

## Ventilator-Associated Events (VAE) Antimicrobial Worksheet Instructions

### What is the purpose of this worksheet?

- This worksheet is designed to help you identify patients who meet the “Infection-related Ventilator-Associated Complication” (IVAC) surveillance definition. Specifically, this tool will help you organize an individual patient’s antimicrobial administration data so that you can determine whether the IVAC antimicrobial criterion is met:

**On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation:**

**A new antimicrobial agent(s)\* is started, and is continued for  $\geq 4$  calendar days.**

### What do I need to know to use this worksheet?

- You need to be familiar with the VAE surveillance definition algorithm and protocol.
- You need access to the patient’s Medication Administration Record (MAR).
- This worksheet is for your own use; information entered into this worksheet is not submitted to the National Healthcare Safety Network/Centers for Disease Control and Prevention.

### What are some terms I need to know to use this worksheet?

- VAE Window Period: This is the period indicated by the light gray shaded area on the worksheet. This period is usually a 5-day period and includes the 2 days before, the day of, and the 2 days after the VAE Event Date (the first day of worsening oxygenation, the day of VAE onset). There is an exception, however, where the VAE Window Period is only 3 or 4 days, as follows:
  - In cases where the VAE Event Date corresponds to mechanical ventilation (MV) Day 3 or Day 4, the window period described above may only be a 3-day or a 4-day window, because it can NOT include any days before the 3<sup>rd</sup> day of MV. For example, if the VAE Event Date is MV Day 3, then the window period includes only the day of VAE onset and the 2 days after VAE onset (because the 2 days before VAE onset are before the 3<sup>rd</sup> day of MV).
- New antimicrobial agent: A new antimicrobial is one that was administered to the patient on or after the 3<sup>rd</sup> MV day AND during the VAE Window Period (the shaded section of the worksheet), AND was NOT administered to the patient in the 2 days preceding the first day of administration during the VAE Window Period. As an example, if an antimicrobial is given on VAE Day 1, which is on or after the 3<sup>rd</sup> day of MV, and was NOT given on VAE Days -1 or -2, the antimicrobial is NEW.

- Qualifying Antimicrobial Day (QAD): A day on which the patient was administered an antimicrobial agent that was determined to be “new” within the VAE Window Period. Four consecutive QADs are needed to meet the IVAC antimicrobial criterion—starting within the VAE Window Period. The 4 consecutive QADs can be met with 4 days of therapy with the same antimicrobial or with 4 days of therapy with multiple antimicrobial agents as long as each antimicrobial was started within the VAE Window Period. Days on which a new antimicrobial agent is administered count as QADs. Days between administrations of a new antimicrobial agent also count as QADs as long as there is a gap of no more than 1 calendar day between administrations of the same agent. For example, if levofloxacin is given on VAE Day 1, has not been given in the 2 preceding calendar days, and is given again on VAE Days 3, 5 and 7, there are 7 QADs—because the days between levofloxacin doses also count as QADs.

What are the steps I need to follow to use this worksheet?

- 1) Make sure that the patient has already met the VAC definition, and that the patient has already met the temperature or white blood cell count criterion of the IVAC definition. *Patients who have not met the VAC definition and who do not have an abnormal temperature or white blood cell count documented during the VAE window period are not eligible for IVAC and do not need further assessment using the VAE surveillance definition algorithm.*
- 2) Make sure you have access to the patient’s MAR. Antimicrobial orders or dispensing information is not sufficient.
- 3) There is a space to record the patient identification at the top of the worksheet, if that is helpful to you. One worksheet should be used for each VAC episode that is identified in each patient.
- 4) Enter the date on which MV was initiated for this patient in the space for “Date of Mechanical Ventilation Initiation.” Keep in mind that an episode of MV is specifically defined in the VAE surveillance protocol.
- 5) Enter the date corresponding to the patient’s VAE Event Date (the day of onset of worsening oxygenation, according to the VAC definition criteria) in the “Date” row of the worksheet, in the cell corresponding to “Event Date: VAE Day 1.”
- 6) Using the VAE Event Date as your reference date, fill in the remainder of the dates in the “Date” row of the worksheet.
- 7) Using the Date of Mechanical Ventilation Initiation as your reference date (and as MV Day 1), fill in the “MV Day” row of the worksheet.
- 8) Use the patient’s MAR to list all antimicrobials that were administered to the patient during the date range included in the worksheet. List these antimicrobials where indicated in the first column of the worksheet. Keep in mind that the VAE surveillance protocol includes an Appendix listing all antimicrobial agents that are eligible for consideration in meeting the IVAC definition. Eligible antimicrobial agents must have been administered via the following routes: intravenous, intramuscular, via the digestive tract, or via the respiratory tract.
- 9) For each antimicrobial listed in the worksheet, put a check or “X” in each cell corresponding to a date on which the antimicrobial was administered to the patient. It is important that you check only those dates on which antimicrobial agents were actually given—antimicrobial order or dispensing information is not sufficient. You do NOT need to know the dose of the antimicrobial or the frequency of administration.

