Complete Summary

GUIDELINE TITLE

Prevention of surgical site infections. In: Prevention and control of healthcare-associated infections in Massachusetts.

BIBLIOGRAPHIC SOURCE(S)

Prevention of surgical site infections. In: Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 1: final recommendations of the Expert Panel. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. p. 61-8.

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Surgical site infections

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Infectious Diseases
Internal Medicine

Preventive Medicine
Surgery

INTENDED USERS

Advanced Practice Nurses
Hospitals
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To provide evidence-based recommendations for a statewide infection control and prevention program to improve health outcomes by reducing the risk of acquiring and transmitting healthcare-associated infections
- To provide recommendations for prevention of surgical site infections

TARGET POPULATION

Patients undergoing surgery

INTERVENTIONS AND PRACTICES CONSIDERED

1. Preoperative management
    - Patient preparation including identifying and treating infections remote to the surgical site before surgery, controlling blood glucose levels, encouraging smoking cessation, preoperative showering with chlorhexidine soap, using appropriate antiseptic agents for skin preparation
    - Hand and forearm antisepsis for surgical team members including standardized hand scrub and hand rub
    - Management of infected or colonized surgical personnel
    - Antimicrobial prophylaxis when indicated

2. Intraoperative management
    - Positive pressure operating room ventilation
    - Cleaning and disinfecting environmental surfaces
    - Sterilization of surgical instruments
    - Wearing surgical attire and drapes
    - Adhering to standard principles of operating room asepsis and appropriate surgical technique

3. Postoperative incision care including sterile dressings, hand hygiene, and patient and family education regarding proper incision care

MAJOR OUTCOMES CONSIDERED

Incidence of healthcare-associated infections

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The Expert Panel was divided into six task groups. In order to generate sound, evidence-based recommendations, a comprehensive reference library was created for each task group comprising articles, publications, and other materials relevant to their work. An expert in library science, aided by a JSI Research and Training Institute, Inc. (JSI) staff member with experience in literature review, conducted literature searches, selected articles for inclusion, and managed and organized the task group libraries. For the purpose of the project, JSI gathered an extensive body of literature (over 2000 published articles). Starting with the reference library of a local healthcare associated infections (HAI) expert, it was supplemented and updated to include the most current articles and expanded on recommendations made by Expert Panel and task group members. Figure 1 in the original guideline document summarizes the literature review process.

Literature searches were conducted in PubMed using applicable Medical Subject Headings (MeSH) and key words. Refer to Figure 2 in the original guideline document for information on literature search methodology.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Level of Evidence Ranking

Level I: Strong evidence from at least one well-designed randomized controlled trial

Level II: Evidence from well-designed non-randomized trials; cohort or case-controlled analytic studies (preferably from >1 center); multiple time-series studies

Level III: Well-designed descriptive studies from more than one center or research group

Level IV: Opinions of authorities (e.g., guidelines), clinical evidence; reports of expert committees

Level V: No quality studies found and no clear guidance from expert committees, authorities or other sources

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

To aid the task groups and Expert Panel in their decisions, JSI Research and Training Institute, Inc. (JSI) generated qualitative summaries and reviews of relevant literature, outlining the current "state of the science" on task group-indicated topics of debate. All selected studies were critically assessed for internal validity or methodological rigor and only those with high quality of evidence grades were considered in generating evidence-based recommendations.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Consensus Development Conference)
Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The 2006 Health Care Reform Law directed the Massachusetts Department of Public Health (MDPH) to establish a comprehensive state wide infection prevention and control program. To direct this new effort, a healthcare-associated infection (HAI) Expert Panel was convened in November 2006 under the auspices of the Betsy Lehman Center for Patient Safety and Medical Error Reduction and MDPH. This multidisciplinary panel of experts included infectious disease specialists, epidemiologists, infection control and hospital quality professionals, consumers, professional organizations, and hospital executives and clinical leaders. Research, coordination and facilitation of the work of the Expert Panel and the associated Task Groups was provided by JSI Research and Training Institute, a public health research and consulting firm located in Boston.

The mission of the Expert Panel was to provide guidance on all aspects of a statewide infection control and prevention program, review the key elements of such a program, and submit their completed recommendations to the Betsy Lehman Center and the Massachusetts Department of Public Health by January 31, 2008.

The Expert Panel held twelve monthly meetings beginning on November 30, 2006. Due to the multi-faceted nature of the Panel's charge, six Task Groups were formed in order to focus the efforts of Panel members on their respective areas of expertise.

1. Bloodstream and Surgical Site Infections (BSI, SSI)--Prevention, Surveillance, and Reporting
2. Optimal Infection Control Program Components
3. Ventilator-Associated Pneumonia (VAP)--Prevention, Surveillance, and Reporting
4. Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Other Selected Pathogens--Prevention, Surveillance, and Reporting
5. Public Reporting and Communication
6. Pediatric Affinity Group--Prevention, Surveillance, and Reporting

Panel members were asked to join at least one group, aligning with their expertise and interest. Additionally, group membership was supplemented with experts and stakeholders from outside the Expert Panel. Each task group was led by an Expert Panel member (Task Group Leader) who facilitated the calls and assisted in the literature review process. Task groups held one-hour-long conference calls every three weeks. A JSI coordinator supported each task group by reviewing and summarizing the literature and aiding in drafting recommendations. Coordinators were also responsible for all administrative work including minute taking, distribution of materials, and communication between the Expert Panel and task groups.

Due to time and capacity limitations, catheter-associated urinary tract infections (CAUTI) were not a specific task group topic. However, the product of a parallel process of evidence review and guideline updating, by experts representing the Infectious Disease Society of America (IDSA) and the Society for Healthcare Epidemiology of America (SHEA), was graciously made available to our project. An ad hoc committee of Expert Panel members and outside experts studied and endorsed these prevention guidelines and they have been incorporated into this final report.

Expert Panel recommendations, in addition to being scientifically sound, needed to take into account the current practices of infection control programs in Massachusetts. For this purpose, JSI surveyed infection control program directors across the Commonwealth in the areas of prevention, surveillance, reporting, and education relating to HAIs. The comprehensive survey questionnaire was developed using a review of current literature, expert reports, and existing surveys. After receiving input and approval from the Expert Panel and the Harvard Pilgrim Health Care Institutional Review Board, the survey was piloted in six hospitals. Once final revisions were made, the survey was mailed to the infection control program of all 71 acute care (non-Veterans Administration) hospitals in Massachusetts. A follow-up phone interview was also conducted to solicit more qualitative information and clarify any answers on the written survey. The completed survey responses were analyzed and results were distributed to project members to aid in their decision-making.

Taking into consideration both the results of the survey and the evidence, task groups drafted recommendations in the areas of HAI prevention and reporting. When voting, either during meetings or electronically, task group members had the opportunity to make comments and suggest additional changes. JSI then tallied the task group votes, reviewed comments, and brought back any major points of contention to the task group.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Strength of Recommendation Ranking

Category A: Strongly recommended

Category B: Recommended for implementation

Category C: Consider for implementation

Category D: Recommended against implementation

Category UI: Unresolved issue

No recommendation: Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

COST ANALYSIS

The annual economic burden of healthcare-associated infections (HAI) in Massachusetts ranges from approximately $200 million to well over $400 million. While it is difficult to determine a precise estimate, it is clear that these infections are costly. Mandatory reporting of institutional-level HAI is a potential tool for improvement of quality of care and a method to be used by consumers, insurers, or providers to make decisions regarding where to seek or fund healthcare. If HAI are reduced with mandatory reporting, societal cost-savings should be anticipated. However, the effect of mandatory reporting on HAI rates is yet unknown. Additionally, increased costs to the hospitals and the Department of Public Health (DPH) should be anticipated. The methods used in this report should be beneficial to other state DPH. With limited resources and the potential benefits of public reporting yet to be established, there is a need to carefully balance the additional burden of reporting with current prevention efforts in order to obtain the optimum outcome, less infections.

