

# Implementing Evidence-based Practice Findings to Decrease Postoperative Sternal Wound Infections Following Open Heart Surgery

Camille Haycock, MS, RN, FNP, CCRN  
Craig Laser, MA, RN  
Jennifer Keuth, BSN, RN  
Kerry Montefour, BSN, RN, CIC  
Melissa Wilson, BSN, RN  
Kerry Austin, RN, BS  
Charmaine Coulen, MPH  
Deborah Boyle, MSN, RN, AOCN, FAAN

Sternal wound infections following open heart surgery are an infrequent occurrence but can have significant impact on patient morbidity, length of stay, and cost of care. The objective of this project initiative was to decrease the incidence of sternal wound infections by examining and changing current practice in the preoperative and postoperative management of patients undergoing open heart surgery. Following a literature review of interdisciplinary best practices, process teams were formed to evaluate our own patient cohort with documented infection. Five key areas were addressed: (1) preoperative skin preparation, (2) antibiotic prophylaxis, (3) blood glucose control, (4) wound care management, and (5) hand hygiene. A retrospective chart review of patients with documented sternal wound infections status post–mediastinal open heart surgery revealed that the average postoperative glucose was 201 mg/dL. An

## **Camille Haycock, MS, RN, FNP, CCRN**

Clinical Nurse Specialist, Cardiovascular Critical Care, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Craig Laser, MA, RN**

Former Director, Critical Care Center, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Jennifer Keuth, BSN, RN**

Staff Nurse, Cardiovascular Intensive Care, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Kerry Montefour, BSN, RN, CIC**

Director, Epidemiology, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Melissa Wilson, BSN, RN**

Educator, Cardiovascular Intensive Care, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Kerry Austin, RN, BS**

Senior Clinical Data Analyst, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Charmaine Coulen, MPH**

Senior Clinical Data Analyst, Banner Good Samaritan Medical Center, Phoenix, Ariz.

## **Deborah Boyle, MSN, RN, AOCN, FAAN**

Practice Outcomes Nurse Specialist, Banner Good Samaritan Medical Center, Phoenix, Ariz.

The authors gratefully acknowledge the contributions of Pierre Tibi, MD, Cardiovascular Surgeon, Mark Rudinsky, MD, Hospital Epidemiologist, Paul Stander, MD, Medical Director, and the support of Herb Geary, MBA, RN, Chief Nurse Executive, in the development and publication of this initiative.

## **Corresponding author**

Camille Haycock, MS, RN, FNP, CCRN, Banner Good Samaritan Medical Center, 1111 E McDowell Rd, Phoenix, AZ 85006 (e-mail: Camille.haycock@bannerhealth.com)

inquiry of practice variations determined the absence of a common provider and causative organism. A change model guided project initiatives and sustainability of new behaviors and practice. Each element of the project initiative had defined outcome measures. Staff nurses participated in peer education and outcome data collection. Following the implementation of evidence based practice changes, a linear decrease in sternal wound infections was documented. Nurses play a critical role in identifying, orchestrating, and evaluating change efforts in clinical practice. Outcomes are enhanced when nurses collaborate with all stakeholders in the practice improvement initiative.

**KEY WORDS:** Galpin's Change Model, nosocomial infection

**M**otivators of clinical change within a hospital setting are numerous. National benchmarking data, the desire for excellence, customer/patient satisfaction findings, research results, and financial constraints all can create incentives for change. The timing and urgency to promote change is tempered by its potential to minimize risk to the patient and ultimately improve practice outcomes.

In spite of recent advances in coronary revascularization, open heart surgery remains a common operative procedure. It offers patients lifesaving intervention through coronary artery bypass and valvular repair and/or replacement. In the United States, there are more than 600,000 cardiac surgeries performed annually.<sup>1</sup> Although atrial fibrillation, pneumonia, stroke, and infection following open heart surgery are uncommon, these complications can have devastating effects.

