



**VENTILATOR-
ASSOCIATED EVENT
SURVEILLANCE :
A NEW TOOL FOR AN OLD
PROBLEM**

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- Nothing to disclose




VENTILATOR ASSOCIATED EVENT MODULE (VAE)

- Superseded Ventilator-Associated Pneumonia module (for adults)
 - CDC-NHSN 2013 (updated Jan 2015)
 - VICNISS July 2014 (updated July 2015)



WHY CHANGE FROM VAP TO VAE FOR ADULT PATIENTS?

- Subjectivity and complexity of VAP definition
 - Despite VAP definition revision in 2002, interpretation of clinical signs and symptoms was subjective
 - 2011 Working expert party- new definitions
 - More objective/ reproducible as not relying on
 - radiographer's interpretation of chest X-ray findings
 - variable health care wording of reports
 - Designed for data to be abstracted from electronic
- 

VAE- SUMMARY

3 tiered definition algorithm:

- Ventilator-Associated Condition (VAC)
 - VAP, sepsis, ARDS, PE, barotrauma, PO
- Infective Ventilator-Associated Complication (IVAC)
 - An infectious event associated with a deterioration in respiratory function
- Possible Ventilator-Associated Pneumonia (PVAP)

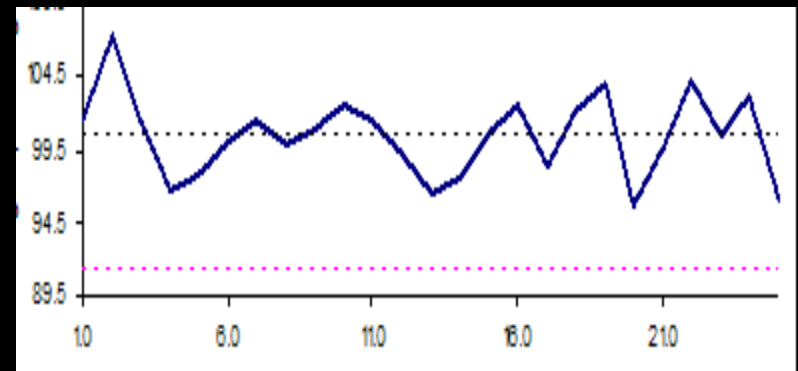
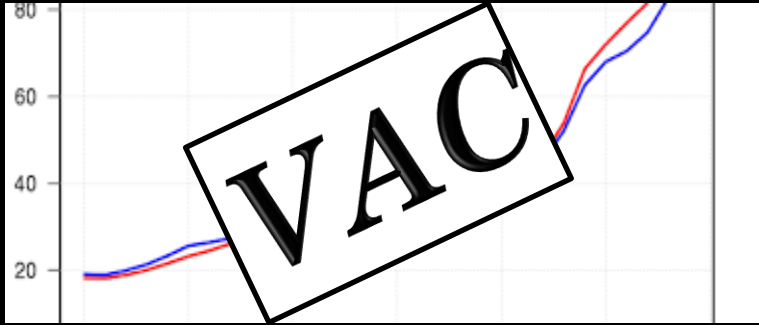


VAE: WHY COLLECT “EVENTS”?

- All tiers VAE associated with:
 - Increased duration of mechanical ventilation
 - Increased ICU and hospital length of stay
 - Mortality MV with acute lung injury 24-60%
- Benchmarking:
 - External (VAC, IVAC)
 - Pay for performance measurements (US)
 - PVAP used internally for quality and safety improvement measures

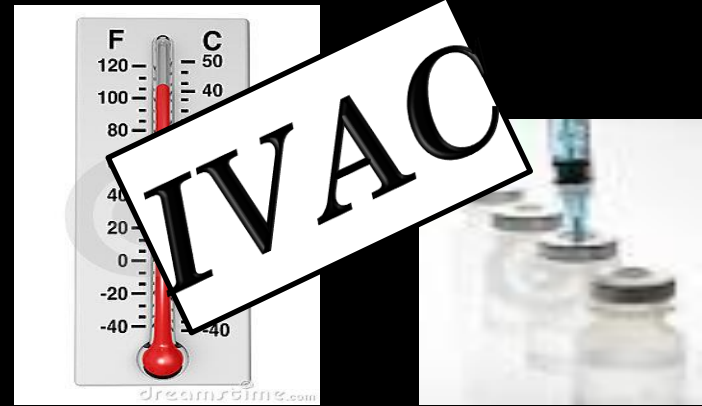


VAE SUMMARY



Period stability

Worsening PEEP or FiO2



Abnormal temp or WCC + antimicrobials



Positive micro



ALFRED VAE SURVEILLANCE

Why did we do the surveillance?

