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Updated Approach for the Assessment of Ventilator Associated Pneumonia

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“If you want to converse with me, first define your terms”

-- Voltaire

Ventilator-associated pneumonia (VAP) is the most common and fatal ICU-acquired infection (1). Despite this frequency, morbidity, and cost, critical care practitioners have struggled for nearly half a century to consistently make an accurate VAP diagnosis. The traditional nomenclature, and the tetrad of clinical signs – fever and/or purulent sputum, leukocytosis, microbiologic growth, and a new or progressive radiographic opacity – has failed to clear up the confusion (1, 2). Fundamentally, our tetrad fails because the signs and symptoms of VAP overlap with other conditions that occur in critically ill patients. The result is the relatively poor sensitivity and specificity of the four diagnostic components, both individually and in combination (1). Differing microbiologic sampling techniques, subjective radiographic interpretations, and variable definitions only further confound the problem (3, 4).

Perhaps at no time has Voltaire's call for a consensus definition been louder. Increases in public reporting, inter-facility comparisons, and pay-for-performance mandates have turned a spotlight on both our diagnostic uncertainty and our lack of standardization. Even more worrisome, facilities could conceivably lower their VAP rates without affecting patient care by simply narrowing their interpretations of both clinical signs and chest radiographs, demanding inter-observer agreement, and/or requiring quantitative bronchoalveolar lavage for diagnosis (5, 6). There is a desperate need for a universal surveillance definition that is objective, reliable, automated, and ultimately associated with meaningful clinical outcomes.

To this end, in this issue of *Critical Care Medicine*, Magill and colleagues describe a new, tiered set of surveillance definitions for the spectrum of all “Ventilator-Associated Events (VAE) (7).”

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Arising from a 2011 Centers for Disease Control (CDC) working group meeting, the authors developed four new terms describing an increasing likelihood of true VAP:

1. “Ventilator-Associated Condition” (VAC): an episode of respiratory deterioration after stability or improvement on mechanical ventilation;
2. “Infection-related Ventilator-Associated Complication” (IVAC): VAC plus fever *or* elevated WBC, *and* new antibiotics started;
3. “Possible Ventilator Associated Pneumonia”: IVAC plus purulent secretions *or* a positive culture; and
4. “Probable Ventilator Associated Pneumonia”: IVAC plus purulent secretions *and* a positive culture, *or* another more stringent test such as histopathology.

What are the immediate advantages of expanding to four definitions? Most importantly, the tiered diagnostic continuum allows for more accurate VAE surveillance at a time of increasing scrutiny for potentially preventable nosocomial infections. Secondly, these new criteria allow infection preventionists to concentrate on more objective criteria. By eliminating relatively subjective components, such as chest radiography, the authors hope to enhance reliability, implementation, and automation of the surveillance process.

There are potential downsides to this new diagnostic algorithm. Notably, the new criteria include the initiation of a new antibiotic regimen of at least four days duration. Therefore, the concurrent initiation of antimicrobial therapy for a non-respiratory condition may result in over diagnosis of VAE. Additionally, and more concerning, would be the purposeful gaming of the system by withholding empiric antibiotics until positive confirmatory studies, which is known to lead to poorer outcomes (8). Alternatively, clinicians could increasingly use short-course antibiotic regimens (fewer than 4 days). While this practice might have some clinical benefit (9), this duration remains shorter than the current ATS/IDSA guidelines (7-8 days for uncomplicated VAP) (10).

The authors note these new definitions are dynamic and subject to improvement by an iterative process. Further, these guidelines are tailored strictly for surveillance, and are *not* meant to guide clinical decision-making. Future work will be necessary to determine the associations between this new surveillance definition and important clinical outcomes. Ultimately, rather than being simply descriptive, implementation of monitoring guidelines should also drive improved patient outcomes – both through prevention and early detection. The VAE algorithm in its current implementation will facilitate multi-centered studies to evaluate preventative strategies to reduce the incidence of VAP.

Additionally, early detection of ventilator associated conditions will require methods to quickly differentiate true ventilator associated pneumonia from the milieu of VAP-mimics. Use of alternative markers of pulmonary infection – including serum procalcitonin and soluble triggering receptor expressed on myeloid cells-1 (sTREM-1) from bronchoalveolar lavage fluid – have been shown to be of limited utility in the early diagnosis of VAP (11, 12). However, it is possible that molecular diagnostic techniques, such as quantitative polymerase chain reaction, could assist in early detection of nosocomial infections when the antimicrobial burden is low (13). Other promising technologies include volatile metabolic compound detection and analysis using gas chromatography for specific bacterial markers (14). It is possible that these future clinical diagnostic advances could ultimately lead to more timely, responsible, and effective antibiotic use. We welcome the new approach to VAE surveillance described in this issue as a necessary step in ongoing advancement in the field.

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