

## RESEARCH BRIEFS

## Survey of Preoperative Infection Prevention for Coronary Artery Bypass Graft Procedures

Approximately 400,000 coronary artery bypass graft (CABG) procedures are performed annually in the United States.<sup>1</sup> Surgical site infections (SSIs) complicate 3%–5% of CABG procedures and result in significant attributable mortality.<sup>2–4</sup> Studies show that surgical preparation with chlorhexidine is more effective than povidone-iodine in reducing bacterial colony counts and lowering SSI.<sup>5–8</sup> In addition to surgical preparation, the use of clippers or a chemical depilatory for hair removal is associated with a lower rate of SSI than is the use of razors.<sup>8,9</sup>

To better understand compliance with established standards of care, we conducted a survey of preoperative surgical practices used before isolated CABG surgery among hospitals in California. We used the survey data to calculate an estimate of excess infections and mortality from noncompliance with practice standards.

We developed a web-based survey for all 120 California medical centers that perform CABG surgery. The survey asked about preoperative bathing, surgical preparation, dressing management, and antibiotic prophylaxis for isolated CABG (Appendix A, available online as a PDF). Questions relating to surgical preparation and hair removal included the following: (i) What do you most commonly use for surgical preparation, usually given in the operating room immediately prior to CABG? (ii) What method is most commonly used for hair removal prior to CABG? (iii) Who receives preoperative bathing? (iv) What is the location of the preoperative bath? (v) What is used for preoperative bathing? We collected descriptive information on individual hospitals, including geographic location of hospitals, and teaching versus community hospital from the California Department of Public Health and the California Office of Statewide Health Planning and Development.<sup>10,11</sup>

Estimates for the number of isolated CABG procedures performed per year were based on the most recent reports to the California CABG Outcomes Reporting Program.<sup>11</sup> The impact of surgical preparation on SSI rates was estimated on the basis of probability of deep SSIs with chlorhexidine (1%) versus povidone-iodine (3%).<sup>3–8</sup>

The number of procedures using povidone-iodine multiplied by a 2% attributable infection rate equaled the number of SSI cases. Estimates for mortality were based on an attributable mortality of 14% for SSI after CABG as previously reported.<sup>3</sup> Eighty (67%) of the 120 medical centers responded to the survey. Respondents included STS database managers (41%), cardiac surgery nurse practitioners (37%), infection

control personnel (20%), and surgeons (2%). Hospitals performed a mean of 140 cardiac surgical procedures annually (median, 106 [interquartile range, 77–174]).

Ninety-one percent of medical centers (69 of 76) had a standard bathing protocol for patients to conduct before surgery. Preoperative bathing was performed only at home by 6 (8%) of 73, only in the hospital by 8 (11%) of 73, and both at home and in the hospital in 59 (81%) of 73 medical centers. Sixty-eight (93%) of 73 used chlorhexidine alone for preoperative bathing, 4 (6%) of 73 used mupirocin and chlorhexidine, and 1 (1%) of 73 used povidone-iodine alone. Ninety-four percent of medical centers had a preoperative bathing protocol for all patients, 4% had a preoperative bathing protocol for patients with a history of methicillin-resistant *Staphylococcus aureus* infection or colonization, and 2% had a preoperative bathing for high-risk patients.

Preoperative hair removal was accomplished with clippers by 94% of responding medical centers. One center used chemical depilatory. None of the medical centers used razors for hair removal.

For surgical skin preparation performed in the operating room, 2 (3%) of 78 medical centers used an alcohol based product, 4 (5%) of 78 used povidone-iodine alone, 54 (69%) of 78 used chlorhexidine alone, and 9 (13%) of 78 used chlorhexidine and povidone-iodine dual cleansing.

We assessed the impact of noncompliant povidone-iodine surgical skin preparation. Annually, an estimated 357 CABG procedures are performed in California using povidone-iodine surgical preparation. We estimate that 7 additional infections ( $357 \times 0.02 = 7.14$  infections) and 1 fatality could have been avoided annually if chlorhexidine had been used for prophylaxis.

Preoperative infection prevention practices for CABG procedures are heterogeneous across California. Dual cleansing with chlorhexidine and povidone-iodine for preoperative operating room bathing is novel, but data establishing clinical effectiveness for SSI reduction are lacking. A small minority of institutions (8%) use povidone-iodine alone, despite clear data that povidone-iodine skin preparation is associated with a higher risk of SSI.<sup>5–8</sup>

There is a need to understand why some medical centers are slow at adopting evidence-based strategies that are demonstrated to reduce SSI rates and the associated morbidity and mortality. Changing the clinical workflow of a particular hospital to adopt evidenced-based practices and reduce patient risk depends on changing the institutional culture of safety and the institutional approach toward quality improvement and performance. Proactive efforts from the Joint Commission: Accreditation, Health Care, Certification (JCAHO) to ensure full uptake of evidence-based guidelines could have a strong impact on patient safety, particularly for standardized process measures. An opportunity may also exist for edu-

cational interventions from the Society for Thoracic Surgeons, Society for Healthcare Epidemiology of America, the Infectious Diseases Society of America, or the American Hospital Association to engage with hospital leaders and cardiac surgeons.

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## Variation in Antibiotic Prophylaxis Selection for Coronary Artery Bypass Graft Procedures in an Era of Increasing Methicillin-Resistant *Staphylococcus aureus* Prevalence

Approximately 400,000 coronary artery bypass graft (CABG) procedures are performed annually in the United States.<sup>1</sup> Infection is the second most common complication, but appropriate preoperative antibiotic prophylaxis reduces the risk of surgical site infections (SSIs).<sup>2</sup>

There is no consensus on routine vancomycin use for CABG prophylaxis. National guidelines from the Infectious Diseases Society of America (IDSA), Society for Healthcare Epidemiology (SHEA), and others state, "there is no clear evidence to support the use of vancomycin, alone or in combination ... for routine antimicrobial prophylaxis in institutions that have a high prevalence of MRSA."<sup>3(p219)</sup> The IDSA/SHEA reserves vancomycin for individual patients at high risk for methicillin-resistant *Staphylococcus aureus* (MRSA) infection.<sup>3</sup> In contrast, the Society for Thoracic Surgery (STS) guidelines state, "it would appear most reasonable to employ a cephalosporin as the primary prophylactic agent ... [and vancomycin as] an adjuvant agent ... where there is a high prevalence of MRSA isolates from infections."<sup>4(p1571)</sup> To understand current practice, we conducted a survey of antibiotic prophylaxis for CABG among California hospitals (Appendix A, available online as a PDF). We surveyed all medical centers