What Is the 360-Degree Approach to Defining Success for VAP?

David P. Nicolau, PharmD, FCCP, FIDSA

VAP: Magnitude of the Problem

Nearly 1.6 million hospital-acquired infections (HAIs) occur annually in the United States (Table 1).1 Predominant among these HAIs are urinary tract infections, bloodstream infections, surgical site infections, and hospital-acquired pneumonia (HAP). Of these, HAP is associated with the greatest infection-related morbidity and mortality.2

In the intensive care unit (ICU) setting, HAP accounts for 25% of all HAIs.3 Furthermore, nearly 90% of HAP cases occur during mechanical ventilation—this subcategory of HAP is referred to as ventilator-associated pneumonia (VAP).2 Although VAP was originally thought to be restricted to the ICU setting, this disease process is increasingly prevalent in non-ICU populations, as severely ill patients are being managed in other care areas (i.e., transitional care, long-term rehabilitation units, etc). Therefore, prevention and management of VAP is a concern for all health care personnel.

The need for mechanical ventilation in these critically ill populations means that these patients will be at an increased risk for the development of pneumonia. This risk increases as the duration of mechanical ventilation increases—estimated at a 3% increase in incidence for each day during the first 5 days of mechanical ventilation.2 Therefore, it is paramount to employ strategies to minimize the development of VAP.3 First and foremost among these is to identify patients who can be extubated as soon as possible to prevent VAP from occurring. Despite these efforts, a small proportion of the ventilated patient population will develop VAP. Given the high mortality associated with VAP, early appropriate therapy is critical for achieving successful outcomes for these patients.4 Selecting appropriate therapy can be challenging, as the nosocomial epidemiology of VAP can be diverse among differing patient populations or care settings. Moreover, the identified pathogens in this infected population commonly express resistance or multidrug resistance (MDR) to antimicrobials.5 Therefore, clinicians must recognize risk factors for infections caused by resistant organisms and be familiar with not only the epidemiology related to their patient population, but must also know the susceptibility profile of these pathogens if early appropriate therapy is to be initiated.

Prevention and Appropriate Management to Reduce Health Care Spending

HAIs have gained renewed attention as a targeted area to reduce health care spending, improve resource utilization, and achieve better patient outcomes. Insurance providers will continue to evaluate ways to conserve health care spending in hospitals and may follow the lead of recent government mandates regarding preventable hospital-acquired conditions.

The Center for Medicare and Medicaid Services (CMS) has listed a number of conditions (including catheter-associated urinary tract infection and vascular-catheter-associated infection) that it will no longer reimburse.6 This will put added pressure on institutions to minimize these infections and limit the resources used to manage patients with these infections. Although VAP is not included in the current CMS listing, this could change as funding shrinks and other preventable conditions are targeted for nonreimbursement.

VAP: Goals of Successful Management Strategy

It is estimated that approximately 38% to 70% of VAP episodes can be prevented.4 Thus, even in ideal situations, hospitals and ICUs will be confronted with a number of VAP episodes. Once a VAP case is identified, it will be important to achieve multiple goals for successful management (Figure 1).

The most important goal of a VAP management strategy is to achieve improved clinical outcomes and reduce morbidity and mortality. This can be achieved through early appropriate antimicrobial therapy. The second goal is to reduce the emergence of bacterial resistance. This is important, as infections caused by resistant pathogens are associated with increased morbidity, mortality, and cost, while the number of agents effective against MDR nosocomial pathogens is diminishing.5,6 The third goal of a VAP management strategy is to improve resource utilization.

Each of these goals is interrelated. If the first 2 goals are achieved through early appropriate antimicrobial therapy, this may reduce the hospital resources needed to successfully treat the patient, particularly by reducing hospital length of stay. The use of this clinical disease management approach coupled with other strategies, such as short-course or de-escalation of therapy, may provide additional opportunities to reduce overall hospital costs. These specific strategies, by reducing the unnecessary use or overuse of antimicrobials, may further reduce the risk of development of resistance.

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TABLE 1 The Burden of Hospital-Acquired Infections

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Number in ICU</th>
<th>Number in Non-ICU</th>
<th>Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary Tract</td>
<td>102,200</td>
<td>424,060</td>
<td>13,088</td>
</tr>
<tr>
<td>Bloodstream</td>
<td>81,942</td>
<td>133,368</td>
<td>30,665</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>100,689</td>
<td>129,519</td>
<td>35,967</td>
</tr>
<tr>
<td>Surgical Site</td>
<td>28,725</td>
<td>244,385</td>
<td>8,205</td>
</tr>
<tr>
<td>Other</td>
<td>80,732</td>
<td>263,810</td>
<td>11,062</td>
</tr>
<tr>
<td>Total</td>
<td>394,288</td>
<td>1,195,142</td>
<td>98,987</td>
</tr>
</tbody>
</table>


ICU = intensive care unit.
What This Supplement Addresses

This supplement reviews tactics that can be used to achieve the 3 goals for success in VAP. Dr. David Burgess reviews the epidemiology of VAP, highlighting the importance of local epidemiology and antibiograms of the institution and specific hospital wards. Dr. Burgess continues his discussion on using pharmacokinetics and pharmacodynamics as the basis for optimizing antimicrobial dosing to reduce the risk of resistance emergence.

Dr. Keith Rodvold emphasizes the importance of efficiently using the available resources when managing patients with VAP. The clinical and economic burden of VAP is substantial, and clinicians must employ strategies that have been proven to be effective in reducing hospital costs and length of stay without compromising patient outcomes. The most effective means to reduce the cost of VAP is preventing it altogether, and a multidisciplinary team approach is imperative for implementing and continuing a successful VAP prevention program. As members of the ICU and infectious diseases team, clinical pharmacists can play an integral role in VAP prevention and should aim to be more proactive in helping achieve goals that minimize episodes of HAIs.

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REFERENCES