- Data-sharing organisation listed Alfred ICU as > 75th percentile for VAP

Alfred ICU

- 45 bed capacity

Feb- April 2015

- Average 38 patients per day
- Ventilator utilisation ratio 0.43



VAE- WHAT DATA DO WE COLLECT?

- Denominator: all mechanically ventilated patients at a specific time each day
- Data collected:
 - per episode of MV
 - all patients mechanically ventilated > 2days excluding ECMO & HFV
- Collect minimum daily PEEP and FIO2 values



VAC- VENTILATOR-ASSOCIATED CONDITION

- Minimum ≥ 2 calendar days stability or decreasing values

- Worsening $\text{FiO}_2 \geq 0.2$ for ≥ 2 days

Or

- Increase PEEP ≥ 3 for ≥ 2 days (0-5 considered the same value)

→ VAC



INFECTION-RELATED VENTILATOR-ASSOCIATED COMPLICATION (IVAC)

Additional data within the window period:

- Temp $> 38^{\circ}$ or $< 36^{\circ}$

Or

- WCC ≥ 12 or ≤ 4

And

- New antimicrobial agent started and cont for 4 calendar days
 - Started in window period
 - Qualifying antimicrobial (listed)

→ IVAC



POSSIBLE VENTILATOR-ASSOCIATED PNEUMONIA (PVAP)

Additional data one of 3 criteria:


- 1. Positive quantitative or semi-quantitative culture in listed specimens*
- 2. Purulent secretions plus a positive qualitative culture of an organism~
 - Purulent defined as ≥ 25 neutrophils and ≤ 10 squamous cells
- 3. Positive test:
 - Pleural fluid culture (spec described), lung histo (described), Legionella or listed resp viruses

→ PVAP



PVAP

SPECIMENS & ORGANISM EXCLUSIONS

- *Culture:
 - Sputum
 - ET aspirate
 - BAL
 - Lung tissue
 - Protected specimen brushing
 - ~Following organisms are excluded from positive culture results unless in lung tissue:
 - Candida sp
 - CNS sp
 - Enterococcus sp
- 

LIAISE WITH YOUR LAB RE INTERPRETATION CRITERION 2

Qualitative culture with purulent secretions:

- Neutrophils not differentiated from basophils and eosinophils, reported as polymorphs

- Gram stain reports:
 - Cells per low powered field:
 - + = 1-9 cells
 - ++ = 10- 24 cells
 - +++ = ≥ 25 cells

- VAE module does have suggested interpretation of Gm stain reports if hospital lab cannot supply



Ventilator-Associated Event (VAE) Data Collection Worksheet

Patient UR: MT, multiple #s, CHI

Date	Vent Day	Step 1: VAC (change in A or B)		Step 2: IVAC (VAC, plus C or D, and E)				Step 3: PVAP (IVAC, plus F or G or H)							
		A PEEP Min	B FiO ₂ Min	C Temp Min (<36°C)	D Temp Max (>38°C)	E WBC Min (≤4,000)	F WBC Max (≥12,000)	G QAD (✓)	H ^a Meets semi-quant or quant criteria (BAL, PSB, ETA, lung tissue cx, ^{abc} ✓)	I Purulent respiratory secretions ^d AND sputum cx, or cx of BAL, ETA, PSB, lung tissue not meeting the semi-quant or quant criteria ^e (✓)	J Pleural fluid (✓)	K Path (✓)	L Legionella or viral diagnostic (✓)	M VAE (VAC, IVAC, PVAP)	
28/3	1	5	13												
29/3	2	5	13												
30/3	3	5	13												
31/3	4	5	13			1.6*									
1/4	5	5	13			1.4*									
2/4	6	VAC	13	IVAC		1.5*				PVAP					
3/4	7	10*	14		38.2*	2.5		✓*							
4/4	8	10	14		38.2	2.4		✓*							
5/4	9	5	13		38.8			✓*							
6/4	10	extubated						✓*							

Handwritten notes in column H:
 A, Klebsiella oxy, 3+ polys, 1+ squamous
 Stereophomonds 3+ polys 1+ squamous



Ventilator-Associated Event (VAE) Calculator Ver. 3.0

Welcome to the Ventilator-Associated Event Calculator. Version 3.0 operates based upon the currently posted (January 2015) VAE protocol. It is strongly encouraged that you read and study the VAE protocol found [here](#).

- The calculator recognizes PEEP values ≤ 5 and corrects entries according to the VAE protocol prior to making a VAC determination.
- For periods of time where a patient is on APRV or a related type of mechanical ventilation for a full calendar day, a daily minimum PEEP value should not be entered into the calculator (i.e., do not enter zero)
- The calculator finds multiple VAEs per patient as long as they conform to the 14 day rule.

