Universal Screening for Methicillin-Resistant *Staphylococcus aureus* in Surgical Patients

Harry J Henteleff, MD, Philip S Barie, MD, Stewart M Hamilton, MD, for the members of the Evidence-Based Reviews in Surgery Group

The term *evidence-based medicine* was first coined by Sackett and colleagues and the Evidence-Based Medicine Working Group[1] as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." The key to practicing evidence-based medicine is applying the best current knowledge to decisions in individual patients. Medical knowledge is continually and rapidly expanding, and it is impossible for an individual clinician to read all the medical literature. For clinicians to practice evidence-based medicine, they must have the skills to read and interpret the medical literature so they can determine the validity, reliability, credibility, and utility of individual articles. These skills are known as critical appraisal skills. Generally, critical appraisal requires that clinician have some knowledge of biostatistics, clinical epidemiology, decision analysis, and economics, as well as clinical knowledge.

The Canadian Association of General Surgeons (CAGS) and the American College of Surgeons (ACS) jointly sponsor a program entitled "Evidence-Based Reviews in Surgery (EBRS)," supported by an educational grant from Ethicon Inc and Ethicon Endo-Surgery Inc. The primary objective of this initiative is to help practicing surgeons improve their critical appraisal skills. During the academic year, 8 clinical articles are chosen for review and discussion. They are selected not only for their clinical relevance to general surgeons, but also because they cover a spectrum of issues important to surgeons; for example, causation or risk factors for disease, natural history or prognosis of disease, how to quantify disease (measurement issues), diagnostic tests and the diagnosis of disease, and the effectiveness of treatment. Methodologic and clinical reviews of the article are performed by experts in the relevant areas and posted on the EBRS Web site. A listserve discussion is held in which participants can discuss the monthly article. Fellows and candidates of the College can access Evidence-Based Reviews in Surgery through the ACS Web site (www.facs.org). All journal articles and reviews are available electronically through the Web site. Currently we have a library of 50 articles and reviews that can be accessed at any time. Each October, a new set of articles will be available each month until May. Surgeons who participate in the current (modules) packages can receive continuing medical education (CME) credits by completing a series of multiple choice questions. Additional information about EBRS is on the ACS Web site or by email to the administrator, Marg McKenzie, at mmckenzie@mtsinai.on.ca.

In addition to making the reviews available through the ACS and CAGS Web sites, 4 of the reviews are published in condensed versions in the *Canadian Journal of Surgery* and the other 4 will be published in the *Journal of the American College of Surgeons* each year.

REFERENCE

1. Evidence-Based Medicine Working Group. Evidence-based medicine. JAMA 1992;268:2420–2425.

SELECTED ARTICLE

Universal screening for methicillin-resistant *staphylococcus aureus* at hospital admission and nosocomial infection in surgical patients

Harbarth S, Fankhauser C, Schrenzel J, et al. JAMA 2008;299:1149–1157

ABSTRACT

Objective: To determine the effect of early methicillin-resistant *Staphylococcus aureus* (MRSA) detection on MRSA infection rates in surgical patients.

Design: Prospective, cohort study.

Setting: Academic Surgical Department.

Patients: Twenty-one thousand seven hundred fifty-four surgical patients admitted to the hospital between July 2004 and May 2006.

Interventions: A crossover design was used to compare 2 MRSA control strategies (rapid screening on admission plus standard infection control measures versus standard infection control measures alone) on hospital-acquired MRSA infection. The study was completed in 4 phases:

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phase 1, baseline surveillance from July 2004 to September 2004; phase 2 intervention period 1, October 2004 to June 2005; phase 3 washout period, July 2005 to August 2005; and phase 4 intervention period 2, September 2005 to May 2006.

Main Outcomes: Incidence of hospital-acquired MRSA infection, MRSA surgical site infection, and rates of hospital-acquired MRSA.

Results: Screening of 10,913 patients identified 515 carriers (5.1%) of MRSA. Three hundred thirty-seven of these carriers had been previously identified. Test results were obtained within 24 hours for most patients (interquartile range, 12.1 to 28.2 hours). The rate of nosocomial MRSA infection in the intervention group was 1.11 per 1,000 patient-days versus 0.91 per 1,000 patient-days in the control group (odds ratio [OR] 1.20, 95% CI 0.85 to 1.69; $p = 0.29$). Fifty-seven percent of the patients with nosocomial MRSA infection in the intervention were MRSA free on admission and developed their infection despite screening and infection control precautions.

Conclusions: A universal, rapid MRSA admission screening strategy did not reduce nosocomial MRSA infection in a surgical department with endemic MRSA prevalence but relatively low rates of MRSA infection.

