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Survey of Pre-operative Infection Prevention for CABG Procedures

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

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

Methods

We developed a web-based survey for all 120 California medical centers that perform CABG surgery. The survey asked about pre-operative bathing, surgical preparation, dressing management, and antibiotic prophylaxis for isolated CABG. Questions relating to surgical preparation and hair removal included: 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 pre-operative bathing, iv) what is the location of the pre-operative bath, and v) what is used for pre-operative bathing. We collected descriptive information on individual hospitals,

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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.^{10,11}

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 (C-CORP).¹¹ The impact of surgical preparation on SSI rates was estimated based on probability of deep surgical site infections with chlorhexidine (1%) versus povidone-iodine (3%).³⁻⁸

Number of procedures using povidone-iodine x 2% attributable infection rate = # of SSI cases

Estimates for mortality were based on an attributable mortality of 14% for SSI following CABG as previously reported.³

Results

Eighty of the 120 medical centers (67%) responded to the survey. Respondents included STS database managers (41%), cardiac surgery nurse practitioners (37%), infection control personnel (20%), and surgeons (2%). Hospitals performed an average of 140 (median 106 [IQR 77, 174]) cardiac surgeries annually.

Ninety-one percent (n= 69/76) of medical centers had a standard bathing protocol for patients to conduct prior to surgery. Pre-operative bathing was performed only at home by 8% (n=6/73), only in the hospital by 11% (n=8/73), and both at home and in the hospital in 81% (n=59/73) of medical centers. Ninety-three percent used chlorhexidine alone for pre-operative bathing (n= 68/73), 6% used mupirocin and chlorhexidine (n= 4/73), and 1% used povidone-iodine alone (n= 1/73). Ninety four percent of medical centers had a pre-operative bathing protocol for all patients, 4% had a pre-operative bathing protocol for patients with a history of MRSA, and 2% had a pre-operative bathing for “high-risk” patients.

Pre-operative 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, 3% of medical centers (n= 2/78) used an alcohol based product, 5% (n= 4/78) used povidone-iodine alone, 69% (n=54/78) used chlorhexidine alone, and 13% (n=9/78) used chlorhexidine and povidone-iodine dual cleansing.

Impact of Non-Compliant 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 ($357 \times 2\% = 7.14$ infections) and 1 fatality could be avoided annually if chlorhexidine had been used for prophylaxis.

Discussion

Pre-operative infection prevention practices for CABG procedures are heterogeneous across California. Dual cleansing, chlorhexidine and povidone-iodine, for pre-operative OR bathing is novel, but data establishing clinical effectiveness for SSI reduction are lacking. A small minority of institutions (8%) use of povidone-iodine alone, despite clear data that povidone-iodine skin preparation is associated with higher risk of SSI.^{5–8}

There is a need to understand why some medical centers are slow at adopting evidence-based strategies demonstrated to reduce SSI rates and the associated morbidity and mortality. Changing the clinical workflow of a particular hospital in order to adopt evidenced-based practices and reduce patient risk depends on changing the institutional culture of safety and institutional approach towards quality improvement and performance. Proactive efforts from the Joint Commission: Accreditation, Health Care, Certification (JCAHO) to ensure full uptake of evidenced based guidelines could have a strong impact on patient safety, particularly for standardized process measures. An opportunity may also exist for educational interventions from the Society for Thoracic Surgeons, Society for Healthcare Epidemiology of America, the Infectious Disease Society of America, or the American Hospital Association to engage with hospital leaders and cardiac surgeons.

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