To get started, enter a date below that corresponds to the first day the patient was placed on mechanical ventilation during the mechanical ventilation episode of interest. You may type in a date or use the popup calendar when it appears. You may only enter dates within the past year. If the patient has been on mechanical ventilation for more than one year during the current mechanical ventilation episode, choose a start date that is more recent but is at least 7 days before the period of interest. [more...](#)

Mechanical Ventilation Start Date: (mm/dd/yyyy)

Print

Close



Calculate VAC

Start Over

Go to IVAC

Explain...

A Ventilator-Associated Condition (VAC) based on PEEP values occurred on 4/20/2015

Click on the Go To IVAC button to move to the next part of the protocol or click on the "Explain" button to see how this determination was made.

MV Day	Date	Min. PEEP (cmH ₂ O)	Min. FiO ₂ (30 - 100)	VAE
1	4/16/2015			
2	4/17/2015	7.5	60	
3	4/18/2015	12	40	
4	4/19/2015	12	40	
5	4/20/2015	15	30	VAC
6	4/21/2015	15	30	
7	4/22/2015	15	25	
8	4/23/2015	15	25	
9	4/24/2015			
10	4/25/2015			

Legend: VAE Window VAE Date Qualifying Antimicrobial Day (QAD) Cumulative QAD

Print

Close



Start Over

Calculate IVAC

Explain...

Go to PVAP

An IVAC was found for this patient. Click on the "Go To PVAP" button to go to the next part of the definition or click on the "Explain..." button for an explanation of how this determination was made.

Date	Hide... Min. PEEP (cmH ₂ O)	Hide... Min. FiO ₂ (30 - 100)	VAE	T<36° or T>38°	WBC≤4,000 or WBC≥12,000 cells/mm ³	Add... Remove... PIPERACILLIN/TAZOBACTAM	VANCOMYCIN
4/16/2015				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4/17/2015	7.5	60		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4/18/2015	12	40		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4/19/2015	12	40		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4/20/2015	15	30	IVAC	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4/21/2015	15	30		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4/22/2015	15	25		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4/23/2015	15	25		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4/24/2015				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4/25/2015				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

tor-Associated Event Calculator Ver. 3.0

Now
expe
click

Min. PEEP (cmH ₂ O)	Min. FiO ₂ (30 - 100)	VAE	T<36° or T>38°	WBC
			<input type="checkbox"/>	
7.5	60		<input type="checkbox"/>	
12	40		<input type="checkbox"/>	
12	40		<input checked="" type="checkbox"/>	
15	30	IVAC	<input type="checkbox"/>	
15	30		<input checked="" type="checkbox"/>	
15	25		<input type="checkbox"/>	

PVAP Determination

For the IVAC on **4/20/2015**, did the patient have documentation of any of the following findings during the VAE Window: **4/18/2015 to 4/22/2015**.

Question	Yes
<p>Criterion 1. Positive culture of one of the following (without requirement for purulent respiratory secretions):</p> <ul style="list-style-type: none"> • Endotracheal aspirate $\geq 10^5$ cfu/ml* • Bronchoalveolar lavage $\geq 10^4$ cfu/ml* • Lung tissue $\geq 10^4$ cfu/ml* • Protected specimen brush $\geq 10^3$ cfu/ml* <p>*or corresponding semi-quantitative result</p>	<input type="checkbox"/>
<p>Criterion 2. Positive culture of one of the following (qualitative or quantitative/semi-quantitative culture without sufficient growth to meet Criterion 1).</p> <ul style="list-style-type: none"> • Sputum • Endotracheal aspirate 	

Start Over

Explain...

Go to PVAP

No check boxes were checked. Therefore this event should be reported as an IVAC.
 The event on 4/20/2015 conforms to the IVAC definition only.

VAE	T<36° or T>38°	WBC≤4,000 or WBC>12,000 cells/mm ³	<input type="checkbox"/> Add... <input type="checkbox"/> Remove...	<input type="checkbox"/> Rem
	<input type="checkbox"/>	<input type="checkbox"/>	PIPERACILLIN/TAZOBACTAM	VANCOMYCIN (intravenous
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
IVAC	<input type="checkbox"/>	<input type="checkbox"/>		
	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		

No check boxes were checked. Therefore this event should be reported as an IVAC.
 The event on 4/20/2015 conforms to the IVAC definition only.