Commentary: It has been estimated that patients who develop an infection caused by MRSA are twice as costly to treat and twice as likely to die, as compared with matched counterparts who develop staphylococcal infections that are methicillin-susceptible. Patients who are colonized with *Staphylococcus aureus* are more likely to develop a postoperative infection, so it is important to determine if preoperative identification of staphylococcal carrier status can prevent postoperative infections.

Screening for disease is an important part of medical practice and has many well-established indications. In this study, asymptomatic individuals were screened for the presence of MRSA in order to prevent surgical infections in carriers and prevent transmission to other patients. Guidelines have recommended screening of patients for MRSA since 2003 despite a lack of clear-cut evidence. Screening patients for culture with topical swabs is minimally invasive, but does incur cost, and there are potential serious consequences for patient care if a patient must be isolated. Active surveillance culture programs add complexity to hospital bed management. Patients on contact precautions require a single-patient room. Therefore, constraints on hospital bed capacity may be encountered that limit the hospital's capacity to expand contact precautions to many more patients. Staffing needs must also be evaluated and adherence of health care workers to maintenance of contact precautions must be reinforced, especially hand hygiene. Moreover, contact precautions can lead to several unintended consequences, including reduced contact between health care workers and patients, and for patients, increased anxiety and depression owing to feelings of isolation. An increase in preventable noninfectious adverse events can also result from decreased contact with primary caregivers.

If MRSA is identified, other tactics that have been advocated include decolonization of the *S. aureus* nasal carrier state by the use of a topical agent such as mupirocin, but the benefit is transitory and there is no convincing evidence that mupirocin treatment reduces the incidence of surgical site infection. Vancomycin rather than cefazolin surgical prophylaxis of MRSA carriers has been advocated, but likewise is controversial owing to a lack of evidence.

The study by Harbath and colleagues included 21,754 patients admitted to multiple surgical services, and it was designed to detect a 33% reduction in the nosocomial infection rate with 95% confidence and a power of 80%. It was a prospective cohort study with a crossover design comparing universal screening with a rapid MRSA test to "standard infection control measures."

The screening test that was used is validated and the protocol for treating carriers (5-day decolonization, changes in perioperative antibiotic prophylaxis) is well described. Nosocomial infection was defined as a blood stream or surgical site infection. Ninety-four percent of patients in the intervention group were screened, which demonstrates good compliance with the protocol. However, it is not clear what "standard infection control measures" involved. It is presumed that known carriers and infected patients were isolated and standard hand washing procedures were followed.

In this study, MRSA screening of 10,193 patients identified 515 carriers (5.1%). Three hundred thirty-seven of these carriers had not been identified previously. Test results were obtained within 24 hours in most patients (interquartile range 12.1 to 28.2 hours). Fifty-seven percent of the patients who developed nosocomial infections with MRSA were free of the bacteria on admission. Overall, the rate of infection in the intervention group was not statistically significantly different (1.11 per 1,000 patient-days versus 0.91 per 1,000 patient-days, [OR 1.2, 95% CI 0.85 to 1.69, $p = 0.29$]). Also, only 43% of patients in the intervention group actually had changes made to their perioperative antibiotics because of time needed to get MRSA test results back. Clearly, the intervention would not have been cost-effective because of the added cost of MRSA

testing. However, it must be stated that there might be a cost benefit to ruling out the MRSA carrier state to avoid isolation of some patients. Some hospitals isolate all admissions from other centers until MRSA tests are negative. A more rapid test such as the one used in this study could shorten the period of isolation in patients who turn out to be MRSA-free and be beneficial from that point of view, which was not addressed in this study.

An ideal study design would have been a randomized, controlled trial with random assignment to a treatment ward or a control ward, but the authors correctly state that it can be very difficult to ensure patients are admitted where you want them, with hospitals often running near 100% occupancy. The crossover design is the next best design and the authors state that their analysis failed to show any effect of study design on their results.

Overall, this was a well-designed and executed study that failed to show that universal screening reduces nosocomial MRSA infection. Five studies, this one included, provide reasonable quality evidence as to the efficacy of universal screening for MRSA in surgical departments. The results are mixed, with 3 studies in favor and 2 against. Given the conflicting data, universal screening for MRSA remains controversial. The solution to the problem of MRSA postoperative infection awaits better screening, more effective decolonization, and better antibiotics for prophylaxis. For now, rigorous implementation of infection prevention ensembles (eg, hand hygiene, meticulous technique, and appropriate administration of prophylactic antibiotics where indicated) is probably the best we can do. Poor performance in any aspect may doom the intervention to failure, and highlights that surveillance, as a single intervention, is unlikely to work.

THE EVIDENCE-BASED REVIEWS IN SURGERY GROUP COMPRISES: