

DEVAL L. PATRICK
GOVERNOR

TIMOTHY P. MURRAY
LIEUTENANT GOVERNOR

JUDYANN BIGBY, MD
SECRETARY

JOHN AUERBACH
COMMISSIONER

Prevention and Control of Healthcare-Associated Infections In Massachusetts

Part 1: Final Recommendations of the Expert Panel

convened by the Betsy Lehman Center for Patient Safety and
Medical Error Reduction

and

JSI Research and Training Institute, Inc.

in Collaboration with

the Massachusetts Department of Public Health

January 31, 2008



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MEMBERS OF THE MASSACHUSETTS HEALTHCARE ASSOCIATED INFECTIONS EXPERT PANEL

CHAIR:

Richard T. Ellison III, MD
Hospital Epidemiologist
Professor of Medicine, Molecular
Genetics and Microbiology
 University of Massachusetts
 Memorial Medical Center

Philip Carling, MD
Director
 Infectious Diseases and Hospital
 Epidemiology
 Caritas Carney Hospital

Richard Olans, MD
Director
 Infectious Disease
 Hallmark Health Hospitals

VICE-CHAIR:

Mary Ellen Scales, RN, MSN, CIC
Manager
 Infection Control
 Baystate Medical Center

Donald Craven, MD
Chair
 Infectious Disease
 Lahey Clinic

Gail Potter-Bynoe, BS, CIC
Manager
 Infection Control
 Children's Hospital Boston

VOTING MEMBERS:

Mary Alexander, RN
Chief Executive Officer
 Infusion Nurse's Society

Jane Foley, RN
Director of Operations, Nursing
 Beth Israel-Deaconess Medical
 Center

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

Eric Alper, MD
 Internal Medicine
 University of Massachusetts
 Memorial Medical Center

Denise Graham
Sr. Director Public Policy
 Association for Professionals in
 Infection Control and Epidemiology

Jeannie Sanborn, RN, MS, CIC
Infection Control Professional
 Heywood Hospital

Evie Bain, RN
 Occupational Health & Safety
 Massachusetts Nurses Association

Paula Griswold, MS
Executive Director
 Massachusetts Coalition for the
 Prevention of Medical Errors

Thomas Sandora, MD
 Pediatric ID
 Children's Hospital Boston

Anne Baras, RN
Surgical Technology Department
Chair
 North Shore Community College

David Hooper, MD
 Internal Medicine/ ID
 Massachusetts General Hospital

Kenneth Sands, MD
Senior Vice President
 Health Care Quality
 Beth Israel-Deaconess Medical
 Center

Karen Boudreau, MD
Medical Director
 Healthcare Quality Improvement
 Blue Cross Blue Shield of MA

Linda Kenney
President, Executive Director
 Medically Induced Trauma Support
 Services

Christine Schuster, RN
CEO and President
 Emerson Hospital

Ann Marie Bourque, NP
President
 New England Chapter of the National
 Conference of Gerontological Nurse
 Practitioners

Jim Liljestrand, MD
Medical Director
 Quality Improvement
 MassPro

David Smith, MHSA
Senior Director
 Health Data Analysis & Research
 Massachusetts Hospital Association

Lou Ann Bruno-Murtha, MD
Medical Director
Infection Control Division Chief
 Cambridge Health Alliance

Michael Mitchell, MD
Director
 Microbiology Services
 University of Massachusetts
 Memorial Medical Center

Carol Sulis, MD
Hospital Epidemiologist
Associate Professor of Medicine
 Boston Medical Center

Wanda Carey, RN, BSN, CIC
Manager
 Infection Control
 Caritas Norwood Hospital

Sharon-Lise Normand, PhD
Professor of Biostatistics
 Harvard Medical School

Thomas Sullivan, MD
 Cardiologist in Private Practice
 Women's Health Center Cardiology
 (Danvers)

LEADERSHIP GROUP

BETSY LEHMAN CENTER FOR PATIENT SAFETY AND MEDICAL ERROR REDUCTION:

Nancy Ridley, MS
Director

Catherine L. Annas, JD
Director of Patient Safety

Eileen McHale, RN, BSN
Patient Safety Ombudsman

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH:

Paul Dreyer, PhD
Director
Bureau of Quality Assurance and Control

Grant Carrow, PhD
Deputy Director
Bureau of Quality Assurance and Control

Roberta Bernstein
Special Projects Bureau of Quality Assurance and Control

Alfred DeMaria Jr., MD
State Epidemiologist
Director, Bureau of Communicable Disease Control

JSI RESEARCH AND TRAINING INSTITUTE TEAM

JSI RESEARCH AND TRAINING INSTITUTE:

Laureen Kunches, ANP, PhD

Project Director

Lisa Hirschhorn, MD, MPH

Principal Investigator

John Carper, MS

Information Specialist/Librarian

Danielle Cuénoud

Research Assistant

Jeanne Day, MPH

Epidemiologist

Deborah Dean, MSPH

Health Education Specialist

Ann Keehn

Senior Consultant

Joseph Musolino

Programmer/Analyst

Allison Power

Intern

Julia Przedworski

Research Assistant

Laurie Robert, MS

Epidemiologist

Jacqueline Steiner

Research Assistant

BRIGHAM AND WOMEN'S HOSPITAL/HARVARD PILGRIM:

