Value of Screening and Isolation for Control of Methicillin-Resistant Staphylococcus aureus

Sr—Nijssen et al. [1] screened patients admitted to their medical intensive care unit (ICU) for Staphylococcus aureus carriage over a period of 10 weeks. This ICU has endemic levels of methicillin-resistant S. aureus (MRSA) (5 [36%] of 14 clinical isolates of S. aureus were MRSA). The authors claim that there was not a single episode of transmission of S. aureus, including MRSA and methicillin-susceptible S. aureus (MSSA), between their patients in this period. They conclude that active surveillance and isolation of patients with MRSA may not be warranted, and they caution against the introduction of such measures in guidelines. Although we appreciate the systematic daily sampling of their ICU patients, we question the validity and interpretation of their data.

First, surveillance cultures were based on direct plating of nasal swabs and endotracheal aspirate samples only. They did not sample the perineum nor did they sample other body sites with lesions (e.g., wounds or intravascular access sites) for S. aureus colonization. Also, they did not use enrichment broths needed for sensitivity when screening for staphylococcal carriage [2]. Thus, they probably missed a sizable proportion of the S. aureus colonization events.

A second point is the arbitrary choice of a 48-h period for discrimination of importation from acquisition. It is not clear why the authors did not use their initial microbiological screening, taken within 12 h after admission, for identifying staphylococci as either imported or acquired. Thus, the authors may have misclassified many patients as importers who were actually contaminated during the first 48 h after admission to the ICU. Even brief encounters with a staphylococcal source or reservoir may suffice to transmit S. aureus [3]. We suspect that the use of a 12-h period as the criterion would yield many potential cases of transmission in the ICU discussed in Nijssen et al. [1]. The fact that the authors did not find strains that had identical DNA PFGE profiles does not rule out cross-transmission, because only patients were screened; other reservoirs of staphylococci (e.g., health care workers and the environment [3]) were not.

Also, the article by Nijssen et al. [1] lacks a graphic presentation of the expected clustering of common clones of MRSA and MSSA [4]. Of interest, a similar but methodologically better study (involving more sample sites and using enrichment broth) was performed at the same time in 2 ICUs in the United Kingdom. In this study [5], the authors did find a high rate of acquisition of MRSA (10%–12%), indicating that, in the ICUs studied, transmission of staphylococci is likely to occur. Importantly, in these ICUs, the majority of beds were not in single rooms but in open bays, which is the more common layout of ICUs.

Even if there truly was no transmission of S. aureus during the 10-week period, Nijssen et al. [1] should have given more consideration to an alternative explanation (e.g., that their patients were isolated sufficiently from each other for transmission rates to remain below the detection threshold of their study). There are several arguments in favor of this explanation. First, the ICU largely consisted of single rooms; because single rooms separate patients from each other, their use is part of a strict isolation procedure [6]. We assume that the separate rooms were used preferentially, so that the vast majority of patients were cared for in single rooms. Second, patients were treated by cohort nursing three-quarters of the time; this is another infection-control measure that is part of an isolation procedure for MRSA. Finally, through a monitoring program, emphasizing hands as transmission vectors, hand hygiene was practiced at very high rates of overall compliance (78%). Taken together, these factors indicate that this ICU was operating under rules that would be the core elements of a rather strict isolation regimen for MRSA control. Thus, the results of this study, when taken at face value, can best be presented as evidence that MRSA surveillance at hospital admission and the isolation of MRSA-positive patients in separate rooms with cohort nursing by a highly motivated staff will be effective in preventing transmissions, rather than as evidence supporting the suggestion of Nijssen et al. [1], that such measures are perhaps without any effect and may thus not be needed.

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Henri A. Verbrugh
Department of Medical Microbiology and Infectious Diseases, Erasmus MC University Medical Center, Rotterdam, The Netherlands

References

Has Methicillin-Resistant Staphylococcus aureus Stopped Spreading in Intensive Care Units?

Sir—Nijssen et al. [1] found no spread of methicillin-resistant Staphylococcus aureus (MRSA) over a 10-week period from 9 MRSA-colonized patients admitted to their intensive care unit (ICU), but they did not specify what infection-control precautions were being followed in the ICU, making reported compliance with gloving and hand hygiene difficult to interpret. Compliance with standard precautions? Universal barrier precautions? A combination of both? Moreover, they reported such compliance for ICU nurses but not for other health care workers, whom they acknowledged to be more prone to spread MRSA because of more-frequent movement from patient to patient. Study methods specified that health care workers were not provided surveillance culture results but did not specify whether health care workers knew that a study was being conducted or were otherwise encouraged to maintain higher levels of compliance than were previously documented in the same ICU [2].

Even though the results of surveillance cultures were not provided to health care workers, data on the proportion of colonized patients who were known to health care workers and over what proportion of the relatively brief study period they were known to be positive for MRSA (because of previously positive or newly positive clinical cultures) would have been of interest, because such knowledge could have modified behavior for colonized patients (and possibly for all patients). The proportion of patients treated during the relatively brief study period with specific and/or empirical therapy (and the duration of treatment) with drugs active against the MRSA strain (e.g., trimethoprim-sulfamethoxazole, vancomycin, quinupristin-dalfopristin, and linezolid) also could be of interest, because such therapy may have suppressed colonization and thus suppressed transmission.

