CONCISE COMMUNICATION

Is the Use of Antimicrobial Devices to Prevent Infection Correlated across Different Healthcare-Associated Infections? Results from a National Survey

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Antimicrobial devices are often used to prevent nosocomial infection, despite mixed evidence as to their efficacy. Using a national survey, we found that a hospital's use of an antimicrobial device to prevent one type of infection was associated with a higher likelihood that a similar device would be used to prevent a different infection.

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Healthcare-associated infections due to the use of devices, such as urinary catheters, central venous catheters, or endotracheal tubes, are especially common and morbid. One approach to preventing infection is using devices that have a coating of antimicrobial substances. However, this approach is controversial, because the evidence supporting the use of such antimicrobial devices is mixed and dependent on the device; evidence is generally strong for antimicrobial central venous catheters, generally weak for antimicrobial urinary catheters, and unclear for antimicrobial endotracheal tubes.[1-3] Despite their higher cost, the use of some antimicrobial devices is substantial, with almost half of US hospitals reporting regular use of antimicrobial urinary catheters and approximately one-third reporting regular use of antimicrobial central venous catheters.[4] We explored whether a hospital's use of a coated device to prevent one type of infection, such as using an antimicrobial central venous catheter to prevent central line–associated bloodstream infection (CLABSI), was associated with a higher likelihood that a similar type of device would be used to prevent a completely different infection (eg, antimicrobial urinary catheters to prevent catheter-associated urinary tract infection [CAUTI]).

METHODS

Study Design and Data Collection

We conducted a national survey to compare the use of specific infection prevention practices by US hospitals. In March 2009, using a national sample of nonfederal hospitals, we surveyed infection prevention personnel to understand how often their hospital used specific practices to prevent CAUTI, CLABSI, and ventilator-associated pneumonia (VAP). Our sample had been originally derived for a similar survey study conducted in 2005.[5] We identified all nonfederal, general medical, and surgical hospitals with an intensive care unit and at least 50 hospital beds using the 2005 American Hospital Association Database (fiscal year 2003 data). We then stratified hospitals into 2 groups on the basis of the number of beds (50–250 beds and greater than 250 beds) and selected a random sample of 300 hospitals from each group. We sent the survey to a total of 588 nonfederal hospitals. Following a modified Dillman approach, we sent an initial mailing, a reminder letter, and a second mailing of the survey after 4 weeks to those who had not yet responded. A third survey mailing was added in 2009 because of a low response to the first 2 mailings, which had occurred contemporaneous with H1N1 preparations. All mailings were addressed to the "Infection Control Coordinator." The University of Michigan and Veterans Affairs Ann Arbor Healthcare System provided institutional review board approval.

Study Measures

The survey asked about the use of practices for adult acute care patients to prevent CAUTI, CLABSI, and VAP, with a specific focus on practices identified in published guidelines or recommendations from the Centers for Disease Control and Prevention or professional societies.[1-3] Respondents were asked to rate the frequency of use for each practice on a scale from 1 to 5 (1 being never and 5 being always). For our analysis, "regular use" was defined as receiving a rating of 4 or 5, indicating that the practice was used almost always or always. For this article, we examined the relationships between antimicrobial urinary catheters (silver-alloy or nitrofurazone-releasing catheters) and antimicrobial central venous catheters (chlorhexidine/silver sulfadiazine or minocycline-rifampin); antimicrobial urinary catheters and silver-coated endotracheal tubes; and antimicrobial central venous catheters and silver-coated endotracheal tubes.

Statistical Analysis

Logistic regression models were fit to examine multivariable relationships between the selected infection prevention practices while accounting for the following potentially confounding characteristics: number of years the respondent has been in his or her current position, the number of full-time equivalent infection preventionists, and number of beds in the hospital. All analyses were conducted using Stata, version 11.0 (Stata).

RESULTS

A total of 406 hospitals responded, for an overall response rate of 69%. Reported "regular use" for antimicrobial devices varied by clinical domain. For CAUTI, antimicrobial urinary catheters were reported to be regularly used in 45% of hospitals. For CLABSI, 33% of respondents reported regularly using antimicrobial central venous catheters. For VAP, 5% of hospitals reported regularly using silver-coated endotracheal tubes.

The regular use of one type of antimicrobial device in one clinical domain was significantly associated with the use of another type of antimicrobial device in several different clinical domains. Regularly using antimicrobial central venous catheters was associated with a nearly 3-fold increase in the odds of regularly using antimicrobial urinary catheters (odds ratio [OR] [95% confidence interval (CI)], 2.57 [1.64–4.01]; $P < .001$). Regularly using silver-coated endotracheal tubes to prevent VAP was associated with over 4-fold increases in the odds of regularly using antimicrobial urinary catheters (OR [95% CI], 4.51 [1.44–14.09]; $P < .001$) and antimicrobial central venous catheters (OR [95% CI], 4.57 [1.64–12.74]; $P < .001$).

DISCUSSION

On the basis of a national survey of self-reported use of infection prevention practices, we found that hospitals regularly using antimicrobial devices for the prevention of one device-related infection were more likely to use similar devices for the prevention of another type of infection. The correlation of using antimicrobial devices across the clinical domains of CAUTI, CLABSI, and VAP prevention was striking.

Although previous studies have shown clinical benefits of using antimicrobial urinary catheters to prevent bacteriuria,[6] a recent randomized trial reported no clinically significant benefit in reducing symptomatic CAUTI.[7] Although a recent trial has found that silver-coated endotracheal tubes reduced VAP rates,[8] the benefit of antimicrobial endotracheal tubes is considered an unresolved issue.[3] Multiple randomized trials, however, have shown that use of antimicrobial devices appears to prevent CLABSI.[2] This level of evidence may lead some hospital staff toward a general predisposition to using antimicrobial devices to prevent infection across multiple clinical domains. Another possible explanation is that it is relatively easy to implement coated devices; a matter of "swapping" uncoated devices with coated ones. Despite the additional cost, for some hospitals, this cost may be perceived as a bargain compared with the challenges in implementing or improving other, more complex infection prevention processes, such as instituting nurse-initated urinary catheter discontinuation to reduce CAUTI, which requires changes in the behavior of staff across multiple roles and professions.[9] Another possible factor is the role of costing and marketing strategies by device vendors in some hospitals.[10] These types of contextual insights may help guide future implementation efforts within infection prevention.

Our study has several limitations. First, because the response rate was less than 100%, our results have some susceptibility to nonresponse bias. Second, we relied on self-reported data from the lead infection preventionist at each hospital to determine how frequently the various prevention practices were used. Although an individual respondent may have overstated or understated how frequently the various practices were used, we have no reason to believe this would happen systematically. Third, by virtue of our study design, we are unfortunately unable to correlate utilization data with effectiveness data.

Our findings may help efforts to implement evidence-based infection prevention practices in hospitals. It appears that some hospitals have a proclivity to use antimicrobial devices across different clinical domains, despite the overall mixed evidence-base supporting their use. More expensive is not necessarily better, and it is possible that some hospitals are relying on the potential benefits of antimicrobial devices with inadequate attention paid to basic infection prevention measures.

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