Refer to *Prevention and Control of Healthcare-Associated Infections in Massachusetts, Part 2: Findings from Complementary Research Activities* (see the "Availability of Companion Documents" field) for more information on cost-analysis.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Once recommendations were approved by the task group members, they were presented to the Expert Panel for consideration and any necessary final revisions.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Note from the Massachusetts Department of Public Health (MDPH) and the National Guideline Clearinghouse (NGC):

- In addition to their own Levels of Evidence and Strength of Recommendation grades, the Task Force has included the original Strength of Recommendation grades from the Centers for Disease Control and Prevention (CDC). For definitions of those grades, please see the CDC Web site.
- *Prevention and Control of Healthcare-Associated Infections in Massachusetts* guideline has been divided into individual summaries. In addition to the current summary, the following are available:
    - Hand hygiene recommendations
    - Standard precautions in hospitals
    - Contact precautions in hospitals
    - Environmental measures for the prevention and management of multi-drug resistant organisms
    - Prevention of ventilator associated pneumonia
    - Prevention of bloodstream infections
    - Prevention of catheter-associated urinary tract infections

Level of evidence ranking (I – V) and strength of recommendation ranking (A – D, Unresolved issue [UI], No recommendation) definitions are presented at the end of "Major Recommendations" field.

A. **Preoperative**

Preparation of the Patient

1. Whenever possible, identify and treat all infections remote to the surgical site before elective operation and postpone elective operations on patients with remote site infections until the infection has resolved. *(CDC category IA)* ***A-IV***
2. Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation. *(CDC category IA)* ***A-IV*** (Tanner, Woodings, & Moncaster, 2006)
3. If hair is removed, remove immediately before the operation, preferably with electric clippers. Patients should be instructed not to shave the incision site within 48 hours prior to surgery. *(CDC category IA)* ***A-IV*** (Niel-Weise, Wille, & van den Broek, 2005)
4. A. Adequately control serum blood glucose levels in all adult surgical patients and particularly avoid hyperglycemia perioperatively. The exact blood glucose levels to be maintained and the duration of the perioperative period are an unresolved issue. ***B-I*** (Vriesendorp et al., 2004; van den Berge et al., 2001; Grey & Perdrizet, 2004; Collier et al., 2005)
   B. For adult cardiac surgery patients, ensure that blood glucose levels measured at 6 a.m. on postoperative days one and two are maintained

below 200 mg/dL. ***A-I*** (Lorenz, Lorenz, & Codd, 2005; Gandhi et al., 2007; Webster & Osborne, 2006)