Nijssen et al. [1] conclude that MRSA does not spread in hospitals such as theirs despite high rates of MRSA endemiaity and that active surveillance cultures and contact precautions for colonized patients, as recommended by a Society for Healthcare Epidemiology of America (SHEA) guideline [3], are thus unneeded. Small studies, such as the one performed by Nijssen et al. [1], are susceptible to statistical imprecision, and all epidemiologic studies (including randomized, controlled trials) require confirmation by studies performed by other authors in other populations. A contemporaneous, larger study by Marshall et al. [4] found that a similar percentage of patients (6.8%) were colonized with MRSA at admission to the ICU, but another 11.4% acquired MRSA in the ICU, which was using only standard precautions. Many other studies support the finding of Marshall et al. [4] that MRSA spread and infection have continued in recent years, despite the use of standard precautions [3]. Another contemporaneous ICU study by Cepeda et al. [5] reported high MRSA transmission rates whether contact precautions or modified “standard precautions” (which were similar to contact precautions) were used and concluded that new infection-control measures are needed. MRSA caused steadily increasing proportions of S. aureus infection in National Nosocomial Infection Surveillance hospitals during the 9 years since standard precautions began to be required in US hospitals [6, 7], raising questions regarding both the validity and the generalizability of the results reported in Nijssen et al. [1]. The SHEA guideline cited 45 studies reporting significantly improved control of MRSA and/or vancomycin-resistant enterococci with active surveillance cultures and contact precautions [3], raising questions regarding the validity and generalizability of the results reported by Cepeda et al. [5]. Scores of studies with data supporting the SHEA guideline have been published or presented at national infection-control meetings since the SHEA guideline was published. Multiple studies also have shown impressive reductions in MRSA infection rates despite years of previously high MRSA rates [8–11].

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Carlene A. Muto, Barry M. Farr, and William R. Jarvis

1Division of Hospital Epidemiology and Infection Control, University of Pittsburgh Medical Center–Presbyterian and Infectious Diseases Epidemiology Research Unit, University of Pittsburgh School of Medicine and Graduate School of Public Health, Pennsylvania; 1University of Virginia Health System, Charlottesville; and 3Jason and Jarvis Associates, Hilton Head Island, South Carolina

References


Reply to Verbrugh and to Muto et al.

Sir—We thank Verbrugh [1] and Muto et al. [2] for their letters, in which they raise several concerns regarding our study [3]. Verbrugh [1] suggests that we might have missed a substantial portion of cases of colonization, because we did not use an enrichment broth and did not obtain culture samples from additional body sites. Naturally, use of enrichment broth might have increased the sensitivity of detection from a single specimen, but our patients had cultures performed daily—nasal swab cultures and, in addition, cultures of respiratory samples for patients who were undergoing intubation—and it is unlikely that epidemiologically important cases of colonization would have been missed with such intense sequential culturing. Moreover, the current Society for Healthcare Epidemiology of America guidelines for control of nosocomial methicillin-resistant *Staphylococcus aureus* (MRSA), which our study was assessing in part, recommend the use of agar media for active surveillance cultures, and the study from the United Kingdom [4] that Verbrugh [1] cites obtained surveillance cultures only weekly and appears to have relied primarily on culture results from agar media for infection-control decision making. In addition, in pilot studies, we found little utility in the use of surveillance cultures other than those recommended by guidelines (and we obtained those surveillance cultures recommended by guidelines).

Use of a 48-h time period to discriminate between imported and hospital-acquired colonization might be arbitrary, as stated by Verbrugh [1], but it is the generally recommended definition used by the Centers for Disease Control and Prevention and most investigators. In fact, it is a more common concern that surveillance cultures with positive results that are obtained later during an intensive care unity (ICU) stay represent under recognition of cases of preadmission colonization. Nevertheless, we analyzed our data using 12 h after admission as a cut-off point, because all patients had a positive first culture result either within 12 h or >48 h after admission (data not shown). This additional analysis did not change our results or interpretation.

Verbrugh [1] is correct that neither health care workers nor the environment were screened, but the fact that there was no clustering of similar PFGE profiles makes such common-source cross-transmission highly unlikely. Verbrugh [1] also feels that we should have given more consideration to an alternative explanation—namely, the possibility that the setting and behavior of personnel were extraordinary and that this prevented transmission. Indeed, as in many ICUs in the United States, several patients in the unit (12 of 16) were treated in single rooms. However, these rooms did not have anterooms or closed doors, as are used when placing patients in strict isolation. Moreover, culture results were not shared with the staff (that was what the study was about!) and, thus, separate rooms were not preferentially used by colonized patients. Furthermore, patients were not cared for in specific cohorts (again, that was impossible, because culture results were unknown to personnel). The cohorting level of 77% means that nurses had contact that was restricted to a single patient much—but not all—of the time. Data for comparison of this cohorting level are scarce. However, in a British ICU with high levels of MRSA endemicity and periods of MRSA transmission associated with understaffing, cohorting levels were 80% [5]. Most importantly, the United Kingdom study [4] lauded by Verbrugh concludes, “Moving MRSA-positive patients into single rooms or cohorted bays does not reduce cross-infection” (p. 303).

Regarding the hand hygiene of our personnel, a 53% rate of compliance (78% if hand hygiene and/or glove use are tallied together) is good but not great, and personnel cover gowns were not part of care. But if we have to devote our efforts either to improving hand hygiene, which benefits all patients, or to doing active surveillance cultures that look for only a single pathogen, we would favor improving hygiene, as supported by our study results.

To answer the question of Muto et al. [2] as to what infection-control measures were being followed, no measures other