- 10) For each antimicrobial listed in the worksheet, indicate those antimicrobials that meet the definition of a “new” antimicrobial (see above or surveillance protocol for more details) by placing a check or “X” or “Yes” in the appropriate cell in the “New?” column of the worksheet.
- 11) For those antimicrobial agents that are new, look to see if there are any instances in which there are gaps of no more than 1 calendar day between administrations of the same drug. Place a check or “X” in those cells, within the row for that antimicrobial agent. These days also count as QADs.
- 12) Circle those days that are QADs. Remember that 2 or more new antimicrobial agents given to the patient on the same date count as 1 QAD.
- 13) Place a check or “X” or “Yes” in the bottom row of the table, “Qualifying Antimicrobial Days,” to indicate which days have been determined to be QADs.
- 14) Tally up the largest total number of consecutive QADs and enter this number in the “Total consecutive QADs” cell on the bottom right of the worksheet.
- 15) Follow the black arrow to the final item on the worksheet.
  - If the total number of consecutive QADs is 4 or more, the patient has met the IVAC surveillance definition. You should now go on to see if the PVAP definition is met.
  - If the total number of consecutive QADs is less than 4, the patient does not meet the IVAC surveillance definition. A VAC should be reported for this patient.

### EXAMPLE #1: Ventilator-Associated Events (VAE) Antimicrobial Worksheet

Patient ID: \_\_\_\_\_

Date of Mechanical Ventilation (MV) Initiation: *01/10/2013*

VAE Day		-- (-4)	-- (-3)	Baseline (-2)	Baseline (-1)	Event Date: VAE Day 1	2	3	4	5	6	7	8	9	
Date (mm/dd)		<i>01/11</i>	<i>01/12</i>	<i>01/13</i>	<i>01/14</i>	<i>01/15</i>	<i>01/16</i>	<i>01/17</i>	<i>01/18</i>	<i>01/19</i>	<i>01/20</i>	<i>01/21</i>	<i>01/22</i>	<i>01/23</i>	
MV Day (1, 2, 3, etc.)		<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	
List antimicrobials:	New?														
1 <i>vancomycin</i>	<i>Yes</i>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
2 <i>cefepime</i>	<i>Yes</i>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>										
3 <i>ciprofloxacin</i>	<i>Yes</i>						<input checked="" type="checkbox"/>								
4 <i>fluconazole</i>	<i>Yes</i>						<input checked="" type="checkbox"/>								
5															
6		The circle indicates that this day is a QAD													
7															
8															
9															
10															
Qualifying Antimicrobial Days (QADs)				<i>Yes</i>	<i>Yes</i>		<i>Yes</i>	<i>7</i>							

The circle indicates that this day is a QAD

The orange checks indicate days between doses of fluconazole (it is being given every other day)—because there is no more than 1 calendar day between administrations, the intervening days count as QADs.

These QADs don't count—because of the gap between QADs on VAE Day 1

Are there at least 4 consecutive QADs, starting in the VAE Window Period? ←

Yes → meets IVAC, evaluate for PVAP

No → does not meet IVAC, report as VAC

## Example #1 Worksheet Explanation:

### 1) Which of the antimicrobials listed are “new,” and why?

- Vancomycin does not appear to qualify as a new antimicrobial agent if you consider only the dose given on VAE Day -2—because you can see that there was a dose of vancomycin given within the 2 days preceding VAE Day -2. HOWEVER, vancomycin was also given on VAE Day 3, at the end of the VAE Window Period, and NO vancomycin was given during the 2 days preceding VAE Day 3. Therefore, vancomycin does in fact qualify as a new antimicrobial agent, and contributes to 1 Qualifying Antimicrobial Day (QAD). We cannot count any vancomycin given after VAE Day 3, however, because there are gaps of more than 1 calendar day between doses.
- Cefepime qualifies as a new antimicrobial agent; it was first given on VAE Day -2, and was not given in the 2 preceding days. Cefepime contributes to 2 QADs: VAE Day -2 and VAE Day -1.
- Ciprofloxacin qualifies as a new antimicrobial agent; it was only given on VAE Day -1, with no doses in the 2 preceding days. Ciprofloxacin contributes to 1 QAD, VAE Day -1 (which is already a QAD, since cefepime was also given on VAE Day -1).
- Fluconazole qualifies as a new antimicrobial agent; it was given for the first time on VAE Day 2, with no doses in the 2 preceding days. Fluconazole contributes to 7 consecutive QADs—VAE Days 2 through 8. Fluconazole administrations are occurring every other day (indicated by the blue check marks). Because there is a gap of no more than 1 calendar day between fluconazole administrations, we count the intervening days as QADs (those days indicated by the orange check marks).