Richard Platt, MD

Principal Investigator

Julie Dunn, MPH

Project Manager

Susan Huang, MD

Infectious Disease Clinician

Michael Klompas, MD

Infectious Disease Clinician

Johanna Vostok

Research Assistant

Deborah Yokoe, MD

Infectious Disease Clinician

EXPERT CONSULTANTS

Patricia Stone, PhD, MPH, RN

Cost Researcher

Kathleen Mazor, EdD

Communication Researcher

Beth Gragg, MIA

Education Specialist

Massachusetts Expert Panel on Healthcare Associated Infections

Under the auspices of the Betsy Lehman Center for Patient Safety and Medical Error Reduction, an independent multidisciplinary panel of experts has been convened to examine the problem of healthcare associated infections (HAI).

Through a consensus based process the panel will assist in the recommendation of evidence-based best practice guidelines and interventions that will promote patient and healthcare worker safety and improve health outcomes by reducing the risk of acquiring and transmitting healthcare associated infections. The Expert Panel shall provide guidance on all aspects of a statewide infection control and prevention program, review each element of such programs and make recommendations to the Lehman Center and the Massachusetts Department of Public Health.

Executive Summary

EXECUTIVE SUMMARY

Healthcare associated infections (HAIs) are a major public health concern throughout the nation, contributing to increased morbidity, mortality, and cost. In an effort to raise awareness, promote transparency for healthcare consumers and motivate hospitals to prioritize infection prevention, several states now require reporting of selected HAIs to their health authorities and some make this information available to the public. The recent healthcare reform law (Chapter 58 of the Acts of 2006, Section 2) directed the Massachusetts Department of Public Health (DPH) Division of Health Care Quality to develop a Statewide Infection Prevention and Control Program. The Betsy Lehman Center for Patient Safety and Medical Error Reduction convened a panel of experts and key stakeholders to make recommendations for a statewide infection prevention and control program, including potential reporting of HAI measures by hospitals. With the assistance of JSI Research and Training Institute, six Task Groups and an ad hoc subcommittee, involving additional local and national experts, reviewed available evidence and developed specific proposals for prevention and reporting. The Expert Panel then decided which should be accepted and determined the strength of the recommendation.

As of January 31, 2008, the Expert Panel has completed its work and endorsed a comprehensive set of recommendations encompassing HAI reporting and “best practices” for preventing HAIs, including programmatic aspects of hospital infection prevention and control programs. This summary provides highlights of the panel’s recommendations; technical specifications of these recommendations and a full description of the process by which they were developed can be found in Part 1 of the full report ---

Prevention and Control of Healthcare Associated Infection in Massachusetts, Part 1: Final Recommendations of the Expert Panel, January 31, 2008.

I. RECOMMENDATIONS REGARDING PREVENTION OF HEALTHCARE-ASSOCIATED INFECTIONS

Strategies to reduce or eliminate the risk of HAIs are a crucial component of a comprehensive infection prevention and control program. While numerous national standards exist, many have not been updated for several years and often there are inconsistencies between related guidelines. To establish an evidence-based set of “best practices” for use by Massachusetts hospitals, the Task Groups and Expert Panel conducted a detailed review of currently available standards and endorsed guidelines in nine areas:

1. Infection Prevention and Control Programs in Hospital Settings
2. Hand Hygiene Recommendations
3. Standard Precautions for the Prevention of HAIs

4. Contact Precautions for the Prevention of HAIs
5. Environmental Measures for the Prevention and Management of Multi-drug Resistant Organisms
6. Prevention of Ventilator Associated Pneumonia
7. Prevention of Surgical Site Infections
8. Prevention of Bloodstream Infections
9. Prevention of Catheter-associated Urinary Tract Infections

The sources used for these updated guidelines included three pivotal CDC standards --- *Guideline for Isolation Precautions* (2007), *Guideline for the Prevention of Intravascular Catheter-related Infections* (2002), and *Guideline for the prevention of surgical site infection* (1999). In addition, the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force *Guideline for hand hygiene in healthcare settings* (2002), HICPAC *Management of Multidrug-Resistant Organisms in Healthcare settings* (2006), American Thoracic Society *Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia* (2005), and IDSA/SHEA *Prevention of Catheter-associated Urinary Tract Infections in Acute Care Hospitals* (in press 2008) were used.

II. RECOMMENDATIONS RELATED TO REPORTING OF HEALTHCARE- ASSOCIATED INFECTION MEASURES

A. General Principles

Establishment of a meaningful and valid HAI reporting system should be guided by several important criteria related to the reporting system, the hospitals' response and the measures themselves:

1. The measures used for reporting of specific healthcare associated infections, as well as the process measures used to prevent such infections, should be based on objective definitions that can be consistently applied by all Massachusetts hospitals that are subject to the reporting requirements.
2. Outcome measures used for reporting (e.g. rates of specific HAIs) should be developed that can include an appropriate level of risk adjustment for patient-specific factors related to increased risk of infection.
3. The reporting system should collect and report healthcare data that are useful not only to the public, but also to the hospital for its infection control and prevention efforts.
4. Hospitals should use the reporting data to provide feedback to their healthcare providers about the facility's performance, to provide additional information to guide the hospital's ongoing efforts to prevent HAI, with the added opportunity to compare the facility's data with others in the health care system.

