of Mechanical Ventilation**	Does the field in the NHSN application that is labeled "location of mechanical ventilation" refer to where the patient was placed on mechanical ventilator or where the patient was intubated?	This field should reflect the location where the patient was intubated. So for example, if the patient was intubated by first responder personnel in the field prior to arrival in the facility where mechanical ventilation was eventually initiated, the location chosen should be Mobile Emergency Services/EMS.
Jan-14	**Specimen**	When respiratory secretions are collected from a patient who is eligible for VAE surveillance, and the specimen is labeled and submitted to the microbiology laboratory as a "sputum" specimen, if I know that the patient was intubated at the time the specimen was collected, and the specimen should have been labeled "endotracheal aspirate," should the documentation of the specimen type on the microbiology report be used when making a VAE determination, or can I interpret the result as if it were an endotracheal aspirate?	Specimens may frequently be labeled as "sputum" when they are really "endotracheal aspirates." Making the automatic substitution is not advised. If, however, you can verify with the patient's caregiver that the specimen was indeed an endotracheal aspirate, and also confirm that your microbiology laboratory does not process specimens labeled as "sputum" differently than those labeled as "endotracheal aspirate," the culture result can be utilized to meet the requirements for the Probable VAP definition. Additionally, take the opportunity to address improving specimen labeling.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Secondary BSI Pathogens**	How does one handle the situation where a blood culture meets criteria for being a secondary BSI to a Possible or Probable VAE, but the blood culture is polymicrobial and one or more organisms isolated from that blood culture were not also isolated from an eligible respiratory tract specimen?	When a bloodstream infection is deemed secondary to a Possible or Probable VAP (i.e., BSI diagnosed by blood culture collected during the 14-day VAE event period, with at least one organism from blood matching an organism isolated from an eligible respiratory tract specimen obtained during the VAE window period), organisms isolated from that blood culture that do not match an organism in the eligible respiratory tract specimen MAY be reported as a Possible or Probable VAP pathogen—EXCEPT when they are one of the excluded organisms (Candida or yeast NOS, Enterococcus, coagulase-negative Staphylococcus species). An exception to the excluded organism rule is made when the eligible respiratory tract specimen is pleural fluid or lung tissue. Excluded organisms isolated from positive blood cultures must be accounted for as a secondary bloodstream infection to an infection present on admission, another hospital acquired infection (HAI) or a primary bloodstream infection. Please see the examples below. • NOTE: When multiple, separate blood cultures are positive during the 14-day Possible or Probable VAP event period, ONLY those blood cultures that are positive for at least one organism matching an organism isolated from an eligible respiratory tract specimen obtained during the VAE window period may be considered secondary to the Possible or Probable VAP.
			Example 1 A Possible VAP was detected in a patient in the MICU, with an event date of August 1. The Possible VAP determination was made on the basis of an endotracheal aspirate culture collected on August 2 (within the VAE window period) that was positive for Pseudomonas aeruginosa (PA). On August 9, within the 14-day event period, the patient has a positive blood culture for PA and E. coli (EC). This positive blood culture should be reported as a secondary BSI for the Possible VAP event, because it occurred within the 14-day event period, and because at least one of the pathogens isolated from blood matches an organism isolated from the respiratory tract specimen. Pathogens reported for this Possible VAP should include PA and EC.
			Example 2 A Possible VAP was detected in a patient in the MICU with an event date of August 1. The Possible VAP determination was made on the basis of an endotracheal aspirate culture collected on August 2 (within the VAE window period) that was positive for Pseudomonas aeruginosa (PA) and Candida albicans (CA) On August 9, within the 14-day event period, the patient has a positive blood culture for PA and CA. This positive blood culture should be reported as a secondary BSI for the Possible VAP event, because it occurred within the 14-day event period, and because at least one of the pathogens isolated from blood matches an organism isolated from the respiratory tract specimen. Pathogens reported for this Possible VAP should be limited to PA. CA CANNOT be reported as a pathogen for this VAE because it is an excluded pathogen when isolated from an endotracheal aspirate.