Close

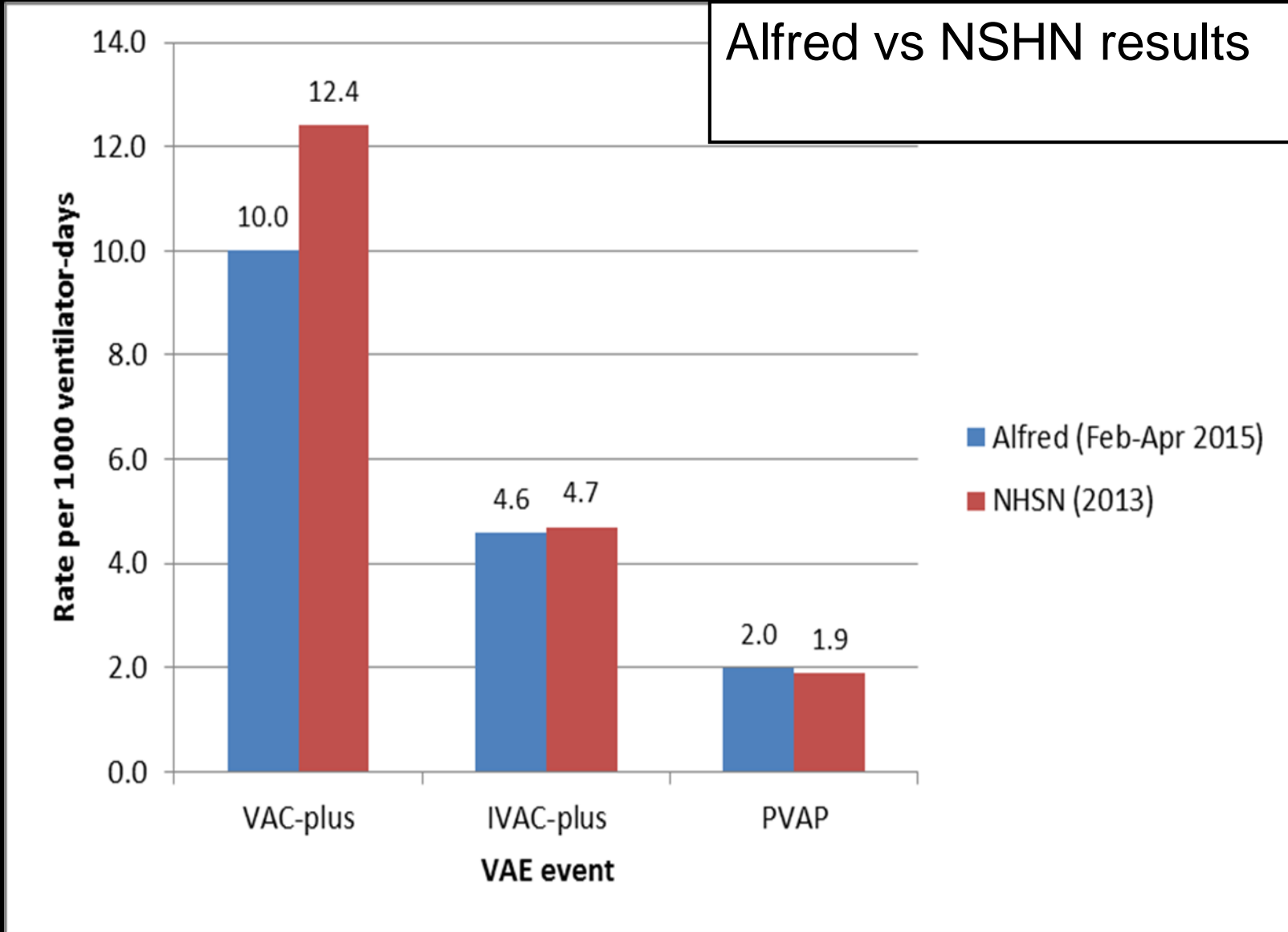
Legend: VAE Window VAE Date Qualifying Antimicrobial Day (QAD) Cumulative QAD

VAE vs VAP AT ALFRED

- Original VAP surveillance module 2000-2009.
Discontinued:
 - Low infection rates
 - Resource intensive
- New VAE module:
 - 3 months of data
 - 3 PVAPs identified. Rate 2.0 per 1000 Ventilator days
- Comparison with VAP
 - For interest, all VAE cases assessed against the superseded VAP definition
 - The 3 PVAPs met the VAP definition



VAE: Questions and Challenges



VAE: Questions and Challenges

- Broadly a patient safety initiative
 - Increase accountability around patient care
- Work with multidisciplinary team
 - Collect daily data
 - Identifying key stakeholders
 - Feedback results
 - Formulate and implement interventions
 - Continue surveillance
- Surveillance priority
 - 3 monthly snapshots
 - Continue if a problem identified



Thank You

Klompas et al *Infect Control Hosp Epidemiol* 2014,35(5):502-510

Muscedere et al *CHEST* 2013; 144(5): 1453-1460

Lilly et al *Crit Care Med* 2014; 42:2019–2028)