5. To avoid duplication of efforts, data collection requirements of the public reporting system (with regard to measures selected, definitions, populations surveyed and surveillance criteria), should, to the extent possible, be consistent with the recommendations and requirements of national organizations and agencies.
6. Reporting requirements should be phased in gradually to enable hospitals to modify their surveillance activities as needed, ensure reliability of data to be reported, and assess needs for additional resources.
7. Requirements for public reporting of HAIs should take into consideration the likely costs to hospitals, and the risk that public reporting may divert resources from infection prevention to data collection unless compensatory resources are made available.
8. Requirements for public reporting of HAIs should take into consideration the need for increased investment in appropriate information technology and information services support in hospitals to facilitate the data collection and analysis required.
9. The Department of Public Health should provide or facilitate initial and ongoing training for hospital staff in the data collection and data submission processes required by the public reporting system.
10. Data collection for public reporting of HAIs should be overseen by individuals with training in infection control and prevention, as defined by the Healthcare Infection Control Practices Advisory Committee (HICPAC).
11. Hospitals should facilitate collaboration and cooperation between their departments of infection control, quality improvement, employee health, and others involved in the prevention and control of HAIs, to ensure that the data required by the reporting system are collected efficiently and used effectively by the institution to improve quality of care.
12. The Department of Public Health should appoint a Technical Advisory Group, to meet regularly, composed of, but not limited to, the Department's director of infectious disease, a representative of the Betsy Lehman Center, infection control professionals, hospital administrators, hospital epidemiologists, quality improvement professionals, health care providers, consumers, and technical experts (e.g., microbiologist, statistician). The purpose of the Group would be to advise the Department on the ongoing implementation of the reporting system, and to assist the Department in the promulgation and review of regulations regarding the surveillance, reporting, and prevention of HAIs.
13. The effects of public reporting of HAIs should be periodically assessed. A plan for such assessment should be built into the public reporting system from the outset.

14. Use of administrative data (such as hospital discharge codes) alone for public reporting of HAIs leads to substantial misclassification and should not be adopted.

B. HAI Measures Selected for Reporting and Monitoring

The selection of measures for HAI reporting was guided by the recommendations of the Healthcare Infection Control Practices Advisory Committee (HICPAC) who emphasized the importance of considering frequency, severity and preventability of HAIs along with the ability to detect and report them accurately^a. The types of infections that best fulfill these criteria are bloodstream infections (BSI) and surgical site infections (SSI). Ventilator-associated pneumonia (VAP) was also considered, but urinary tract infections (UTI) were not since HICPAC has determined there is “less prevention effectiveness relative to the burden of data collection and reporting” of UTIs^a.

Thus far, most public information on hospital performance used to monitor quality of care has been based solely on *process measures* (actions taken by healthcare providers that improve care and reduce risk of complications). However, there is also interest in monitoring the results of these processes through *outcome measures* such as rates of specific infections. The Task Groups and Expert Panel considered both types of measures in their deliberations.

The Expert Panel identified three potential levels of reporting for HAI-related process and outcome measures:

1. To the public for use by consumers, insurers and all stakeholders;
2. To the Betsy Lehman Center for monitoring and quality improvement purposes, but not for public dissemination;
3. Within the institution only, for tracking performance and results of quality improvement activities.

Some HAI measures raise serious concerns about difficulties with standardization across hospitals, which could lead to false reassurance, unfounded fears, and other unintended consequences. For this reason, the second level (Betsy Lehman Center without public distribution) was chosen as a reasonable compromise in selected instances, since it provides an opportunity to study the results with input from experts and appropriate stakeholders while still providing a basis for oversight. In situations in which hospitals use different methods and definitions or evidence supporting the validity of the measure is lacking, internal tracking within the facility for self-assessment was determined to be the limit of utility.

^aMcKibben L, Horan T, et al. Guidance on public reporting of healthcare associated infections: Recommendations of the Healthcare Infection Control Practices Advisory Committee. AJIC. 2005; 33: 217-226.

Using this framework, the following chart summarizes the HAI-related measures that have been recommended for reporting and tracking. Thirteen measures (10 outcome and 3 process) have been given final approval:

HAI Measures Approved by Expert Panel			
Outcome Measures	Reporting Level		
	Public ¹	BLC ²	Internal ³
✓ CVC-BSI in ICUs – true pathogens (CDC criterion 1)*	♦		
✓ CVC-BSI in ICUs – skin contaminants (CDC criterion 2 and 3)*		♦	
✓ CVC-BSI outside of ICUs – true pathogens and skin contaminants (CDC criteria 1 and 2)*			♦
✓ SSI resulting from hip arthroplasty	♦		
✓ SSI resulting from knee arthroplasty	♦		
✓ SSI resulting from hysterectomy (vaginal and abdominal)		♦	
✓ SSI resulting from coronary artery bypass graft		♦	
✓ Ventilator-Associated Pneumonia (VAP)			♦
Point prevalence of methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)		♦	
<i>Clostridium difficile</i> -associated disease (CDAD)			♦
Process Measures			
VAP prevention: Daily application of protocol-driven assessments for ventilation		♦	
VAP prevention: Elevation of the head of the patient's bed		♦	
✓ Influenza vaccination of healthcare workers (new to NHSN for 2008)		♦	