			Example 3 A Possible VAP was detected in a patient in the MICU with an event date of August 1. The Possible VAP determination was made on the basis of a lung biopsy obtained for culture on August 2 (within the VAE window period) that was positive for Pseudomonas aeruginosa (PA) and Candida albicans (CA). On August 9, within the 14-day event period, the patient has a positive blood culture for PA and CA. This positive blood culture should be reported as a secondary BSI for the Possible VAP event, because it occurred within the 14-day event period, and because at least one of the pathogens isolated from blood matches an organism isolated from the respiratory tract specimen. Pathogens reported for this Possible VAP should include PA and CA. CA in this instance CAN be reported as a pathogen for this VAE because it is isolated from a culture of lung tissue.

Frequently Asked Questions: Ventilator-Associated Event (VAE)			
Date	**Topic**	**Question**	**Response**
			Example 4 A Possible VAP was detected in a patient in the MICU with an event date of August 1. The Possible VAP determination was made on the basis of a lung biopsy obtained for culture on August 2 (within the VAE window period) that was positive for Pseudomonas aeruginosa (PA). On August 9, within the 14-day event period, the patient has a positive blood culture for PA and CA. This positive blood culture should be reported as a secondary BSI for the Possible VAP event, because it occurred within the 14-day event period, and because at least one of the pathogens isolated from blood matches an organism isolated from the respiratory tract specimen. Pathogens reported for this Possible VAP should be limited to PA. CA CANNOT be reported as a pathogen for this VAE because it is an excluded pathogen, unless isolated from pleural fluid or lung tissue. The lung tissue culture in this case did NOT grow CA. As an excluded organism, isolated from positive blood culture, CA must be accounted for as a secondary bloodstream infection to an infection present on admission, another hospital acquired infection (HAI) or a primary bloodstream infection.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
Jan-14	**Ventilator Data**	How does one use ventilator data obtained in pre-hospital or Emergency Department (ED) settings, or in other transferring units within the same hospital, or in transferring hospitals, when making VAE determinations?	
		Scenario A: Patient is intubated by the EMS in the field, or is intubated in the ED. FiO2 and PEEP data are available from the time the patient spent in the ED, prior to the patient being transferred to the ICU as an inpatient. Should I use the pre-hospital/ED ventilator data when making my VAE determinations for that patient?	No. Ventilator data that is obtained from patients in the Emergency Department or other pre-hospital/pre-inpatient locations should not be included in VAE surveillance. Therefore, VAE surveillance begins for patients who are intubated in the pre-hospital or ED setting upon transfer to an inpatient location where VAE surveillance is being conducted. Day 1 of ventilator data consists of data collected during the first calendar day of inpatient care.
		Scenario B: Patient is intubated and mechanically ventilated in an inpatient unit where VAE surveillance is not occurring. The patient is transferred to another inpatient unit in the same hospital where VAE surveillance is occurring. Do I use ventilator data from the transferring unit, even though VAE surveillance was not occurring in that unit?	Yes—to an extent. Since the transferring unit is in the same hospital, and since ventilator data from that transferring unit should be readily available, we advise that you go back 2 calendar days prior to transfer and utilize minimum daily PEEP and FiO2 data from the transferring unit to determine whether a VAE has occurred during the first 2 days in the receiving unit. If a VAE is detected with an onset date on calendar day 1 or 2 in the receiving unit, that VAE would be attributable to the transferring unit and so would not be reported (since the transferring unit was not doing VAE surveillance).
		Scenario C: Patient is intubated and mechanically ventilated in an inpatient unit where VAE surveillance IS occurring. The patient is transferred to another inpatient unit in the same hospital where VAE surveillance is also occurring. Do I use ventilator data from the transferring unit, even though VAE surveillance was occurring in that unit?	Yes. When transferring a patient between units that are both participating in VAE surveillance, surveillance should continue in a continuous, ongoing fashion. In other words, if the patient had a VAE in the transferring unit on August 1, and was transferred to the receiving unit on August 4, a new VAE could not be detected in the receiving unit until the 14-day event period for the August 1 VAE had elapsed (so, August 15 in this case).