5. Encourage stopping use of tobacco products. At minimum, instruct patients to abstain for at least 30 days before elective operation from smoking cigarettes, cigars, pipes or any other form of tobacco consumption (e.g., chewing/dipping). *(CDC category IB)* ***B-IV***
6. Do not withhold necessary blood products from surgical patients as a means to prevent surgical site infection (SSI). *(CDC category IB)* ***B-IV***
7. Preoperative showering or bathing with agents such as chlorhexidine has been shown to reduce bacterial colonization of the skin but has not definitively been proven to decrease SSI risk. If hospitals elect to use preoperative showering with chlorhexidine soap as an SSI strategy, staff responsible for presurgical evaluations shall educate patients on the appropriate showering technique. *(CDC category IB)* ***UI*** (Webster & Osborne, 2006)
8. Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation. *(CDC category IB)* ***A-IV***
9. Use an appropriate antiseptic agent for skin preparation. *(CDC category IB)* ***A-IV***
10. Apply preoperative antiseptic skin preparation using manufacturer's product guidelines. The prepared area must be large enough to extend the incision or create new incisions or drain sites, if necessary. *(CDC category II)* ***A-IV***
11. Keep preoperative hospital stay as short as possible while allowing for adequate preoperative preparation of the patient. *(CDC category IB)* ***B-IV***
12. The routine use of preoperative mupirocin to reduce nosocomial infections after surgery is an unresolved issue. Therefore, no recommendation for or against its preoperative use can be made. In one randomized controlled trial, prophylactic intranasal application of mupirocin did not significantly reduce the rate of *Staphylococcus aureus [S. aureus]* surgical-site infections overall, but it did significantly decrease the rate of all nosocomial *S. aureus* infections among the patients who were *S. aureus* carriers. Application of mupirocin for non-general surgical cases may be considered based on surgeon preference and patient selection. (*Comment: Issues still outstanding include: use of mupirocin in patients from intensive care unit [ICU] settings who subsequently require surgery; use of mupirocin in ICU patients over 7 days for the prevention of SSI; use of mupirocin in patients who are colonized with methicillin-resistant Staphylococcus aureus [MRSA] from prior hospitalizations*.) ***UI*** (Kallen, Wilson, & Larson, 2005; Suzuki et al., 2003; Kalmeijer et al., 2002; Yano et al., 2000; Perl et al., 2002)

Hand/Forearm Antisepsis for Surgical Team Members

13. Keep nails short and do not wear artificial nails. *(CDC category IB)* ***B-IV***
14. A U.S. Food and Drug Administration (FDA)-compliant, surgical hand antiseptic agent (i.e., surgical hand scrub/rub) approved by the facility's infection control personnel should be used for all surgical

hand antisepsis. Hands should be washed with plain or antimicrobial soap and running water immediately before beginning the surgical hand antisepsis/scrub.

Hand scrub: Traditional antimicrobial scrub agent should include a standardized scrub procedure that follows the manufacturer's written directions for use and is approved by the health care facility. A traditional, standardized anatomical, timed or counted stroke method may be used for surgical hand antisepsis/scrub.

Hand rub: Standardized protocol for alcohol based surgical hand rubs should follow manufacturer's written instructions and include washing hands and forearms with soap and running water before beginning the surgical hand antisepsis procedure. *(CDC category IB)* ***B-IV*** (Association of Operating Room Nurses, 2007)

15. After performing the surgical scrub, keep hands up and away from the body (elbows in flexed position) so that water runs from the tips of the fingers toward the elbows. Dry hands with a sterile towel and put on a sterile gown and gloves. If alcohol hand antisepsis is used, allow hands to dry before donning gloves. *(CDC category IB)* ***B-IV***
16. For both types of surgical hand antisepsis, clean underneath each fingernail prior to performing the first surgical scrub/rub of the day. *(CDC category II)* ***B-IV***
17. Scrubbed personnel should not wear hand or arm jewelry. *(CDC category II)* ***B-IV***
18. Nail polish, if used, should not be chipped. Available data indicate that nail polish that has been obviously chipped or worn for more than four days harbors greater numbers of bacteria. *(CDC category UI)* ***A-IV*** (Association of Operating Room Nurses, 2007)

Management of Infected or Colonized Surgical Personnel

19. Develop and implement well-defined policies concerning patient care responsibilities when personnel have potentially transmissible infectious conditions. These policies should govern (a) personnel responsibility in using the health service and reporting illness, (b) work restrictions, and (c) clearance to resume work after an illness that required work restriction. The policies also should identify persons who have the authority to remove personnel from duty. *(CDC category IB)* ***A-IV***
20. Obtain appropriate cultures from, and exclude from duty, surgical personnel who have draining skin lesions until infection has been ruled out or personnel have received adequate therapy and infection has resolved. *(CDC category IB)* ***B-IV***
21. Do not routinely exclude surgical personnel who are colonized with organisms such as *Staphylococcus aureus* (nose, hands, or other body site) or group A *Streptococcus*, unless such personnel have been linked epidemiologically to dissemination of the organism in the healthcare setting. *(CDC category IB)* ***B-IV***

