Ventilator-Associated Events (VAE) Supplemental Frequently-Asked Questions
July 2013

1. **Why was the VAE surveillance protocol changed so that PEEP values between 0 cmH_20 and 5 cmH_20 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 cmH_2O must have an increase in the daily minimum PEEP to at least 8 cmH_20, sustained at or above 8 cmH_20 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 H_20 is necessary to satisfy the required increase in daily minimum PEEP ≥ 3 cmH_20 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		

Example #3:

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	3	30		
2	5	35		
3	3	30		
4	5	40		
5	3	40		
6	8	40	**VAC**	**VAC**
7	8	40		
8	8	40		
9	6	40		
10	6	40		

Example #4:

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	0	30		
4	5	40	VAC	(no VAC)
5	5	40		
6	6	40		
7	5	40		
8	10	40		**VAC**
9	10	40		
10	8	40		
11	8	40		

2. 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)?

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*.

3. 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).

4. 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.

5. 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**

6. 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.

7. 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.

8. 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 FiO_2 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 FiO_2 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 FiO_2 or PEEP. If the FiO_2 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).

9. 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.

10. 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," but your microbiology laboratory may process specimens labeled as "sputum" differently than those labeled as "endotracheal aspirate." So making the automatic substitution is not advised.
The better option is to take the opportunity to address improving specimen labeling.