Deep and superficial sternal wound infections occur infrequently but can have a significant impact on patient morbidity, length of stay, and the cost of care. This article reviews one hospital's response to an increased deep sternal wound infection rate that resulted in improved patient outcomes.

### The Impetus for Change

Surgical site infections are the most common nosocomial infection among surgical patients.<sup>2</sup> The national incidence of deep sternal wound infection ranges from 0.5% to 5%<sup>3</sup> and is associated with a morbidity and mortality of 14%.<sup>4,5</sup> The Centers for Disease Control and Prevention (CDC) defines a deep sternal wound infection as an infection involving incisional deep soft tissue within 30 days of the operation.<sup>6</sup>

Our hospital benchmarks sternal wound infection utilizing the National Nosocomial Infection Surveillance System (NNIS). Over a period of 6 months, we noted an increase in post-open heart surgery infections. An investigation of possible causes ensued.

A retrospective chart review of patients ( $n = 7$ ) with documented sternal wound infections during the first quarter of 2003, focused on potential identification

of common provider, causative agent, and/or common environment. This review did not identify a common healthcare provider (ie, surgeon, nurse, anesthesiologist, technician) among the infected patients. No consistent causative organism, operating room suite, intensive care unit (ICU), telemetry room, or common piece of equipment was identified as a possible causal factor. What was discovered was an average postoperative glucose level of 201 mg/dL, varied practice in the documentation and administration of antibiotic prophylaxis, lack of standardized preoperative skin preparation, and highly diverse postsurgical wound care management. As these problems emerged, the literature was reviewed and best practices were established.

### Best Practice Findings

*Surgical site infections* account for approximately one quarter of all nosocomial infections.<sup>7</sup> In 1999, the CDC published guidelines for the prevention of surgical site infections, recommending that hair removal be by clipping, rather than traditional shaving, performed immediately before surgery.<sup>6</sup>

*Prophylactic antibiotics* prior to surgery are recommended. The initial dose of intravenous prophylactic antimicrobial agent should be timed such that the bactericidal concentration of the drug in the serum and tissues is reached before the initial incision is made.<sup>6</sup> Therapeutic levels in serum and tissues should be sustained throughout the surgical procedure and maintained for several hours following closure.<sup>6</sup>

*Hyperglycemia* and Insulin resistance are 2 common problems in critically ill patients. In a prospective, randomized trial involving 1548 adult cardiovascular surgical patients, intensive insulin therapy used to maintain blood glucose at or below 110 mg/dL decreased morbidity and mortality among critically ill patients regardless of a presurgical history of diabetes.<sup>11</sup>

The association between elevated blood glucose levels and postoperative deep sternal wound infection has been studied and diabetes mellitus has been

identified as an independent risk factor for sternal wound infection.<sup>8</sup> The use of continuous intravenous insulin in the perioperative phase can reduce the incidence of sternal wound infection in diabetic patients.<sup>9</sup> In the immediate postoperative phase, elevated blood glucose levels have been associated with an increased rate of sternal wound infections. Hence the maintenance of blood glucose levels less than 200 mg/dL in the immediate postoperative period could reduce sternal wound infections in diabetic patients.<sup>10</sup> In a multivariate analysis of patients with sternal wound infections, preoperative blood glucose levels, timing of antibiotics, and staple use in the operating room were associated with sternal wound infections.<sup>8</sup>

There is no consensus on best practice for *post-operative wound care*. National guidelines recommend protection of the wound with a sterile dressing for 24 to 48 hours.<sup>7</sup> Beyond this time frame, there is not a recommendation for wound cover and variability in surgeon practice is the norm. Evidence that promotes the standardization of evidence-based patient care in this area could improve patient outcomes.