Antimicrobial Prophylaxis

22. Administer prophylactic antimicrobial agents only when indicated, and select in accordance with published recommendations as delineated in national guidelines. *(CDC category IA)* ***A-IV*** (Bratzler & Hunt, 2006; Bratzler et al., 2004)
23. Administer by the intravenous route the initial dose of prophylactic antimicrobial agent, timed such that an effective concentration of the drug is established in serum and tissues when the incision is made. Maintain therapeutic levels of the agent in serum and tissues throughout the operation and until, at most, a few hours after the incision is closed in the operating room (OR). Prophylactic antibiotic should be received within one hour prior to surgical incision (vancomycin within 2 hours). Subsequent intraoperative doses of antibiotics should be administered as needed based on the pharmacokinetic profiles of the prophylactic agents being used. The duration of antibiotic prophylaxis should be in accordance with national guidelines. *(CDC category IA)* ***A-IV*** (Bratzler & Hunt, 2006; Bratzler, et al., 2004; Dellinger et al., 2005; Institute for Healthcare Improvement, 2007; ASHP (American Society of Health-System Pharmacists) therapeutic guidelines on antimicrobial prophylaxis in surgery, 1999; "Antimicrobial prophylaxis for surgery," 2006)
24. A. The use of mechanical bowel preparation for elective colorectal operations has not been found to reduce the incidence of surgical site infections or other surgical complications. ***UI*** (Guenaga et al., 2005; Wille-Jorgensen et al., 2005)
    B. Antibiotic prophylaxis for colorectal surgery can be either with non-absorbable oral antibiotics or systemic antibiotics, with agents selected in accordance with national guidelines. The utility of combined prophylaxis with both non-absorbable oral and systemic antibiotics is an unresolved issue. ***UI*** (Bratzler & Hunt, 2006; Lewis, 2002; "Antimicrobial prophylaxis for surgery," 2006; ASHP (American Society of Health-System Pharmacists) therapeutic guidelines on antimicrobial prophylaxis in surgery, 1999)

B. **Intraoperative**

Ventilation

25. Maintain positive-pressure ventilation in the operating room with respect to the corridors and adjacent areas. *(CDC category IB)* ***B-IV***
26. Maintain a minimum of 15 air changes per hour, of which at least 3 should be fresh air. *(CDC category IB)* ***B-IV***
27. Filter all air, recirculated and fresh, through the appropriate filters per the American Institute of Architects' recommendations. *(CDC category IB)* ***B-IV***
28. Introduce all air at the ceiling, and exhaust near the floor. *(CDC category IB)* ***B-IV***
29. The use of ultraviolet (UV) radiation in the operating room to prevent SSI and the performance of orthopedic implant operations in operating rooms supplied with ultraclean air are unresolved issues. Therefore, no recommendation for or against these practices can be made. ***UI***
30. Keep operating room doors closed except as needed for passage of equipment, personnel, and the patient. *(CDC category IB)* ***B-IV***

31. Limit the number of personnel entering the operating room to necessary personnel. *(CDC category II)* ***B-IV***

Cleaning and Disinfection of Environmental Surfaces

32. Cleaning should be performed on a regular basis to reduce the amount of dust, organic debris, and microbial load in surgical environments. After each surgical procedure a safe, clean environment should be reestablished. Operating rooms in which procedures may be performed should be terminally cleaned once daily, regardless of use. Operating room equipment and furniture that are visibly soiled, and surfaces of equipment that are touched by personnel while they are providing patient care or handling contaminated items, (such as anesthesia equipment), should be cleaned with an Environmental Protection Agency (EPA)-registered hospital-grade germicidal agent at the end of each surgical procedure. ***B-IV*** (Association of Operating Room Nurses, 2007)

Microbiologic Sampling

33. Do not perform routine environmental sampling of the OR. Perform microbiologic sampling of operating room environmental surfaces or air only as part of an epidemiologic investigation. *(CDC category IB)* ***B-IV***

Sterilization of Surgical Instruments

34. Sterilize all surgical instruments according to published guidelines. *(CDC category IB)* ***B-IV***
35. Flash Sterilization should be used only in carefully selected clinical situations where certain parameters are met.
    - Work practices dictating proper cleaning and decontamination, inspection and arrangement of instruments in the sterilizing tray or containers are followed.
    - Sterilization parameters are monitored and are consistent with sterilization guidelines issued by Association for the Advancement of Medical Instrumentation (AAMI), Association of Perioperative Registered Nurses (AORN), and manufacturer of items to be sterilized.
    - Mechanisms are in place for direct delivery of sterilized items to the point of use.
    - Defined procedures for aseptic handling and personnel safety during transfer of sterilized items to the point of use are followed and audited.
    - Documentation mechanism in place to identify surgical procedures that had flash sterilized supplies provided for use.
    - Hospitals should monitor flash sterilization reprocessing and provide this data to a patient oversight committee in the hospital (e.g., infection control, quality assurance, performance improvement or patient safety) at least annually.
    - Hospitals may wish to monitor by calculating a flash sterilization rate (# of flash loads per month/# of cases per month X100)

- Implants should not undergo routine flash sterilization except under emergent conditions. A rapid biological test should be performed during the process.
- Flash sterilization should not be used for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time. *(CDC category IB)* ***B-IV*** (Association of Operating Room Nurses, 2007)

Surgical Attire and Drapes

36. Wear a surgical mask that fully covers the mouth and nose when entering the operating room if an operation is about to begin or already under way or if sterile instruments are exposed or a sterile field has been established. Wear the mask throughout the operation. (This recommendation is in keeping with Occupational Safety and Health Administration [OSHA] regulations that "require masks in combination with protective eyewear, such as goggles or glasses with solid shields, or chin-length face shield be worn whenever splashes, spray, spatter, or droplets of blood or other potentially infectious material may be generated and eye, nose, or mouth contamination can be reasonably anticipated" in addition to "longstanding surgical tradition.") *(CDC category IB)* ***B-IV***
37. Wear a cap or hood to fully cover hair on the head and face when entering the operating room. *(CDC category IB)* ***A-IV***
38. Do not wear shoe covers for the prevention of SSI (however, shoe covers are required by OSHA regulations when "gross contamination can reasonably be anticipated") *(CDC category IB)* ***A-IV***
39. Wear sterile gloves if a scrubbed surgical team member. Put on gloves after putting on a sterile gown. Wearing two pairs of gloves (double-gloving) has been shown to reduce hand contact with patients' blood and body fluids when compared to wearing only a single pair. *(CDC category IB)* ***A-IV***
40. Use surgical gowns and drapes that are effective barriers when wet (i.e., materials that resist liquid penetration). *(CDC category IB)* ***A-IV***
41. Change scrub suits that are visibly soiled, contaminated and/or penetrated by blood or other potentially infectious materials. (Per OSHA regulations, if a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) shall be removed immediately or as soon as feasible). *(CDC category IB)* ***A-IV***
42. No recommendations on how or where to launder scrub suits, restricting use of scrub suits to the operating suite or for covering scrub suits when out of the operating suite. Home laundering of visibly soiled surgical attire is not recommended. *(CDC category UI)* ***UI***

Asepsis and Surgical Technique

43. Adhere to standard principles of operating room asepsis as well as to relevant practice guidelines (i.e., recommendations for preventing central line associated bloodstream infections, when placing intravascular devices (e.g., central venous catheters), spinal or epidural anesthesia catheters, or when dispensing and administering intravenous drugs. *(CDC category IB)* ***A-IV***