✓ = Measure found in National Healthcare Safety Network (NHSN)

¹ Public – Data submitted to the Department of Public Health

² BLC – Betsy Leman Center for Patient Safety and Medical Error Reduction

³ Internal – For reporting hospital's own use only

CVC-BSI – central-venous catheter-associated bloodstream infection

ICU – intensive care unit

SSI – surgical site infection

* please see [Attachment C](#) in *Recommendations Related to Reporting of Healthcare-Associated Infection Measures*

Given the need for consistent measures, definitions and protocols, the Expert Panel has recommended that the Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) be adopted. Massachusetts hospitals should collect and transmit data to NHSN as the initial HAI reporting framework. To date, 12 other states have also opted to use NHSN for this purpose.

Glossary of acronyms

AAMI	Association for the Advancement of Medical Instrumentation
ABHR	alcohol-based hand rubs
AIIR	Airborne Infection Isolation Room
AORN	Association of Perioperative Registered Nurses
APIC	Association for Practitioners in Infection Control
APR-DRG	All Patient Refined-Diagnosis Related Group
ATS	American Thoracic Society
BSI	bloodstream infection
CABG	coronary artery bypass graft
CABSI	catheter-associated bloodstream infection
CAUTI	catheter-associated urinary tract infection
CBGB	coronary artery bypass graft
CBIC	Certification Board of Infection Control
CDAD	<i>Clostridium difficile</i> -associated disease
CDC	Centers for Disease Control
CMS	Centers for Medicare and Medicaid Services
CPI	Consumer Price Index
CPIS	Clinical Pulmonary Infection Score
CSICU	cardiac surgery intensive care unit
CVC	central-venous catheter
CVC-BSI	central-venous catheter-associated bloodstream infection
DIP	deep incisional primary
DIS	deep incisional secondary
DRG	diagnostic related group
EPA	Environmental Protection Agency
ESBL GNR	extended beta-lactamase producing gram negative rods
ETT	endotracheal tube
FDA	Food and Drug Administration
FTE	full-time equivalents
HAI	healthcare-associated infection
HAP	hospital acquired pneumonia
HCP	healthcare personnel
HCW	healthcare worker
HICPAC	Hospital Infection Control Practices Advisory Committee
HSCT	hematopoietic stem cell transplant
ICD-9	International Classification of Diseases, 9 th Revision
ICP	infection control professional
ICU	intensive care unit
IDSA	Infectious Diseases Society of America
INS	Infusion Nurses Society
IT	information technology
LCBI	laboratory-confirmed bloodstream infection
LCBSI	laboratory-confirmed bloodstream infection
MDPH	Massachusetts Department of Public Health
MHA	Massachusetts Hospital Association
MHCC	Maryland Health Care Commission
MICU	medical intensive care unit
MDRO	multi-drug resistant organism
MRSA	methicillin-resistant <i>Staphylococcus aureus</i>

MSSA	methicillin-susceptible <i>Staphylococcus aureus</i>
NFID	National Foundation for Infectious Diseases
NHSN	National Healthcare Safety Network
NICU	neonatal intensive care unit
NIM	nosocomial infection markers
NNIS	National Nosocomial Infections Surveillance System
NSICU	neuro/neurosurgery intensive care unit
OMB	Office of Management and Budget
OR	operating room
OSHA	Occupational Safety and Health Administration
PCR	polymerase chain reaction
PDS	post-discharge surveillance
PICC	peripherally inserted central catheter
PICU	pediatric intensive care unit
PPE	personal protective equipment
RHQDAPU	Reporting Hospital Quality Data for Annual Payment Update
RSV	Respiratory Syncytial Virus
SARS	severe acute respiratory syndrome
SCIP	surgical care improvement project
SDD	selective decontamination of the digestive tract
SENIC	Study on the Efficacy of Nosocomial Infection Control Project
SHEA	Society for Healthcare Epidemiology of America
SICU	surgical intensive care unit
SIP	superficial incisional primary
SIS	superficial incisional secondary
SSI	surgical site infection
TSM	transparent semipermeable membrane
UTI	urinary tract infection
VAP	ventilator-associated pneumonia
VRE	vancomycin-resistant <i>enterococcus</i>

Project Background

I. Introduction

The importance of healthcare-associated infections (HAIs) as a cause of preventable illness and death has been recognized increasingly in recent years, and the prevention and control of these infections has become a national priority. It has been estimated that 2 million patients develop one or more healthcare associated infections, which contribute to 90,000 deaths annually in the United States.^a Four types of infections account for more than 80 percent of all infections acquired in the healthcare setting: catheter-associated urinary tract infection, surgical site infection, ventilator-associated pneumonia, and bloodstream infection.^a According to our cost analysis, in Massachusetts, an estimated 34,000 HAIs translate into a financial burden ranging from \$200 to \$400 million annually. Recently, American consumer groups have called for mandatory public reporting of individual hospital HAI rates, in an effort to raise public awareness and motivate hospitals to make infection prevention a top priority.

