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## CONCISE COMMUNICATION

## Current Practice in *Staphylococcus aureus* Screening and Decolonization

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We surveyed infectious disease physicians to determine their preoperative *Staphylococcus aureus* screening and decolonization practices. Sixty percent reported preoperative screening for *S. aureus*. However, specific screening and decolonization practices are highly variable, are focused almost exclusively on methicillin-resistant *S. aureus*, and do not include testing for mupirocin or chlorhexidine resistance.

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Surgical site infection (SSI) is a common cause of healthcare-associated morbidity and mortality.<sup>1</sup> Each SSI is estimated to increase hospital length of stay by over a week and hospital charges by over \$3,000.<sup>1</sup> Several measures may reduce the risk of SSI, including appropriate use of prophylactic antibiotics, maintenance of perioperative normothermia, careful control of glucose levels, and proper hair removal (reviewed in Anderson et al<sup>2</sup>).

*Staphylococcus aureus* is the most common cause of SSI and accounts for 30% of all SSIs reported to the National Healthcare Safety Network.<sup>3</sup> *S. aureus* carriers are at increased risk of SSI due to their own colonizing strain of *S. aureus*; therefore, eradication of the carrier state has been studied as another SSI prevention measure.<sup>4</sup> Because of conflicting data, the effectiveness of preoperative screening and eradication of *S. aureus* (including methicillin-resistant *S. aureus* [MRSA]) carriage is considered an “unresolved issue” in the recent Society for Healthcare Epidemiology of America (SHEA)/Infectious Diseases Society of America (IDSA) compendium of strategies to prevent SSI.<sup>2</sup> However, many medical centers still conduct preoperative screening and use the results to guide decolonization and/or prophylactic antimicrobial decisions.

A recently published randomized controlled trial that demonstrated a reduction in SSI associated with *S. aureus* screening and decolonization has further increased interest in the preoperative identification of *S. aureus* carriage.<sup>5</sup> We were interested in current practices among infectious disease clinicians related to preoperative identification of the *S. aureus* (including MRSA) carrier state.

### METHODS

The IDSA Emerging Infections Network (EIN) is a healthcare provider-based network of infectious diseases clinicians who are members of the IDSA or the Pediatric Infectious Diseases Society. In May 2010, the EIN surveyed its 1,339 members by fax or e-mail. Members who did not respond were sent 2 reminders.

We asked members whether they performed preoperative screening of surgical patients for *S. aureus* carriage (whether for all *S. aureus* strains or only for MRSA strains) and, if so, which surgical populations and body sites were screened and which laboratory methods were used. We then asked whether members routinely decolonized patients prior to surgery. Those who practiced decolonization were asked which patients received decolonization and with what antimicrobials. We also asked whether perioperative antibiotic prophylaxis was altered on the basis of screening results. We asked about preoperative chlorhexidine bathing practices. We also inquired about *S. aureus* susceptibility testing for the most commonly used topical antimicrobials, mupirocin and chlorhexidine. Finally, we asked members whether they thought that preoperative screening and decolonization for SSI prevention was or should be the standard of care in their communities and whether a legislative mandate required them to screen for *S. aureus* or MRSA.

### RESULTS

Of the 1,339 members who received the survey, 674 (50.3%) responded. Of 674 respondents, 152 (23%) were pediatric infectious diseases physicians. Response rates were higher among pediatric infectious diseases physicians than among adult infectious diseases physicians (58% vs 49%;  $P = .02$ ), higher among members with at least 15 years of practice experience than among those without such experience (58% vs 45%;  $P < .0001$ ), and higher among SHEA members than among others ( $P < .0001$ ). One hundred eighty-six (28%) of 674 respondents reported being unfamiliar with or uninvolved in perioperative *S. aureus* screening in their practices or hospitals. Data described below are based on the responses of the remaining 488 respondents. Denominators for each question vary as outlined below because not every respondent answered every question.

Overall, 294 (60%) of 488 respondents reported preoperative screening of patients for *S. aureus* carriage (231 [47%] screened for MRSA only, and 63 [13%] screened for all *S. aureus* strains). Those who performed screening were most likely to do so for patients undergoing cardiothoracic surgery (178 [67%] of 266; only 43 [16%] of 266 reported doing so for all patients undergoing surgical procedures; Table 1). All 294 respondents who screened patients sampled the nares,

TABLE 1. Surgical Populations Screened, by Report of 266 Emerging Infections Network (EIN) Members Who Performed Screening and Were Aware of Populations Screened