44. Assemble sterile equipment and solutions immediately prior to use. ***A-IV***
45. A. Handle tissue gently, maintain effective hemostasis, minimize devitalized tissue and foreign bodies (i.e., sutures, charred tissues, necrotic debris) and eradicate dead space at the surgical site. *(CDC category IB)* ***A-IV***
    B. Animal and clinical data suggest that maintenance of intraoperative normothermia will reduce surgical site infections for selected procedures in adults. ***A-I*** (Flores-Maldonado et al., 2001; Leaper, 2006; Scott & Buckland, 2006; Melling, Scott, & Leaper, 2001)
    C. The perioperative use of high inspired concentrations of oxygen and/or induction of mild hypercarbia intraoperatively to prevent surgical site infections are unresolved issues. ***UI*** (Kurz, Sessler, & Lenhardt, 1996; Sessler, 2006; Greif et al., 2000; Akca et al., 2002; Agarwal, 2006; Fleischmann et al., 2006; Belda et al., 2005; Pryor et al., 2004)
46. Use delayed primary skin closure or leave an incision open to heal by second intention if the surgeon considers the surgical site to be heavily contaminated (e.g., Class III and Class IV). *(CDC category IB)* ***B-IV***
47. If drainage is necessary, use a closed suction drain. Place a drain through a separate incision distant from the operative incision. Remove the drain as soon as possible. *(CDC category IB)* ***B-IV***

C. **Postoperative Incision Care**

48. Protect with a sterile dressing for 24 to 48 hours postoperatively an incision that has been closed primarily. *(CDC category IB)* ***A-IV***
49. Perform hand hygiene before and after dressing changes and any contact with the surgical site. *(CDC category IB)* ***A-IV***
50. When an incision dressing must be changed, use sterile technique. *(CDC category II)* ***A-IV***
51. Educate the patient and family regarding proper incision care, symptoms of SSI, and the need to report such symptoms. *(CDC category II)* ***A-IV***
52. No recommendation to cover an incision closed primarily beyond 48 hours, or on the appropriate time to shower or bathe with an uncovered incision. *(CDC category UI)* ***UI****

*Identifies evidence from the Centers for Disease Control and Prevention (CDC)'s updated guidelines without repeating the detailed literature review process.

Definitions:

Level of Evidence Ranking

Level I: Strong evidence from at least one well-designed randomized controlled trial

Level II: Evidence from well-designed non-randomized trials; cohort or case-controlled analytic studies (preferably from >1 center); multiple time-series studies

Level III: Well-designed descriptive studies from more than one center or research group

Level IV: Opinions of authorities (e.g., guidelines), clinical evidence; reports of expert committees

Level V: No quality studies found and no clear guidance from expert committees, authorities or other sources

Strength of Recommendation Ranking

Category A: Strongly recommended

Category B: Recommended for implementation

Category C: Consider for implementation

Category D: Recommended against implementation

Category UI: Unresolved issue

No recommendation: Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Evidence-based best practice guidelines and interventions for prevention of healthcare-associated infection will promote patient and healthcare worker safety and improve health outcomes by reducing the risk of acquiring and transmitting healthcare associated infections.

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The final recommendations contained in *Prevention and Control of Healthcare-Associated Infections in Massachusetts* were adopted by the Betsy Lehman Center for Patient Safety and Medical Error Reduction (BLC) and the Massachusetts Department of Public Health (MDPH). MDPH incorporated the recommendations into the reporting requirements, and developed an assessment tool for surveyors to use to evaluate the implementation of best practices.

IMPLEMENTATION TOOLS

Staff Training/Competency Material

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Prevention of surgical site infections. In: Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 1: final recommendations of the Expert Panel. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. p. 61-8.

ADAPTATION

The guideline was adapted from: Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol. 1999 Apr;20(4):250-78.

DATE RELEASED

2008 Jan 31

GUIDELINE DEVELOPER(S)

Betsy Lehman Center for Patient Safety and Medical Error Reduction - State/Local Government Agency [U.S.]
Massachusetts Department of Public Health - State/Local Government Agency [U.S.]

