CDC Releases Ventilator-Associated Events Criteria

A new term has been coined by the CDC, ventilator-associated events (VAEs) (1). In 2011, the CDC convened a working group composed of members of several stakeholder organizations to address the limitations of the definition of ventilator-associated pneumonia (VAP) definition (2). The organizations represented in the Working Group include: the Critical Care Societies Collaborative (the American Association of Critical-Care Nurses, the American College of Chest Physicians, the American Thoracic Society, and the Society for Critical Care Medicine); the American Association for Respiratory Care; the Association of Professionals in Infection Control and Epidemiology; the Council of State and Territorial Epidemiologists; the Healthcare Infection Control Practices Advisory Committee's Surveillance Working Group; the Infectious Diseases Society of America; and the Society for Healthcare Epidemiology of America.

VAEs are defined by an increase oxygen ($\geq$0.2 in FiO2) or positive end-expiratory pressure (PEEP) (≥3 cm H2O), after a previous stable baseline of at least 2 days. There are three definition tiers within the VAE algorithm: 1) Ventilator-Associated Condition (VAC); 2) Infection-related Ventilator-Associated Complication (IVAC); and 3) Possible VAP (PVAP) (2). There are also many other criteria to classify a VAE into the CDC's tiers which are omitted for brevity. These definitions have been implemented in the National Healthcare Safety Network (NHSN) and according to the CDC are easily implemented, can make use of electronic health record systems to automate event detection, and identify events that are clinically important and associated with outcomes such as ICU and hospital length of stay and mortality. According to the CDC most VACs are due to pneumonia, ARDS, atelectasis, and pulmonary edema which "are significant clinical conditions that may be preventable".

The CDC says "the VAE definition algorithm is for use in surveillance; it is not a clinical definition algorithm and is not intended for use in the clinical management of patients". Based on the experience with the hospital acquired infections program this seems unlikely. What seems more likely is that hospitals will be measured on VAE rates with financial or public relations consequences shortly to follow.

The best evidence suggests that the VAE concept is not useful for guiding clinical decisions in the moment (1). Its performance characteristics as a screening test appear to be terrible, with poor sensitivity (~32%) for detecting VAP in the one of the only prospective studies. This is because clinically insignificant fluctuations in oxygenation/PEEP status are often recorded as VAEs, diluting signal with noise. Numerous retrospective reviews supporting the VAE concept listed on CDC's website strongly link VAEs with morbidity and mortality. However, these observations could be true of many events and may be very different from showing that a prospective (intervention-based) approach is helpful.

Pulmonologist Dr. Richard Wunderink from Northwestern commented that “the central hypothesis of the VAE criteria—that VAP and other potentially preventable complications of mechanical ventilation can consistently be detected by worsening gas exchange—is clearly not true”.

The problems with VAE appear much the same as the problems with VAP. Neither is strongly evidence-based and neither has been shown to be helpful in patient care. Furthermore, it might be possible to “game” the numbers by adjusting PEEP, expiratory time, and FiO2 within the defined limits.

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References

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