The use of hospital-specific performance data to stimulate improved quality of care and enhance consumer choice is a complicated and divisive issue. Over the past few years, several states have initiated mandatory public reporting of HAI rates. The Massachusetts legislature has initiated efforts to explore and develop a system of reporting hospital-specific HAI reporting in the Commonwealth. To generate a thoughtful and rational approach to this proposition, the Department of Public Health requested that the Betsy Lehman Center for Patient Safety and Medical Error Reduction, with the assistance of JSI Research & Training Institute, Inc., assemble a Panel of Experts charged with formulating a new statewide Infection Prevention and Control Program.

II. Process of Massachusetts Healthcare Associated Infection Prevention and Control Project

JSI Research and Training Institute, Inc. was selected as the contractor through a competitive process by the Massachusetts Department of Public Health in early October 2006 to assist in the effort of establishing a comprehensive statewide infection control program in Massachusetts as specified in a recent healthcare reform law (Chapter 58 of the Acts of 2006, Section 2, Line 4570-1502). 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. 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.

The HAI Expert Panel was charged with making sound, evidence-based, and practical recommendations for a statewide infection control and prevention program. With the objective of

^a Burke JP. (2003). Infection Control - A Problem for Patient Safety. *N Engl J Med* 13;348(7):651-6.

improving health outcomes by reducing the risk of acquiring and transmitting HAIs, the Expert Panel made recommendations on public reporting of HAIs, best practice guidelines, and interventions that promote patient and healthcare worker safety. 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.

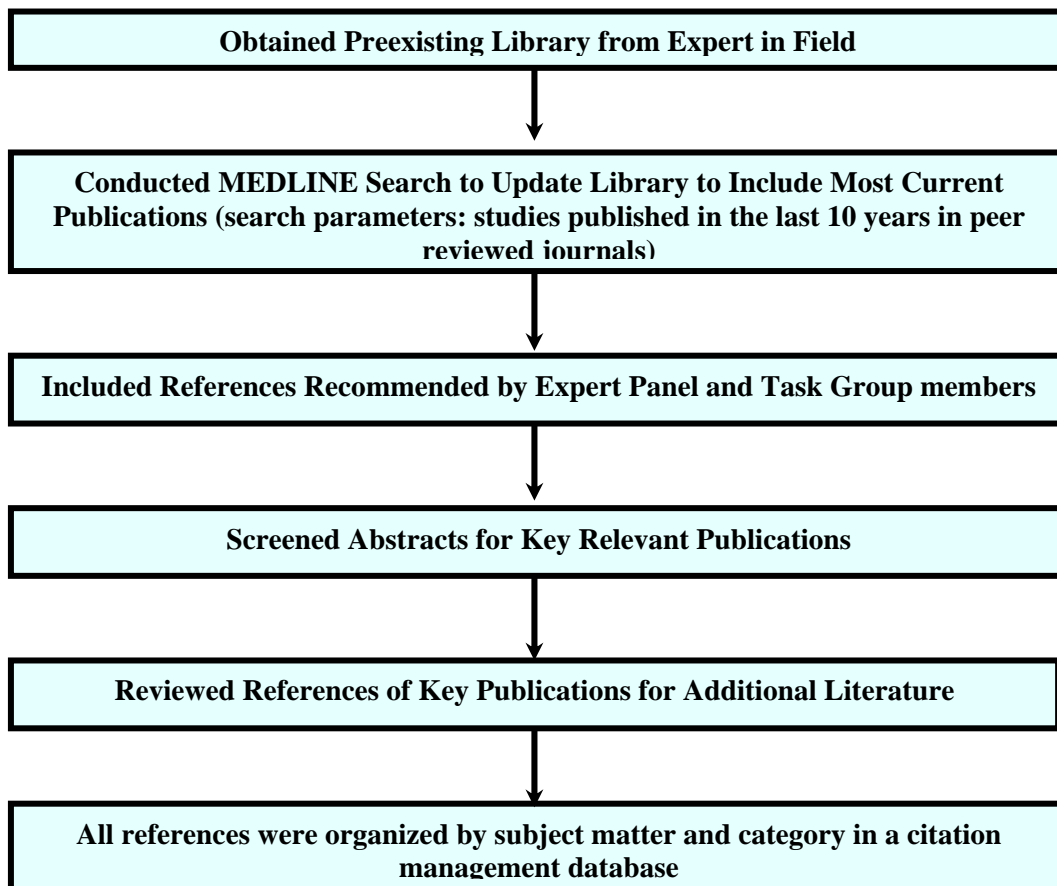
Due to time and capacity limitations, catheter-associated urinary tract infections (CAUTI) were not a specific Task Group topic. However, the product of a parallel process of evidence review and guideline updating, by experts representing the Infectious Disease Society of America (IDSA) and the Society 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.

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 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 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* summarizes the literature review process.

Certain areas of HAI prevention, surveillance, and reporting have been established for decades and are reflected in publications by national agencies and professional societies^b. Advances in science and healthcare delivery methods, however, have resulted in disagreement and controversy in numerous other areas. To aid the Task Groups and Expert Panel in their decisions, JSI generated qualitative summaries and reviews of relevant literature, outlining the current “state of the science” on Task Group-indicated topics of debate. Literature searches were conducted in PubMed using applicable MeSH and key words. 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.