In recent studies involving *hand hygiene*, it was shown that bacterial reduction on the hands is best accomplished by alcohol-based hand rubs rather than washing with soap and water, unless hands are visibly soiled, or washing performed for 15 seconds.<sup>12,13</sup> In addition, healthcare personnel are more likely to use alcohol-based hand rubs than hand washing because of the convenience of hand rubs.<sup>14</sup> In a recent study, specific to physician practice, it

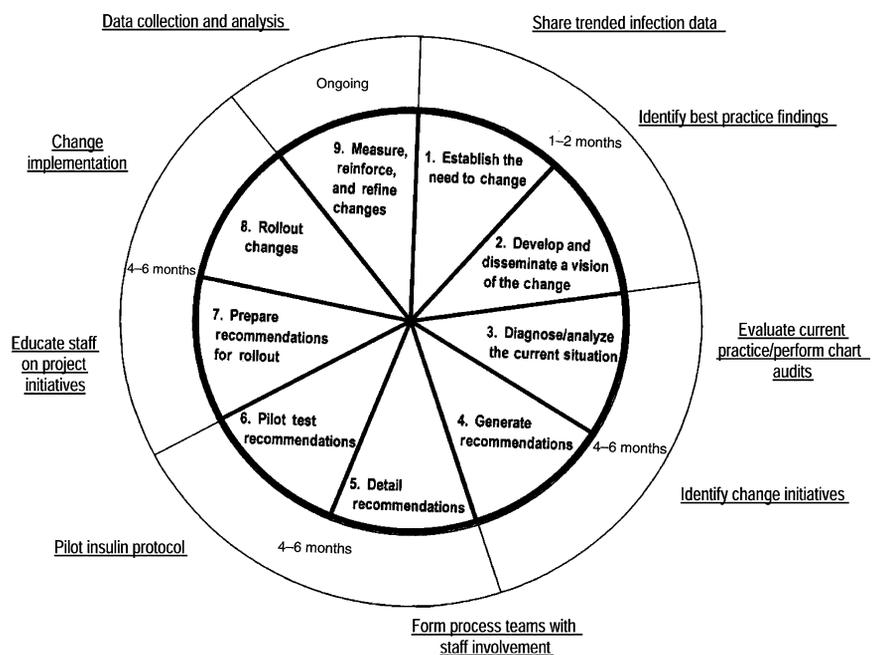
was noted that hand washing adherence was only 57%.<sup>15</sup>

### Change Initiatives

Best practice findings related to reduction of sternal wound infections identified five critical areas to consider: (1) preoperative skin preparation, (2) antibiotic prophylaxis and timing, (3) blood glucose control, (4) wound care management, and (5) hand washing. Change initiatives then were developed based on institution-specific data.

Timothy Galpin's Change Model was used to guide change processes.<sup>16</sup> Described as the effort that drives disruption of the status quo deep into an organization, the work of change needs to occur at the local level. Concern should be directed toward sustaining change as well as implementing it. Acceptance of the gradual nature of change is essential. Galpin identified 9 stages of the change trajectory, as shown in Figure 1.<sup>16</sup>

The 9 stages of change are typically associated with the 4- to 6-month time frame noted in Galpin's Change model. However, during our hospital's initiative, the first 4 stages evolved rapidly within the space of 4 to 8 weeks. Pilot test recommendations also occurred within a 2-month time frame. The preparation for rollout and the actual rollout of project initiatives occurred within 3 to 4 months of project inception. Urgency created by the need to improve patient outcome and safety accelerated the change process. In addition, a key factor in this urgency and speed of implementation came from the grassroots



**FIGURE 1.** Change management process model with hospital correlates of each stage Adapted from Galpin.<sup>16</sup> Reprinted with permission of Wiley.

involvement of staff. The following describes the change initiatives utilized at this hospital.

### Implementation of Change Initiatives

Teams were formed to implement evidence-based practice changes. On each team were representatives from midlevel management, staff nurses, and physicians. Initially, education of all team members was provided on the supporting evidence for each change initiative. This intensive education served as the foundation for this interdisciplinary collaborative.