		Scenario D: Patient is intubated and mechanically ventilated in another hospital or healthcare facility and then transferred to my hospital/facility. It is unknown whether the transferring facility was performing VAE surveillance or not. Should I use ventilator data from the transferring facility (if available) when making my VAE determinations?	When ventilator data are available from a transferring facility, you may use the ventilator data from the 2 calendar days prior to transfer to determine whether a VAE has occurred early in the course of the inpatient stay in your receiving hospital/facility. As in Scenario B, above, if a VAE is detected with onset date on calendar day 1 or 2 in your receiving hospital/facility, the VAE would be attributable to the transferring facility. If no ventilator data are available from the transferring facility, VAE surveillance begins on admission to the receiving facility/unit where VAE surveillance is taking place.

Frequently Asked Questions: Ventilator-Associated Event (VAE)

Date	Topic	Question	Response
		Scenario E: Patient is intubated and mechanically ventilated in another hospital or healthcare facility and then transferred to my hospital/facility. The transferring facility was performing VAE surveillance, and I have been informed that a VAE was detected in the transferring facility five days prior to transfer. Upon arrival in my receiving facility, does the 14-day event period apply, or do I need to "start fresh" with ventilator data available in my facility?	You should "start fresh," although as noted above in Scenario D, you can use ventilator data from the 2 calendar days prior to transfer to determine whether there is a VAE early in the course of hospitalization in the receiving facility that would be attributed back to the transferring facility.
Jan-14	**Minimum Daily Values**	Why was the VAE surveillance protocol changed so that the daily minimum PEEP and FiO2 values must be maintained for at least 1 hour?	In some facilities or units, ventilator data monitoring may occur very frequently (minute to minute, for example). This may lead to difficulties in determining the daily minimum PEEP and FiO2. Additionally, we have received feedback from users expressing concerns that adjustment to ventilator settings that are maintained for a short period of time (but long enough to be documented and therefore used when selecting the daily minimum values) may in some instances falsely establish what appears to be a period of stability, or negate the detection of sustained worsening in oxygenation. This change now requires that the daily minimum PEEP and FiO2 values are to represent the lowest values for the calendar day that were maintained for at least one hour. This means in a unit that is documenting PEEP and FiO2 hourly, there must be two consecutive recordings of the lowest PEEP and FiO2 value (e.g., PEEP=8 cmH2O at 09:00 and 10:00). If documenting every 30 minutes, there must be 3 consecutive recordings (e.g., at 09:30, 10:00 and 10:30). If documenting every 15 minutes, there must be 5 consecutive recordings (e.g., at 09:00, 09:15, 09:30, 09:45, and 10:00). If a unit is documenting PEEP/FiO2 settings less frequently than once per hour, the lowest PEEP/FiO2 setting each calendar day would be selected as the daily minimum PEEP or FiO2 value.
Jan-14	**Antimicrobial Agent Appendix**	Why was the list of eligible antimicrobial agents (Appendix) shortened?	The antimicrobial criterion is one of the required criteria in the Infection-related Ventilator-Associated Complication (IVAC) definition. The IVAC definition was not originally developed to identify respiratory infections alone, and therefore, the list of antimicrobial agents eligible for meeting the IVAC antimicrobial criterion was broad, and included drugs that are not used to treat respiratory infections. This caused concern and confusion among some users—particularly in situations where the "new" antimicrobial agent that resulted in an IVAC determination and then subsequently a Possible or Probable VAP determination was not an agent used to treat a respiratory infection. Possible solutions to this problem were discussed with the VAE Surveillance Definition Working Group. The Working Group felt it was important to find a solution that avoided increasing the complexity of this already complex criterion. Therefore, the decision was made to refine the existing IVAC antimicrobial list by removing selected antimicrobial agents: oral cephalosporins and penicillins, erythromycin and erythromycin/sulfisoxazole, amantadine, rimantadine, chloramphenicol, tinidazole, fidaxomicin, nitrofurantoin, enteral vancomycin, and daptomycin. These are agents that would not be used, or would be unlikely to be used, in treating a lower respiratory infection in a critically ill patient.
Jan-14	**Candida species - excluded pathogens**	When referencing the pathogens that are excluded for meeting possible and probable VAP definition, what does *Candida* species refer to?	This means all *Candida* species—those that have been identified to the species level such as *Candida albicans* , those that are reported as *Candida* species and also to include culture reports that may simply say for example, " many yeast isolated".