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 its 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—have 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, interfacility comparisons, and pay-for-performance mandates have turned a spotlight on both our diagnostic uncertainty and our lack of standardization. Even more worrisome is the fact that facilities could conceivably lower their VAP rates without affecting patient care by simply narrowing their interpretations of both clinical signs and chest radiographs, demanding interobserver 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 et al (7) describe a new, tiered set of surveillance definitions for the spectrum of all "ventilator-associated events (VAEs)." Arising from a 2011 Centers for Disease Control 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 VAP: IVAC plus purulent secretions or a positive culture; and
4) Probable VAP: 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? First, the tiered diagnostic continuum allows for more accurate VAE surveillance at a time of increasing scrutiny for potentially preventable nosocomial infections. Second, 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 4 days duration. Therefore, the concurrent initiation of antimicrobial therapy for a nonrespiratory condition may result in overdiagnosis of VAE. Additionally, 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 d). Although this practice might have some clinical benefit (9), this duration remains shorter than the current American Thoracic Society/Infectious Diseases Society of America guidelines (7–8 d for uncomplicated VAP) (10).

*See also p. 2467.

Key Words: guidelines; surveillance; ventilator-associated pneumonia

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The authors note that 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 multicentered studies to evaluate preventative strategies to reduce the prevalence of VAP.

Additionally, early detection of VACs will require methods to quickly differentiate true VAP 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 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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Routine Intra-Aortic Balloon Pump Support in High-Risk Cardiac Surgery Patients: Is It Time to Throw Away the Pump?*

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***See also p. 2476.**

Key Words: coronary artery bypass grafting surgery; intra-aortic balloon pump; left ventricular dysfunction; randomized controlled trial

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Forty years ago, the intra-aortic balloon pump (IABP) was first reported to be used for the treatment of patients in shock after cardiopulmonary bypass (1). Preoperative use of the device in high-risk patients with severe left main disease or depressed left ventricular function undergoing myocardial revascularization was described shortly thereafter (2). While in the ensuing decades, prophylactic IABP support for high-risk patients undergoing cardiac surgery has become established in the practice of surgical centers, and the evidence to support routine use of this strategy is not particularly robust with only four randomized trials having been completed, all small, and with fewer than 300 patients in total having been studied (3, 4). Although meta-analyses of these trials are