For Nosocomial Vancomycin-Resistant Enterococcal Infections: The Ounce of Prevention or the Pound of Cure?

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(See the article by Perencevich et al. on pages 1108–15)

This issue of the journal contains an important article by Perencevich et al. describing the results of a mathematical model evaluating various measures for controlling the spread of vancomycin-resistant enterococci (VRE) among intensive care unit (ICU) patients. It concludes that active surveillance cultures and contact precautions for all colonized patients provide significantly better control than do standard precautions and/or isolation of the small minority of colonized patients who are recognized to be colonized through the results of routine clinical cultures. It further concludes that presumptive isolation at the time of ICU admission (i.e., pending surveillance culture results) adds significantly to this control.

The article is important for multiple reasons. First, a patient cannot have VRE infection if VRE is not first spread to the patient, and spread of VRE is out of control in the United States health care system, in which probably at least one-half of all VRE infections have affected ICU patients. This is a significant problem, because VRE infections appear to be more deadly and more costly than do infections caused by vancomycin-susceptible strains [3–5]. Second, many epidemiologic studies have shown better control of VRE using active surveillance cultures and contact precautions, adding support to the model’s conclusions [6–8]. Third, the results are further corroborated by those of a prior mathematical model, which found that increasing compliance with hand hygiene to 80% (i.e., an as-yet unattainable level for most hospitals) would reduce spread of VRE in the ICU by only approximately one-quarter, and that optimal control would instead require surveillance cultures and cohort isolation [9].

The article by Perencevich et al. has potential for moving the infectious diseases and infection-control communities closer to a tipping point on the control of this important pathogen (not to mention MRSA, for which the data on control parallel and support those regarding VRE). It has this potential because the model seems to be logical and mathematically correct and because its authors include some highly respected epidemiologists with considerable experience making such calculations. The model provides valuable insight into the importance of variables such as the prevalence of culture positivity at ICU admission and the duration of ICU stay. It logically concludes that more VRE acquisitions can be prevented in the large, complex ICUs of tertiary care facilities, because this is where spread is maximal.

However, this does not mean that confining such efforts to the ICUs of tertiary care facilities would result in optimal control of VRE throughout the health care sector.
system. Data are available from multiple hospitals at which such efforts were being made only in an ICU or two and not throughout the rest of the hospital [18–20]. VRE prevalence among patients in these ICUs remained at 20%–45%. By contrast, a hospital where the intervention was used to control spread throughout the hospital documented a much greater reduction in the prevalence of VRE in its ICUs [21]. The ICU with the highest prevalence (100%) observed a reduction to a 0% prevalence that remained at this low level for the next year using this approach, despite the lack of an antibiotic-control program during that time [22]. If high rates had been allowed to persist in other parts of the hospital, this would not have been possible.

The largest cohesive effort to control spread of VRE to date occurred in the Siouxland Health District (Iowa, Nebraska, and South Dakota), where all 28 nursing homes and all 4 hospitals participated using active surveillance cultures and contact precautions (modifying the precautions somewhat to various degrees in the different nursing homes), and this worked to eliminate or significantly reduce the spread of VRE in all 32 facilities [23]. It seems likely that the degree of success of any one of these facilities was influenced by the fact that all 31 other facilities were collaborating to control spread.

As mentioned above, data regarding the spread and control of MRSA and VRE parallel one another. Both MRSA and VRE are amplified in the health care system, because the high prevalence of antibiotic resistance classes a selective advantage to survive and proliferate, and because patient contact with contaminated hands, clothes, and/or equipment of health care workers provides a mechanism for nosocomial transmission. Optimal control of nosocomial MRSA infections has been achieved not by focusing control efforts only on the ICUs of large tertiary care hospitals, but by trying to prevent MRSA spread wherever it occurs throughout the hospital and in all facilities throughout the health care system [24, 25]. The Perencevich model is undoubtedly correct that fewer VRE colonized patients will be found in small, nonacademic facilities, but optimal control will nevertheless likely require their being involved in the effort in the same way that all facilities attempt to control MRSA in the northern European countries, where the proportion of MRSA has been kept at <1% among all S. aureus infections [24, 25]. Henri Verbrugh emphasized this point at the 2003 SHEA meeting. A mathematical model examining the effect of having such control programs in all facilities would be of interest (i.e., compared with having them only in large tertiary care facilities).

References
16. Karchmer TB, Cook EM, Lovato JF, et al. Active surveillance cultures for methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE) decreased the incidence of new colonization