SOURCE(S) OF FUNDING

Massachusetts Department of Public Health

GUIDELINE COMMITTEE

Massachusetts Healthcare-Associated Infections Expert Panel

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Richard T. Ellison III, MD (*Chair*) Hospital Epidemiologist, Professor of Medicine, Molecular Genetics and Microbiology, University of Massachusetts Memorial Medical Center; Mary Ellen Scales, RN, MSN, CIC (*Vice-Chair*) Manager, Infection Control, Baystate Medical Center; Mary Alexander, RN, Chief Executive Officer, Infusion Nurse's Society; Eric Alper, MD, Internal Medicine, University of Massachusetts Memorial Medical Center; Evie Bain, RN, Occupational Health & Safety, Massachusetts Nurses Association; Anne Baras, RN, Surgical Technology Department Chair, North Shore Community College; Karen Boudreau, MD, Medical Director, Healthcare Quality Improvement, Blue Cross Blue Shield of MA; Ann Marie Bourque, NP, President, New England Chapter of the National Conference of Gerontological Nurse Practitioners; Lou Ann Bruno-Murtha, MD, Medical Director, Infection Control Division Chief, Cambridge Health Alliance; Wanda Carey, RN, BSN, CIC, Manager, Infection Control, Caritas Norwood Hospital; Philip Carling, MD, Director, Infectious Diseases and Hospital Epidemiology, Caritas Carney Hospital; Donald Craven, MD, Chair, Infectious Disease, Lahey Clinic; Jane Foley, RN, Director of Operations, Nursing, Beth Israel-Deaconess Medical Center; Denise Graham, Sr. Director Public Policy, Association for Professionals in Infection Control and Epidemiology; Paula Griswold, MS, Executive Director, Massachusetts Coalition for the Prevention of Medical Errors; David Hooper, MD, Internal Medicine/ID, Massachusetts General Hospital; Linda Kenney, President, Executive Director, Medically Induced Trauma Support Services; Jim Liljestrand, MD, Medical Director, Quality Improvement, MassPro; Michael Mitchell, MD, Director, Microbiology Services, University of Massachusetts Memorial Medical Center; Sharon-Lise Normand, PhD, Professor of Biostatistics, Harvard Medical School; Richard Olans, MD, Director, Infectious Disease, Hallmark Health Hospitals; Gail Potter-Bynoe, BS, CIC, Manager, Infection Control, Children's Hospital Boston; Selwyn Rogers, MD, Division Chief, Trauma, Burns, and Surgical Critical Care, Director, Center for Surgery and Public Health, Assistant Professor of Surgery, Brigham and Women's Hospital; Jeannie Sanborn, RN, MS, CIC, Infection Control Professional Heywood Hospital; Thomas

Sandora, MD, Pediatric ID, Children's Hospital Boston; Kenneth Sands, MD, Senior Vice President, Health Care Quality, Beth Israel-Deaconess Medical Center; Christine Schuster, RN, CEO and President, Emerson Hospital; David Smith, MHSA, Senior Director, Health Data Analysis & Research, Massachusetts Hospital Association; Carol Sulis, MD, Hospital Epidemiologist, Associate Professor of Medicine, Boston Medical Center; Thomas Sullivan, MD, Cardiologist in Private Practice, Women's Health Center Cardiology (Danvers)

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the Massachusetts Department of Public Health Web site.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 2: findings from complementary research activities. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. 131 p. Available in Portable Document Format (PDF) from the Massachusetts Department of Public Health Web site.
- Handwashing education materials for health care professionals. Available from the Massachusetts Department of Public Health Web site.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on October 6, 2008. The information was verified by the guideline developer on December 22, 2009.

COPYRIGHT STATEMENT

DISCLAIMER

NGC DISCLAIMER

The National Guideline Clearinghouse™ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at http://www.guideline.gov/about/inclusion.aspx .

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.

Date Modified: 2/9/2009