Implementation of New Ventilator-associated Event Surveillance in a Community-based Academic Healthcare Center

Marci Drees, MD, MS,[1,2]* Benjamin Silverman, MD,[1] Nora Protokowicz, MSN, RN, NE-BC,[1] Lorraine Adkins, BSN, RN, CIC,[1] Leslie Freeman, RN, CIC,[1] Carol Briody, MT(ASCP), CIC,[1] Kathy Wroten, BSN, RN, CIC,[1] and Michael DePietro, MD[1]

[1]Christiana Care Health System, Wilmington, DE, [2]Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA

*Corresponding Author:
Dept of Medicine, Suite 2E70
4755 Ogletown-Stanton Rd,
Newark, DE 19718
302-733-5602; 302-733-6386 (f)
mdrees@christianacare.org

Presentation #1067

ABSTRACT:

Background: The National Healthcare Safety Network (NHSN) launched new surveillance definitions for ventilator-associated events (VAE) in Jan 2013. The correlation between these surveillance definitions and clinical syndromes is unclear.

Methods: Our 2-hospital, 1100-bed community-based academic healthcare system began VAE surveillance in 4 adult ICUs in Jan 2013 using NHSN definitions. The laboratory reports semi-quantitative results for Gram stains (GS): only "numerous" polymorphonuclear leukocytes (PMNs) meets the NHSN definition of ≥ 25 per high power field. Patients defined as ventilator-associated complication (VAC), infection-related VAC (IVAC), and possible or probable ventilator-associated pneumonia (VAP) during Jan-Mar 2013 underwent chart review to assess clinical documentation and specific reasons why definitions were not met. Administrative data were obtained to identify patients coded as VAP (997.31).

Results: During Jan-Mar 2013, 66 patients met surveillance definitions, including 41 VACs, 15 IVACs, 10 possible and 0 probable VAPs. During all of 2012, 27 VAPs were identified in the same ICUs using the prior definitions. Of all VAEs, discharge summaries documented only 1 (1.5%) as "VAP" and 31 (47%) as other types of pneumonia. Of the 41 VACs, 14 (34%) did not meet IVAC criteria because of normal temperature and white blood cell count; 11 of these were not given antibiotics (ABx). The remaining 27 VACs had either no new ABx started (14 [52%]), or ABx were started but continued < 4 days (13 [48%], including 2 patients who died <4 days from ABx start). Of those who met IVAC criteria but were not possible VAP, Gram stain/cultures were negative in 9 (60%), positive but outside the window period in 3 (20%), an excluded organism in 2 (14%), and not done in 2 (14%). Of the possible VAPs, the majority (80%) did not meet the probable VAP definition because they had moderate/many PMNs rather than "numerous." Only 3 patients had a VAP diagnosis code, 2 of whom had been identified as VAC, and 1 with no VAE.

Conclusion: In the first 3 months of VAE surveillance, our institution experienced a high rate of VACs, particularly compared to the prior VAP definition. Half were identified as any type of pneumonia by clinicians. No probable VAPs were identified, primarily because of the strict definition for purulent sputum.

INTRODUCTION:

- In January 2013 CDC's National Healthcare Safety Network (NHSN) revised its surveillance definitions for ventilator-associated pneumonia (VAP) and implemented new surveillance for ventilator-associated events (VAE)[1]:
  - **Ventilator-associated complication (VAC)**: based on sustained increase in fraction of inhaled oxygen (FiO2) or positive end-expiratory pressure (PEEP)
  - **Infection-related VAC (IVAC)**: VAC plus an elevated white blood cell (WBC) count or fever/hypothermia, AND treatment with new antibiotic(s) for ≥4 days
  - **Possible VAP**: IVAC plus purulent sputum OR positive respiratory culture
  - **Probable VAC**: IVAC plus purulent sputum AND positive respiratory culture
- Purpose of new definitions include improved objectivity and better standardization for intra- and inter-hospital comparisons[2,3]
- VACs thought to include not only pneumonias but pulmonary edema, atelectasis, and acute respiratory distress syndrome (ARDS)
- At our institution, implementation of the new definitions resulted, as expected, in dramatically higher VAE rates compared to prior VAP rates (based on NHSN definition)

STUDY AIMS:

- To evaluate patients identified with VAEs and determine why the next level of definition was not met
- To compare surveillance definitions of VAC, IVAC and possible/probable VAP with clinical diagnoses and coding for VAP

METHODS:

Study Setting

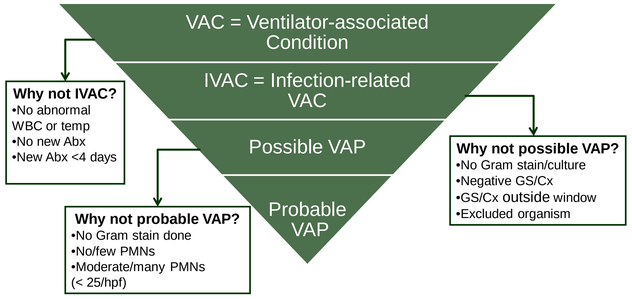
- Two-hospital, 1100-bed community-based academic healthcare system in northern Delaware
- NHSN participant since 1995
- 5 adult ICUs (medical, surgical/trauma, cardiac, cardiovascular surgery, and mixed medical/surgical), each with assigned Infection Preventionist