Figure. 1
Literature Search Process



^b The Centers for Disease Control and Prevention (CDC), The Society of Healthcare Epidemiology of America (SHEA), The Association for Professionals in Infection Control and Epidemiology (APIC) and select others.

The approach to searching for reference materials is summarized in Figure 2.

Figure. 2

Search Methodology

General Search Methodology	Articles indexed with the MeSH term "Cross Infection", published in the last twenty years, limited to United States studies only.
Methicillin-Resistant <i>Staphylococcus aureus</i>	MeSH term Methicillin Resistance combined with MeSH term Staphylococcal Infection. Also used the text word MRSA. Combined with MeSH term "Cross Infection". Last 10 years, US studies only.
Surgical Site Infection	MeSH term Surgical Wound Infection combined with Cross Infection. Also used the text words SSI and surgical site infection. Last 10 years, US studies only.
Ventilator-Associated Pneumonia	MeSH terms "Pneumonia, Ventilator-Associated", or the combination of MeSH terms Cross Infection and Pneumonia. The words VAP and "ventilator associated pneumonia" were also searched in the titles and abstracts.
Public Reporting	MeSH terms Mandatory Reporting, Disease Notification, Disclosure and text words performance reporting, public disclosure, public release, public reporting.
Bloodstream Infection	MeSH term Bacteremia and Cross Infection. Also used text words BSI, "blood stream infections".
Education	Search all above results combined with MeSH term Education. Also used text words education and training.

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. Once recommendations were approved, they were presented to the Expert Panel for consideration and any necessary final revisions. Strength of evidence and strength of recommendation were rated using the following scales:

1. 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

2. 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.

The strength of recommendation and evidence scales were adapted by JSI from currently accepted standards and approved by the Expert Panel.^c

During the year, updated CDC guidelines were released that addressed isolation precautions after the Task Group had been reviewing the earlier version. Given that CDC's updated evidence review was current, the Task Group opted to accept these guidelines without repeating the detailed literature review process. This deviation from the earlier process is noted by the symbol [†]. Similarly, the Pediatric Task Group faced the challenge that many of the formal recommendations extrapolate evidence in adults to children of various ages. The lack of specific studies in children results in this limitation. For our

^c McKibben L, Horan T, et al. Guidance on public reporting of healthcare associated infections: Recommendations of the Healthcare Infection Control Practices Advisory Committee. AJIC. 2005; 33: 217-226.

pediatric statements, the [†] symbol is used to identify the statements in which only the adult evidence cited by the source guideline was used.

The Pediatric Affinity Group was charged with reviewing recommendations of the other Task Groups to identify areas where specific modifications were needed to make the statements applicable to neonates, infants and/or children. The majority of these modifications were found in the VAP and BSI Prevention Recommendations. After a review of the pediatric literature, the group amended the general/adult statements and determined the strength of recommendations. These revisions are designated below with the original number of the statement they relate to, followed by P (i.e., 4-P in VAP recommendations). When the original statements (from the source national guidelines) was specific to pediatrics, the Pediatric Group also reviewed these items and updated them, but the numbering system was consistent with the overall format (e.g., no P is added).

III. Other aspects

JSI Research and Training carried out several complementary projects as part of its charge. JSI investigated the perspectives of infection control professionals, hospital executives, and the general public on issues relating to prevention, surveillance, and reporting of HAIs. Analyses of both the economic impact of HAIs and approaches to healthcare worker education were conducted. The details of each project are contained within Part 2 of the report –*Prevention and Control of Healthcare Associated Infections in Massachusetts, Part 2: Findings from Complementary Research Activities, January 31, 2008*.

Recommendations Regarding Prevention of Healthcare-Associated Infections

BEST PRACTICES FOR THE PREVENTION AND CONTROL OF HEALTHCARE-ASSOCIATED INFECTIONS

Activities to reduce or eliminate the risk of HAIs are a crucial component of a comprehensive infection prevention and control program. This section of the report contains nine guidelines reviewed and endorsed by the HAI Expert Panel for implementation in Massachusetts hospitals with the purpose of preventing healthcare-associated infections. These guidelines were adapted from nationally accepted standards developed by the Centers for Disease Control and Prevention (CDC), the American Thoracic Society (ATS) and IDSA/SHEA following a standardized procedure.

The Expert Panel approved the guidelines listed below as of January 31st, 2008:

1. Recommendations Related to Infection Prevention and Control Programs in Hospital Settings
2. Hand Hygiene Recommendations
3. Standard Precautions in Hospitals
4. Contact Precautions in Hospitals
5. Environmental Measures for the Prevention and Management of Multi-drug Resistant Organisms
6. Prevention of Ventilator-Associated Pneumonia
7. Prevention of Surgical Site Infections
8. Prevention of Bloodstream Infections
9. Prevention of Catheter- Associated Urinary Tract Infections

The section that follows provides a detailed discussion of these nine best practice recommendations.