#### Preoperative Skin Preparation

The presurgical change initiatives included the standardization of skin preparation technique. All patients would be prepped using clippers instead of razors within 4 hours of operating start time. The procedure for skin preparation included 2 antiseptic preoperative skin washings (or showers) with chlorhexadine, with the clipping procedure performed between washings. A goal of 100% of patients having hair removed without shaving was established. Razors were removed from the cardiovascular preoperative suites and clippers were acquired. Best practice education was provided to all persons responsible for prepping patients. Ongoing chart audits and direct observation were used to measure the percentage of patients whose hair was removed without shaving. Exclusion criteria included patients for whom hair removal was not necessary or patients who were taken emergently to the operating room. Direct observation and chart auditing provided ongoing measurement of compliance with established procedure and patient outcomes data relative to this initiative. Specifically, the data collectors extracted the way in which hair was removed (ie, shaving, clipping, or both). In the retrospective review of charts ( $n = 39$ ), 79% of patients had hair removed with clippers within the 4-hour window of operating time. However, with direct patient observation, 100% clipping compliance for skin preparation ( $n = 24$ ) was verified. We realized then that some care providers were using the terminology of shaving and clipping interchangeably in their documentation of preoperative skin preparation.

#### Antibiotic Prophylaxis

This initiative included appropriate and on-time preoperative antibiotic prophylaxis. The recommended practice was for cefazolin 1 gm or cefuroxime 1.5 gm intravenous to be administered within 30 to 60 minutes preprocedure. With a history of penicillin allergy or risk for methicillin-resistant *Staphylococcus*

**TABLE 1** Elements of Surgical Infection Prevention Data Collection Tool<sup>17</sup>

% Open heart patients with appropriate selection of prophylactic antibiotic
% Open heart patients with on-time prophylactic antibiotic administration
% Open heart patients who received prophylactic antibiotics whose antibiotic was discontinued within 24 h after close
% Open heart patients with perioperative and postoperative glucose control
% Open heart patients whose hair was removed without shaving

*aureas* or another indication, vancomycin is administered within a 2-hour window of operating time. The institutional practice is consistent with the guidelines established by the Surgical Infection Prevention Medicare Quality Improvement Project,<sup>17</sup> adapted from antimicrobial recommendations for prophylaxis in surgery.<sup>18</sup>

Implementation of this initiative required multiple practice changes for nurses and physicians. The long-standing practice of nurses administering antibiotics on the patient care unit prior to transfer to the operating room was ceased. The new protocol for initiating prophylactic antibiotic infusions required administration in the operating room by the Anesthesia Department. This procedure facilitated antibiotic administration within the recommended window of 30 to 60 minutes prior to incision time.<sup>6</sup> The method used to evaluate this change initiative included the utilization of the Surgical Infection Prevention (SIP) Collaborative Data collection tool (Table 1).<sup>17</sup> A retrospective chart review was used to determine the appropriateness of antibiotic administration and the timing of the antibiotic. In chart review, we have identified that the percentage of open heart patients currently receiving appropriate antibiotics is 98% and the percentage of patients receiving antibiotics on time is 87%.

#### Blood Glucose Control

In the critically ill, strict glycemic control (ie, blood glucose  $\leq 110$  mg/dL) has been documented to reduce morbidity and mortality.<sup>11</sup> On the basis of this evidence, we established a target blood glucose range of 80 to 110 mg/dL. The next step was to develop an aggressive insulin protocol to manage blood sugar fluctuation. The cardiovascular ICU nursing staff on the glucose control best practice team conducted a national search to determine protocol use and establish global standards of care. These findings were shared with the rest of the team of cardiovascular surgeons, intensivists, pharmacists, and endocrinologists. A protocol was devised that allowed nursing to incrementally increase insulin dosing in response to hourly

blood glucose levels. Three levels of infusion allow the nurses to move to a more aggressive infusion rate if the target is not reached within 3 hours. In addition, bolus dosing is used for excessive hyperglycemia and a criterion for insulin discontinuation was established. This insulin protocol was approved by Critical Care, Anesthesia, Cardiothoracic, and Cardiology Committees. Interdisciplinary staff education was conducted for pharmacy, medicine, anesthesia, and nursing personnel. Following protocol approval and interdisciplinary education, the implementation phase was initiated.