Surgical procedure	No. (%) of EIN members, by type of procedure	
	Elective ( <i>n</i> = 266)	Urgent ( <i>n</i> = 93)
All	43 (16)	19 (20)
All cardiothoracic	147 (55)	55 (59)
Selected cardiothoracic <sup>a</sup>	31 (12)	11 (12)
All orthopedic	84 (32)	19 (20)
Selected orthopedic <sup>b</sup>	88 (33)	19 (20)
Plastic surgery	20 (8)	7 (8)
Other <sup>c</sup>	58 (22)	16 (17)

<sup>a</sup> Coronary artery bypass graft (16); valves (7); with sternotomy (3); cardiac surgery only (3); any foreign body or graft placement (2); previous history of methicillin-resistant *Staphylococcus aureus* (MRSA; *n* = 2); and high risk, inpatient, pacemaker placement, pediatric, and vascular grafts (1).

<sup>b</sup> Joint replacements (49); total hips only (1); depends on surgeon or surgeon's preferences (6); implants or hardware (6); spinal surgery, implant, or fusion (18); nursing home patients (1); previous history of MRSA infection (2); and high risk (1).

<sup>c</sup> Neurosurgical procedures, some specified "with instrumentation" or "with hardware" (18); implants or grafts (9); implantable cardiac devices (2); patients with a history of MRSA infection (7); obstetrics and gynecology, with 2 specified cesarean section only (4); and intensive care unit patients (5).

but fewer than 20% sampled any other body site in addition to the nares, including wounds and/or ulcers (23 [8%]), groin (21 [7%]), axilla (18 [6%]), perirectal area (14 [5%]), and throat (6 [2%]).

Polymerase chain reaction alone (99 [36%] of 277) was the most common screening method used, followed by standard (83 [30%] of 277) and chromogenic agar (76 [27%] of 277) cultures. Only 2 respondents reported using broth enrichment to improve culture yield. Very few respondents tested isolates for susceptibility to mupirocin (19 [6%] of 294) or chlorhexidine (1 [0.3%] of 294).

Over half of the respondents (225 [52%] of 435) reported some use of *S. aureus* decolonization (133 [31%] of 435 decolonized MRSA carriers; 36 [8%] of 435 decolonized all *S. aureus* carriers; and 67 [15%] of 435 decolonized a subset of patients who underwent surgical procedures regardless of carrier status). Interestingly, of the 210 respondents who reported that they did not use decolonization, 80 (38%) still performed preoperative screening. The most common decolonization regimen was a combination of mupirocin ointment and chlorhexidine body wash (161 [69%] of 232; Table 2). Systemic antibiotics were used by 11% (27 of 232) of those who used decolonization regimens; the most commonly used antibiotics were trimethoprim-sulfamethoxazole, a tetracycline, and rifampin. Irrespective of screening-driven decolonization practices, two-thirds of the respondents reported

routine use of preoperative chlorhexidine bathing, either for all patients who underwent surgical procedures (141 [29%] of 486) or a subset thereof (184 [38%] of 486).

Most respondents (242 [79%] of 308) reported altering their prophylaxis practices for patients found or known to be MRSA carriers; in almost all cases, vancomycin was added to the regimen (237 [98%] of 242). For a third of those who made such a change, a second agent was added to the regimen; in most cases (41 [55%] of 74), the second agent was cefazolin.

Finally, although only 18% (88 of 486) of the respondents felt that preoperative screening and decolonization for SSI prevention was the standard of care in their community, over half (252 [52%] of 486) felt that it should be the standard of care. Twenty-five percent (126 of 486) reported practicing under a legislative mandate that required active MRSA surveillance.

## DISCUSSION

Although most EIN respondents reported performing some preoperative *S. aureus* screening, they did so for a variety of different surgical populations and employed several different decolonization approaches. In addition, almost 80% of those who performed screening did so only for MRSA. By contrast, the only randomized controlled trial of screening and decolonization to demonstrate a significant reduction in SSI was performed in the Netherlands and did not include any MRSA carriers.<sup>5</sup> Even if one presumes that this study can be generalized to populations with high MRSA infection rates, screening only for MRSA ignores over half of all *S. aureus* SSIs in US hospitals,<sup>3</sup> given recent data from the National Healthcare Safety Network that reveals that 49% of *S. aureus* SSIs are due to MRSA. If a screening and decolonization intervention is effective, it may be beneficial to apply it to all *S. aureus* carriers.