VAE Surveillance

- Each Infection Preventionist conducted prospective VAE surveillance following NHSN standardized definitions
- FiO2 & PEEP recorded in electronic medical record respiratory flowsheet
- Reviewed VAE definitions with Microbiology Laboratory to ensure that semi-quantitative results could be properly categorized into new definitions
  - Purulent sputum: lab reports "few," "moderate," "many," or "numerous" polymorphonuclear leukocytes (PMNs)
  - "Numerous" changed from ≥30 PMNs per high powered field (hpf) to ≥25 per hpf to be consistent with VAE definition

Study Procedures

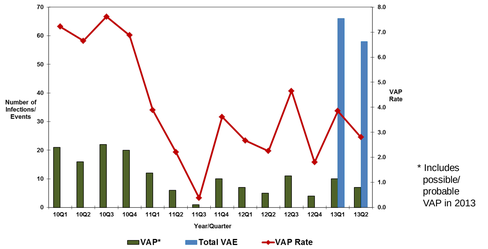
- Independent chart review of each identified VAE case to determine:
  - Primary discharge diagnosis
  - Whether VAP or other type of pneumonia mentioned in discharge summary



- Administrative data obtained to identify all discharges with ICD-9 code for VAP (997.31)
- Descriptive statistics used to describe percentages for each category

RESULTS:

- After steady decline in VAP rate over past several years, possible/probable VAP rate (new definition) was similar to that for VAP (old definition), but total VAE much higher



* Includes possible/ probable VAP in 2013

- VAE in first 2 quarters of 2013:
  - 60% VAC
  - 26% IVAC
  - 14% Possible VAP
  - Zero probable VAP identified

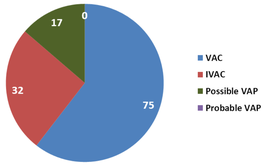
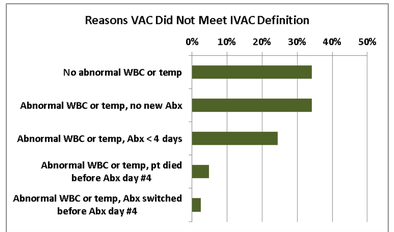
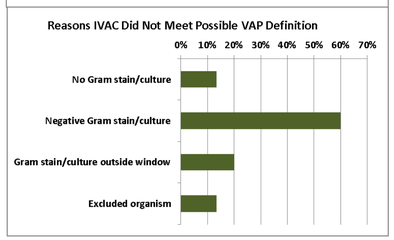


Chart review of 66 VAE cases during quarter 1 of 2013:

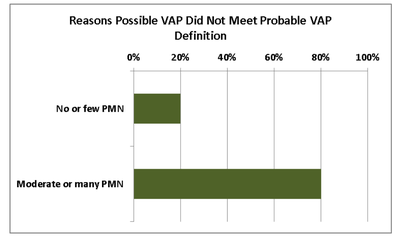
- 41 VACs did not meet IVAC definition:



- 15 IVAC did not meet possible VAP definition:



- 10 possible VAP did not meet probable VAP definition:
- No cases met the probable VAP definition.



Clinical Diagnoses:

- Discharge summaries documented only 1 VAE as "ventilator-associated pneumonia"
- 31 (47%) documented as other types of pneumonia
- During same period only 3 patients in institution were assigned VAP diagnosis ICD-9 code:
  - Two met VAC definition
  - One did not meet any VAE definition

LIMITATIONS

- Single center study, may not be representative of VAE surveillance nationally
- Prospective surveillance but retrospective chart review & analysis

CONCLUSIONS

- Possible VAP rate similar to VAP rate using prior NHSN definition
- Majority of VAE identified are VAC, as would be expected with intentionally broad definition
- Approximately half of all VAE identified described as pneumonia by clinicians
- No probable VAP identified, primarily because microbiology laboratory rarely noted "numerous" (≥25 per hpf) PMNs in sputum
- Obtaining clinical buy-in for VAE challenging:
  - New definitions confusing to clinicians
  - Unclear what VAC and IVAC represent
  - Lack of probable VAP in our institution led to some believing that VAP had disappeared
- While clinical impact of VAP has been demonstrated,[4] better understanding of the clinical conditions these represent is important to develop better prevention strategies.

REFERENCES

1. CDC. Surveillance for ventilator-associated events (VAE). http://www.cdc.gov/nhsn/acute-care-hospital/vae/index.html.
2. Klompas M, Kleinman K, Khan Y, et al. Rapid and reproducible surveillance for ventilator-associated pneumonia. *Clin Infect Dis* 2012: 54:370-7.
3. Y Hayashi, K Morisawa, M Klompas, et al. Toward improved surveillance: the impact of ventilator-associated complications on length of stay and antibiotic use in patients in intensive care units. *Clin Infect Dis* 2013: 56:471-7.
4. Muscedere J, Sinuff T, Heyland DK, et al. The clinical impact and preventability of ventilator-associated conditions in critically ill mechanically ventilated patients. *Chest* 2013, epublished ahead of print.

DISCLOSURES: All authors have no financial disclosures related to this abstract.