Galpin's Change Model asserts that change needs to occur at the "grassroots" level. In hospital settings, this mandates that bedside staff be involved as they are the key to ultimate goal attainment.<sup>16</sup> Under the direction of the Cardiovascular ICU Medical Director, 25 patients were placed on the aggressive insulin protocol over a 6-week pilot period. Education was provided to every nurse and patient during this initial phase. Data collected on these patients included baseline glycosylated hemoglobin (Hb A<sub>1C</sub>), mean ICU admit-to-discharge blood glucose, average length of time required to obtain target range, and baseline blood glucose. Among these 25 patients, 40% were known diabetic patients. The mean baseline Hb A<sub>1C</sub> was 6.8. The mean baseline blood glucose on arrival to the ICU was 152 mg/dL. It took an average of 10 hours for patients to reach target range and the mean admission-to-hospital discharge blood glucose was 113 mg/dL. The mean blood glucose during the patient's ICU stay was 102 mg/dL.

After these data were analyzed, input was obtained from ICU staff and physicians while the protocol was modified to include a more aggressive approach to the management of hyperglycemia immediately after surgery and also for discontinuation of the intravenous insulin. This was accomplished to allow for a shorter time to target range and prevent blood glucose variation upon discontinuation of intravenous insulin.

After these revisions, all patients undergoing open heart surgery were placed on the insulin protocol. Cardiovascular ICU staff tracked mean hourly glucose levels, transition to a subcutaneous dosing regimen, comorbidities, hours to target range, and any hypoglycemic event. This real-time data collection by staff nurses provided a means to determine protocol effectiveness and prevalence of complications. In addition, it fostered nursing staff's ownership of this change initiative. The results of this blood glucose audit were obtained by a retrospective chart review of 152 patients. The mean hourly ICU glucose level was 108 mg/dL and the average time to target range was 5.2 hours.

**TABLE 2** Elements of the Sternal Wound Care Protocol

- With the exception of the wounds closed with "Dermabond," all sternal incision sites will have a dressing change every 24 h
- First dressing change will take place 24 h postoperatively
- The site is washed with hibiclens soap and rinsed with sterile water
- A dry, sterile dressing is applied with paper tape
- Date, time, and initials are required on every dressing
- Dressing change is placed on the medication administration record (MAR) when the patient is admitted to the unit
- Dressing change is charted in nursing notes and on the MAR

### Standardized Wound Care

A lack of evidence to guide optimum postoperative wound care promotes a wide range of management techniques. Hence, this initiative included the standardization of wound care management, utilizing best practice findings, with a goal of 100% compliance. The hospital epidemiologist provided research data that supported the use of chlorhexidine gluconate soap to cleanse sternal wounds. The surgeons performing the majority of cases collaborated with nursing staff to identify elements of the sternal wound care protocol. Table 2 identifies key elements of this protocol. In addition, as part of the wound care educational initiative, all nursing staff completed a learning module on aseptic wound care principles and technique.<sup>19</sup> Objectives focused on patient risk factors, exogenous and endogenous sources of infection, and standard guidelines to reduce the spread of infection. Principles relating to aseptic technique were emphasized and participants completed a posttest following the education. In an effort to standardize wound care among physicians, the postoperative order set was revised to integrate consistent dressing change expectations. Engaged bedside ICU nurses, providing peer recommendations for improved practice and adherence to standards, completed monthly real-time chart audits and identified wound care discrepancies among providers. Currently, the ICU and telemetry units have a 98% compliance rate to the wound care standard ( $n = 58$ ).