### 2) How many QADs are there in total?

- Circle each QAD in the worksheet—and then indicate in the bottom row of the table each day that has been determined to be a QAD. In the cell at the far right of this row, indicate the largest total number of consecutive QADs.
- In this example, the total number of QADs (whether consecutive or not) is 9—BUT keep in mind that we cannot count the first 2 QADs, on VAE Days -2 and -1, because these are not consecutive or continuous with the QADs starting on VAE Day 2. The largest total number of consecutive QADs is 7 (VAE Days 2 through 8), meeting the IVAC antimicrobial criterion.

### 3) Does this patient meet the IVAC definition?

- Yes—for the following reasons:
  - We assume that this worksheet is ONLY completed for patients who have already met the VAC definition AND who have an abnormal white blood cell count or temperature, in accordance with the VAE surveillance definition algorithm criteria;
  - The patient has met the IVAC antimicrobial criterion—there are at least 4 consecutive QADs starting within the VAE Window Period.

### 4) What happens next?

- Since this patient has met the IVAC definition, it is now necessary to check for additional laboratory/microbiological information that would meet the PVAP definition criteria. See the surveillance protocol for details.

## EXAMPLE #2: Ventilator-Associated Events (VAE) Antimicrobial Worksheet

Patient ID: \_\_\_\_\_

Date of Mechanical Ventilation (MV) Initiation: *01/10/2013*

VAE Day		-- (-4)	-- (-3)	Baseline (-2)	Baseline (-1)	Event Date: VAE Day 1	2	3	4	5	6	7	8	9	Total consecutive QADs:
Date (mm/dd)		<i>01/11</i>	<i>01/12</i>	<i>01/13</i>	<i>01/14</i>	<i>01/15</i>	<i>01/16</i>	<i>01/17</i>	<i>01/18</i>	<i>01/19</i>	<i>01/20</i>	<i>01/21</i>	<i>01/22</i>	<i>01/23</i>	
MV Day (1, 2, 3, etc.)		<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	
List antimicrobials:	New?														
1 <i>vancomycin</i>	<i>No</i>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
2 <i>ciprofloxacin</i>	<i>Yes</i>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
3 <i>meropenem</i>	<i>No</i>								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
4 <i>cefepime</i>	<i>Yes</i>					<input checked="" type="checkbox"/>									
5															
6															
7															
8															
9															
10															
<b>Qualifying Antimicrobial Days (QADs)</b>							<i>Yes</i>	<i>Yes</i>	<i>Yes</i>						<b>3</b>

The circles indicate days that are QADs

These days of meropenem and vancomycin therapy do not count as QADs—the first doses were started outside of the VAE Window Period.

**Are there at least 4 consecutive QADs, starting in the VAE Window Period?**

- Yes → meets IVAC, evaluate for PVAP
- No → does not meet IVAC, report as VAC



## Example #2 Worksheet Explanation:

### 1) Which of the antimicrobials listed are “new,” and why?

- Ciprofloxacin qualifies as a new antimicrobial agent; it was initially given during the VAE Window Period, on VAE Day 2, with no doses in the 2 preceding days. Ciprofloxacin contributes to 2 QADs, VAE Day 2 and Day 3.
- Vancomycin does not qualify as a new antimicrobial agent, because no doses of vancomycin were administered during the VAE Window Period.
- Meropenem does not qualify as a new antimicrobial agent, because no doses of meropenem were administered during the VAE Window Period.
- Cefepime qualifies as a new antimicrobial agent; it was initially given during the VAE Window Period, on VAE Day 1, with no doses in the 2 preceding days. Cefepime contributes 1 QAD, VAE Day 1

### 2) How many QADs are there in total?

- Circle each QAD in the worksheet—and then indicate in the bottom row of the table each day that has been determined to be a QAD. In the cell at the far right of this row, indicate the largest total number of consecutive QADs.
- In this example, the total number of QADs is 3. Both ciprofloxacin and cefepime QADs are counted as they are consecutive and both agents are started within the VAE Window Period. We cannot count the days of vancomycin and meropenem therapy that occur outside of the VAE Window Period, because no adjoining days of therapy with vancomycin or meropenem (or no days of therapy with gaps of no more than 1 calendar day between administrations of the same agent) occurred during the VAE Window Period.

### 3) Does this patient meet the IVAC definition?

- No—for the following reason:
  - The patient did not have at least 4 consecutive QADs starting within the VAE Window Period.

### 4) What happens next?

- This patient should be reported as having a VAC.