Pharmacoeconomic Considerations In the Treatment of Hospital-Associated Methicillin-resistant *Staphylococcus aureus*

Economic analyses of the evaluation and therapy of methicillin-resistant *Staphylococcus aureus* (MRSA) infections are difficult but increasingly important, as issues regarding resistance to antibacterial agents continue to emerge and outbreaks with new and more virulent strains continue. An understanding of the factors involved in the significant financial costs of MRSA must consider a variety of perspectives as well as the value of a careful clinical assessment of every person infected.

There are a number of economic perspectives that should be considered and reconsidered when therapeutic decisions are made.

When Is Antibiotic Therapy Warranted?

The recovery of *S. aureus* on a culture is not, in and of itself, an indication for antibiotic therapy. Reports of MRSA strike fear into many healthcare workers and nursing home managers. In fact, roughly one third of otherwise healthy individuals carry *S. aureus* (usually in and around their nasal area), with no apparent symptoms. Some of these bacteria are MRSA.

On the other hand, many infections are not treated aggressively, causing severe disease and other complications that could have been avoided. The challenge facing clinicians is distinguishing those patients who are truly infected from those who are not (ie, those who need aggressive treatment from those who do not). Indeed, clinical acumen is becoming increasingly important, and it has significant financial implications when it comes to MRSA.

While a quick and inexpensive assessment for MRSA can be done with an on-site Gram stain testing, this procedure is typically done in an outside laboratory; results may not be available in a timely manner. Waiting for results can lead to costly delays in treatment decisions. For example, delays in initiating adequate antibiotic therapy have been associated with greater mortality in ventilator-associated pneumonia. They can also increase patient anxiety.

A rapid means of detecting *S. aureus* and determining whether or not it is MRSA would be extremely useful. New and more expensive techniques for rapid identification of *S. aureus* and even MRSA markers are in development, but they are not yet available for bedside use. These newer tests, while costly in and of themselves, may prove cost-effective in the long run, especially given the increasing number of hospitalizations for MRSA and the need for prolonged courses of therapy.

The Cost of Treatment

If antibiotic treatment is necessary, choosing a drug based on its cost is one way to reduce the overall financial burden of treatment. However, there are other important considerations involved in antimicrobial selection, including:

- the underlying disease(s)
- clinical efficacy of the drug
- adverse effects of treatment (including likelihood of allergic reaction)
- the likelihood of patient compliance with treatment
- the status of available healthcare resources
- patients’ health insurance coverage
- patients’ ability to care for themselves
- costs associated with intravenous administration (including home infusion costs)
- availability of oral formulations
- the cost of therapeutic failure.

Indeed, the price of an effective oral therapy for MRSA may well be worthwhile when other potential costs are factored into the equation. In a study of patients with community-acquired pneumonia, Davis et al demonstrated that conversion to a therapy that included oral antibiotics was associated with a significant cost savings.

**Table 1. Antibiotic Cost Factors in Hospitalized Patients, With Potential Strategies for Cost-Efficiency**

<table>
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<tr>
<th>Obvious Cost</th>
<th>Cost-saving Strategies</th>
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<td>Price of acquisition (cost per dose or per day)</td>
<td>Purchase bulk through groups or consortia.</td>
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<tr>
<td>Cost of increased antibiotic resistance and outbreaks due to resistant organisms (includes cost of infection control and isolating patients)</td>
<td>Minimize or avoid use of antibiotics associated with emergence of resistant organisms.</td>
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<td>Cost of adverse reactions</td>
<td>Consider avoiding poorly tolerated antibiotics.</td>
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<tr>
<td>Cost of therapeutic failure (ie, prolonged treatment or need for retreatment with different antibiotic)</td>
<td>Consider avoiding antibiotics likely to fail because of improper spectrum. Consider avoiding antibiotics with poor tissue penetration.</td>
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**Adapted from references 4-7.**
from intravenous to oral therapy can reduce associated treatment costs, without compromising efficacy. Table 1 summarizes the potential costs associated with antibiotic therapy and offers potential cost-saving strategies. Certain options may initially be more expensive, but they may save money in the long run through ability to control expenses.

From a pharmacy perspective, however, the acquisition cost of an antibiotic may be a critical factor in antibiotic selection. Many hospital pharmacies operate on a fixed budget, and staff performance may be measured based on the ability to control expenses.

Despite the common and frequent use of antibiotic therapy for S. aureus infections, there may be a lack of information about the agents’ adverse effects. Older oral agents have not been approved by the U.S. Food and Drug Administration for the treatment of infections due to MRSA, and there have been few comparative studies. Nevertheless, the older antimicrobials are often used as first-line therapy for suspected or documented MRSA. Clinicians must not only consider drug costs but outpatient parenteral antibiotic therapy (OPAT), if resources and local expertise are available.

Cost-Effective Treatment Approaches

Cost-effective antimicrobial therapy starts with an initial, thorough evaluation and the initiation of therapy with an antibiotic. Possible treatment approaches might also include wound debridement, incision and drainage, a culture, par- enteral therapy, and hospitalization. A daily clinical evaluation as well as a review of the culture results can quickly provide useful answers about whether more aggressive care is needed or a switch to an oral or less expensive antibiotic is possible. Daily outpatient assessments for clinical response, adverse effects, and related medical problems also may be quite cost-effective compared with hospitalization.

Conclusion

The bottom line in the evaluation of antimicrobial agents should be the patient. However, economic issues are a major consideration in antibiotic selection and use. The factors involved are multiple, complex, interrelated, and changing. The best approach is to conduct a comprehensive evaluation when a patient presents with a possible infection; if warranted, initiate aggressive intervention at the start and moderate it as clinical and laboratory information accumulates. Given the increasing incidence of MRSA, more clinical input, laboratory cultures, economic studies, clinical research, and clinician teamwork are urgently needed.

References

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9. Moghadasipour T, Tice A. HMJ. In press.