### Hand Hygiene

Any infection prevention initiative would be incomplete without an aggressive hand washing campaign. A hand washing audit tool was developed by the Infection Control Department and baseline hand washing audits were completed by ICU staff. The results were stratified by discipline (ie, physician, nurse, ancillary care provider). Although the baseline hand hygiene compliance was better than

**TABLE 3** Change Initiatives With Goal, Evaluation Method, and Results

Initiative	Initiative Goal	Methodology used to Evaluate Change	Results
Standardize skin preparation to include skin washing and hair removal by clippers	100% compliance	Direct observation	100% compliance ( <i>n</i> = 24)
Anesthesia administration of appropriate prophylactic antibiotic within 30–60 min of incision time	100% compliance	Retrospective chart audit utilizing Surgical Infection Prevention Collaborative Audit Tool	Monthly review includes 98% appropriate antibiotic ( <i>n</i> = 34) 87% on time antibiotic ( <i>n</i> = 40)
Postoperative glucose control	Blood glucose controlled at 80–110 mg/dL	Mean hourly glucose on every open heart patient	Mean hourly glucose = 108 mg/dL <i>n</i> = 152 Patients
Wound care standardization	100% compliance to protocol	Nurse-conducted chart audits and direct observation	98% compliance ( <i>n</i> = 58)
Improved hand hygiene	Improvement from baseline	Nurse-conducted anonymous observations	11% improved compliance from baseline

expected, likely due to the attainment of convenient hand gels, we believed there was still room for improvement. Results of the baseline audits were reviewed with each department and an aggressive hand washing campaign ensued. The Infection Control Department conducted on-site hand washing in-service training that addressed the use of antimicrobial hand gels. Highly visible signs were placed on units reminding care providers to wash their hands and/or use hand rubs. However, the most effective intervention was peer pressure by nursing staff, reminding all care providers to use hand rubs before and after contact with patients. Independent observers then conducted postcampaign audits. From baseline observations to postcampaign audit, an 11% increase in hand washing compliance was observed.

## Results

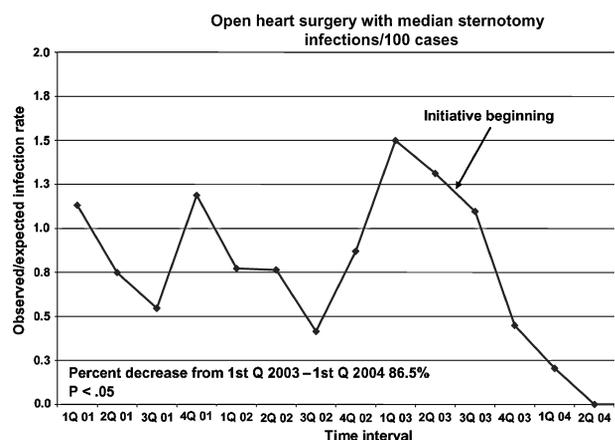
Each element of the project initiative had defined outcome measures identified by the interdisciplinary team (Table 3). These outcome measures enhanced ownership of the initiative and fostered project compliance. Data were collected on each initiative including preoperative retrospective chart review of antibiotic administration and hair removal. Mean hourly glucose levels were measured on each patient to determine effectiveness of the insulin protocol. Wound care management was assessed by random chart audits and real-time peer review. Hand washing surveillance and auditing continued throughout the initiative. The results of each initiative are summarized in Table 3.

From project inception in first quarter of 2003, to first quarter 2004, the sternal wound infection rate was decreased by 86.5% (Fig 2), with the most dramatic decrease (54.7%) between 3rd and 4th quarter

of 2003. This decrease coincided with the implementation of project initiatives. Using the Cochran-Armitage Test of Trend, the results are statistically significant ( $P < .05$ ).

## Conclusion

The article demonstrates one hospital's successful use of a clinical process improvement project utilizing a multidisciplinary approach to implement evidence-based practice. Effective change requires strategic planning with all disciplines involved, which promotes ownership of outcomes and sustainability of new practice expectations. Although the decrease in sternal wound infections at our institution was significant, additional opportunities exist to further optimize care of this patient population. These include detailing predictors of preoperative risk factors for sternal wound infection, efficacy of various antimicrobials in prophylaxis, and developing methods for discharge wound surveillance. Putting these



**FIGURE 2.** Observed/expected infection rate.

practices in place would provide more comprehensive accountability and address patient needs across the entire continuum of care.