A. ACTIVITIES WITHIN EFFECTIVE INFECTION PREVENTION AND CONTROL PROGRAMS

The cornerstone of efforts to reduce HAIs in the hospital setting is an effective infection prevention and control program. The primary goal of hospital infection prevention and control programs is to protect patients, employees and visitors from transmission of infections. To achieve this goal, hospital infection prevention and control programs take an epidemiologic approach--collecting surveillance data to detect occurrences of infection, analyzing the data to identify factors that increase infection risk, and intervening to minimize or eliminate preventable risk factors in order to lower infection rates. This approach has been more concisely described as “recognize, explain, act”.¹

The Study of the Efficacy of Nosocomial Infection Control (SENIC), conducted by CDC in the late 1970’s, was the first, and remains the only, comprehensive study, to assess the relationship between hospital infection control program structure and activities and infection outcomes.²⁻⁴ The SENIC study established the collection, analysis and dissemination of surveillance data as the single most important factor in the prevention of nosocomial infections (now referred to as healthcare-associated infections).. Building upon this foundation of surveillance, expert groups such as CDC and SHEA, and accreditation bodies such as The Joint Commission, have described the following core functions and essential activities of hospital infection prevention and control programs:⁵⁻⁷

- *Managing critical data and information, including development of surveillance systems within the hospital, collection of surveillance data, analysis and interpretation of the data to identify risk factors and transmission trends, and reporting of findings to key staff, as well as to external bodies as required.*
- *Development of infection control policies and procedures, both hospital-wide and unit specific, that are epidemiologically valid, aligned with current best practice guidelines, and practical to implement within the specific hospital environment. This includes taking steps to ensure that the hospital is in compliance with local, state and federal regulations, as well as accreditation standards related to infection prevention and control.*
- *Intervention to prevent transmission of infectious agents, including facilitation of scrupulous hospital-wide application of hand hygiene and standard and isolation precautions, investigation of outbreaks, and corrective action to minimize identified infection risks and contain outbreaks.*
- *Education and training of health care personnel, including training for all employees at orientation in general principles of infection control in healthcare and standard precautions, and*

ongoing, job or task-specific education in preventing transmission of infectious agents and adhering to best practice guidelines. The infection prevention and control program should also oversee provision of infection prevention information to patients, families and visitors.

- *Infection control aspects of employee health, including the development of employee immunization policies and programs, establishment of work restriction policies, follow-up of workers exposed to communicable diseases, and ongoing collaboration with the employee health department around issues that have infection control implications.*
- *Communication and collaboration with local and state health departments to protect public health. This includes the reporting of communicable diseases and related conditions, and action to respond to elevated local incidence of infectious diseases.*

Other increasingly important and time-consuming functions of the modern hospital infection prevention and control program include: product review (assessment of new equipment, instruments and supplies for infection risk); providing input for decisions on facility design, renovation and construction; monitoring antibiotic usage; and emergency preparedness planning. Most recently, responsibility for public reporting of HAI rates has been added to the list of required tasks for hospital infection prevention and control programs.

While the infection prevention and control program must guide the effort, reducing the risk of HAIs is a hospital-wide responsibility, requiring teamwork and a multidisciplinary approach. Preventing transmission of infectious agents must be a hospital priority and part of institutional objectives. Collaboration of the infection prevention and control program with clinical units and other hospital departments (e.g. quality improvement, employee health, microbiology) is necessary to implement infection control policies, ensure that best practices to reduce device- and procedure-related infection risks are followed, and act to address incidents or clusters of infection. Finally, as specified by both The Joint Commission and CMS, an effective infection prevention and control program requires the direct involvement of hospital leaders to ensure that identified infection control problems are addressed, and to allocate sufficient resources to infection control activities.^{7, 11}

An effective hospital infection prevention and control program must be provided adequate personnel and other resources to accomplish its core functions.^{6-8, 11-12} Resource allocation should be proportional to the institution's size, scope and complexity of clinical services, case mix and acuity of the patient population, and infection risks and trends in the surrounding community.

Essential personnel resources are the professionals required to lead, manage and conduct the work of the infection prevention and control program.²⁻⁶ The SENIC study found hospital epidemiologists and infection control professionals (ICPs) to be vital components of effective programs. The qualifications and responsibilities of these key members of the infection control team are described in the following section entitled Infection Prevention and Control Program Staffing. In addition, an effective infection prevention and control program needs dedicated secretarial and data management support. Surveillance technicians, employed by some programs to collect denominator data and compile data for analysis, can act as ICP “extenders”, freeing up ICP time for infection prevention and education activities.

Necessary other resources include information technology and laboratory services.⁵⁻⁶ Sufficient microbiology laboratory capacity is essential for the detection and investigation of infections, and reference laboratory services should also be readily accessible. IT services and informatics infrastructure are fundamental to infection surveillance and control, facilitating case finding, data analysis, and report generation. Electronic medical records, specialized infection control databases and software, and automated reporting systems maximize efficiency of surveillance and enhance the capacity of infection control program staff to accomplish other critical tasks.