Regarding detection methods, most centers that screen for *S. aureus* use culture. However, only a fraction of centers include a broth enrichment step, and the vast majority screen nares samples only. Failure to include a broth enrichment step can reduce nares culture yield by up to 15%,<sup>6</sup> and sampling the nares only (instead of the nares and throat and/or other body sites) misses another 15%–20% of carriers,<sup>6–8</sup> although it is not clear whether the detection of these additional carriers would further impact SSI rates. Finally, despite the fact that mupirocin plus chlorhexidine is the most widely applied decolonization approach, very few centers test for mupirocin resistance, which is a known threat,<sup>9</sup> and only 1 center tests for chlorhexidine resistance, which is a potentially emerging threat.<sup>10</sup>

In summary, preoperative *S. aureus* screening and decolonization practices among EIN members are highly variable, focus almost exclusively on MRSA, and often employ less sensitive methods of *S. aureus* detection. Where should we go from here? Respondents were almost evenly split on

TABLE 2. Agents Used for Decolonization by the 232 Emerging Infection Network (EIN) Members Who Performed Perioperative Decolonization of *Staphylococcus aureus* Carriers and Reported Specific Regimens

Antimicrobial regimen	No. (%) of EIN members (n = 232)
Mupirocin ointment plus chlorhexidine body wash	161 (69)
Mupirocin ointment alone	23 (10)
Chlorhexidine body wash alone	14 (6)
Mupirocin plus chlorhexidine plus oral <sup>a</sup> antibiotics	24 (10)
Mupirocin plus chlorhexidine plus parenteral <sup>b</sup> antibiotics	1 (0.4)
Mupirocin plus chlorhexidine plus oral <sup>a</sup> and parenteral <sup>b</sup> antibiotics	1 (0.4)
Chlorhexidine plus oral <sup>a</sup> antibiotics	1 (0.4)

<sup>a</sup> Includes trimethoprim-sulfamethoxazole (TMP-SMX) plus a tetracycline plus rifampin (9 respondents), TMP-SMX alone (4), a tetracycline plus rifampin (4), a tetracycline alone (3), TMP-SMX plus a tetracycline (2), TMP-SMX plus rifampin (2), and rifampin alone (2).

<sup>b</sup> Includes vancomycin (1 respondent) and vancomycin plus ceftazidime (1).

whether *S. aureus* screening and selective decolonization should become the standard of care for SSI prevention. Additional information that may help support this approach and identify those subsets of surgical populations most likely to benefit include randomized controlled trials in populations with high MRSA prevalence and trials that compare preoperative chlorhexidine bathing of all patients with *S. aureus* screening and selective decolonization. If these studies confirm a benefit, broader application of screening and decolonization will also require wider availability of methods for testing and surveillance for mupirocin and chlorhexidine resistance.

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#### REFERENCES

- Kirkland KB, Briggs JP, Trivette SL, et al. The impact of SSI in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. *Infect Control Hosp Epidemiol* 1999;20:725–730.
- Anderson DJ, Kaye KS, Classen D, et al. Strategies to prevent surgical site infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl):S51–S61.
- Hidron AJ, Edwards JR, Patel J, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006–2007. *Infect Control Hosp Epidemiol* 2008;29:996–1011.
- Van Rijen M, Bonten M, Wenzel R, Kluytmans J. Intranasal mupirocin for reduction of *Staphylococcus aureus* infections in surgical patients with nasal carriage: a systematic review. *J Antimicrob Chemother* 2008;61:254–261.
- Bode LGM, Kluytmans JAJW, Wertheim HFL, et al. Preventing surgical-site infections in nasal carriers of *Staphylococcus aureus*. *N Engl J Med* 2010;362:9–17.
- Andrews JI, Fleener DK, Messer SA, Kroeger JS, Diekema DJ. Screening for *Staphylococcus aureus* carriage in pregnancy: usefulness of novel sampling and culture strategies. *Am J Obstet Gynecol* 2009;201:396.e1–e5.
- Boyce JM, Havel NL, Maria B. Frequency and possible infection control implications of gastrointestinal colonization with methicillin-resistant *Staphylococcus aureus*. *J Clin Microbiol* 2005;43:5992–5995.
- Mertz D, Frei R, Periat N, et al. Exclusive *S. aureus* throat carriage: at risk populations. *Arch Intern Med* 2009;169:172.
- Deshpande LM, Fix AM, Pfaller MA, Jones RN. Emerging elevated mupirocin resistance rates among staphylococcal isolates in the SENTRY Antimicrobial Surveillance Program (2000): correlations of results from disk diffusion, Etest and reference dilution methods. *Diagn Microbiol Infect Dis* 2002;42:283–290.
- Batra R, Cooper BS, Whiteley C, Patel AK, Wyncoll D, Edgeworth JD. Efficacy and limitation of a chlorhexidine-based decolonization strategy in preventing transmission of methicillin-resistant *Staphylococcus aureus* in an intensive care unit. *Clin Infect Dis* 2010;50:210–217.