Nurses play a critical role in identifying, orchestrating, and evaluating change efforts in clinical practice. With their proximity to the patient, nurses are key drivers of patient-centered change. This exemplar attests to the practicalities and possibilities for nurses to spearhead efforts to enhance postoperative recovery and reduce the risk of premature mortality.

## REFERENCES

1. American Heart Association. *Heart Disease and Stroke Statistics: 2004 Update*. Dallas, Tex: National Center of the American Heart Association; 2004.
2. Emory TG, Gaynes RP. An overview of nosocomial infection including the role of microbiology laboratory. *Clin Microbiol Rev*. 1992;6:428–442.
3. Roy MC. Surgical-site infections after coronary artery bypass surgery: discriminating site-specific risk factors to improve prevention efforts. *Infect Control Hosp Epidemiol*. 1998;19:229–233.
4. Loop FD, Lytle BW, Cosgrove DM, et al. Sternal wound complications after isolated coronary artery bypass grafting: early and late mortality, morbidity, and cost of care. *Ann Thorac Surg*. 1990;49:170–186.
5. EI Oakley R, Paul E, Wong PS, et al. Mediastinitis in patients undergoing cardiopulmonary bypass: risk analysis and midterm results. *J Cardiovasc Surg*. 1998;38:595–600.
6. Managam AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, the Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection 1999. *Infect Control Hosp Epidemiol*. 1999;20:247–280.
7. Bitkover CY, Gardlund B. Mediastinitis after cardiovascular operations: a case-control study of risk factors. *Ann Thorac Surg*. 1998;65:36–40.
8. Trick WE, Scheckler WE, Tokars JI, et al. Modifiable risk factors associated with deep sternal site infection after coronary artery bypass grafting. *J Thoracic Cardiovasc Surg*. 2000;119:108–114.
9. Furnary AP, Zerr KJ, Grunkemeier GL, Starr A. Continuous intravenous insulin infusion reduces the incidence of deep sternal wound infection in diabetic patients after cardiac surgical procedures. *Ann Thorac Surg*. 1999;67:352–362.
10. Zerr KJ, Furnary AP, Grunkemeier GL, Bookin S, Kanhere V, Starr A. Glucose control lowers the risk of wound infection in diabetics after open heart operations. *Ann Thorac Surg*. 1997;63:356–361.
11. Van Den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in critically ill patients. *N Engl J Med*. 2001;345:1359–1367.
12. Boyce JM, Pittet D. Guideline for hand hygiene in health-care settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA. *Am J Infect Control*. 2002;30:1–46.
13. Girou E, Loyeau S, Legrand P, et al. Efficacy of hand-rubbing with alcohol based solution versus standard handwashing with antiseptic soap: randomized clinical trial. *BMJ*. 2002;7360:325–362.
14. Bissett L. Can alcohol hand rubs increase compliance with hand hygiene? *Br J Nurs*. 2002;11:1074–1077.
15. Pittet D, Simon A, Hugonnet S, et al. Hand hygiene among physicians: performance, beliefs, and perceptions. *Ann Intern Med*. 2004;141:1–8.
16. Galpin TJ. *The Human Side of Change: A Practical Guide to Organization Redesign*. San Francisco, Calif: Jossey Bass; 1996.
17. CMS/HSAG. *Surgical Infection Prevention National Project, Measure Specifications for Quality Indicators for the 7th Scope of Work*. Phoenix, AZ: Health Services Advisory Group; 2004.
18. Antimicrobial prophylaxis in surgery. In: Close, W, ed. *Handbook of Antimicrobial Therapy*. 16th ed. New Rochelle, NY: Medical Letter, Inc.; 2002;55–61.
19. Probst M, Stilwell J. *Aseptic Wound Care Principles and Techniques. Training Module*. Phoenix, AZ: Banner Good Samaritan Medical Center; 1993.