Expert groups have identified the following obstacles to optimal effectiveness of hospital infection prevention and control programs: limited resources and inadequate staffing; an overwhelming scope of work for both the program and for individual staff; responsibility for outpatient and/or long term care sites with diverse infection control needs, in addition to the acute care hospital setting; nursing shortages or inadequate nurse staffing levels that contribute to adverse outcomes; the inherent difficulties of changing provider and patient behaviors that increase infection risk or impede infection prevention; and underestimation of the scope of infection control by hospital administration and staff.^{8, 12-13}

In addition to these health care system-related hurdles, hospital infection prevention and control programs face emerging or intensifying challenges in the broader environment including: antimicrobial resistance and the spread of multidrug-resistant organisms; emerging pathogens such as SARS, virulent new influenza strains, and prion diseases; increasingly invasive medical devices and new therapies such as xenotransplantation; and the increasing threats of bioterrorism and environmental disasters.^{1, 5, 6}

Critical to the success of strategies to reduce HAIs are efforts to strengthen hospital infection prevention and control programs, fully equipping them to “recognize, explain and act” on infection risks, and adapt to emerging trends in health care and in the larger environment.

Source: A Siegel, J. D., E. Rhinehart, et al. (2007). 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. *Am J Infect Control* 35(10 Suppl 2): S65-164.

Administrative Responsibilities¹⁻¹⁴

1. Incorporate preventing transmission of infectious agents into the objectives of the organization's patient safety and occupational health and safety programs. (*CDC Category IB/IC*) **A-II**[†]
2. Make preventing transmission of infectious agents a priority for the healthcare organization. Provide administrative support, including fiscal and human resources for maintaining infection control programs. (*CDC Category IB/IC*) **A-II**[†]
3. Assure that individuals with training in infection control are employed by or are available by contract to all healthcare facilities so that the infection control program is managed by one or more qualified individuals. (*CDC Category IB/IC*) **A-II**[†]
4. Determine the specific infection control full-time equivalents (FTEs) according to the scope of the infection control program, the complexity of the healthcare facility or system, the characteristics of the patient population, the unique or urgent needs of the facility and community, and proposed staffing levels based on survey results and recommendations from professional organizations. (*CDC Category IB*) **A-II**[†]
5. Develop and implement processes to ensure oversight of infection control activities appropriate to the healthcare setting and assign responsibility for oversight of infection control activities to an individual or group within the healthcare organization that is knowledgeable about infection control. (*CDC Category II*) **A-IV**[†]
6. Include prevention of healthcare-associated infections (HAI) as one determinant of bedside nurse staffing levels and composition, especially in high-risk units. (*CDC Category IB*) **A-II**[†]
7. Delegate authority to infection control personnel or their designees (e.g., patient care unit charge nurses) for making infection control decisions concerning patient placement and assignment of Transmission-Based Precautions. (*CDC Category IC*) **A-II**[†]
8. Involve infection control personnel in decisions on facility construction and design, determination of AIIR and Protective Environment capacity needs and environmental assessments. (*CDC Category IB/IC*) **A-II**[†]
9. Provide ventilation systems required for a sufficient number of AIIRs (as determined by a risk assessment) and Protective Environments in healthcare facilities that provide care to patients for whom such rooms are indicated, according to published recommendations. (*CDC Category IB/IC*) **A-II**[†]

10. Involve infection control personnel in the selection and post-implementation evaluation of medical equipment and supplies and changes in practice that could affect the risk of HAI. *(CDC Category IC)*
A-II[†]
11. Ensure availability of human and fiscal resources to provide clinical microbiology laboratory support, including a sufficient number of medical technologists trained in microbiology, appropriate to the healthcare setting, for monitoring transmission of microorganisms, planning and conducting epidemiologic investigations, and detecting emerging pathogens. Identify resources for performing surveillance cultures, rapid diagnostic testing for viral and other selected pathogens, preparation of antimicrobial susceptibility summary reports, trend analysis, and molecular typing of clustered isolates (performed either on-site or in a reference laboratory) and use these resources according to facility-specific epidemiologic needs, in consultation with clinical microbiologists. *(CDC Category IB)*
A-II[†]
12. Provide human and fiscal resources to meet occupational health needs related to infection control (e.g., healthcare personnel immunization, post-exposure evaluation and care, evaluation and management of healthcare personnel with communicable infections). *(CDC Category IB/IC)* **A-II**[†]
13. In all areas where healthcare is delivered, provide supplies and equipment necessary for the consistent observance of Standard Precautions, including hand hygiene products and personal protective equipment (e.g., gloves, gowns, face and eye protection). *(CDC Category IB/IC)* **A-II**[†]
14. Develop and implement policies and procedures to ensure that reusable patient care equipment is cleaned and reprocessed appropriately before use on another patient. *(CDC Category IA/IC)* **A-II**[†]
15. Develop and implement systems for early detection and management (e.g., use of appropriate infection control measures, including standard and isolation precautions, PPE) of potentially infectious persons at initial points of patient encounter in outpatient settings (e.g., triage areas, emergency departments, outpatient clinics, physician offices) and at the time of admission to hospitals and long-term care facilities (LTCF). *(CDC Category IB)* **A-II**[†]
16. Develop and implement policies and procedures to limit patient visitation by persons with signs or symptoms of a communicable infection. Screen visitors to high-risk patient care areas (e.g., oncology units, hematopoietic stem cell transplant [HSCT] units, intensive care units, other severely immunocompromised patients) for possible infection. *(CDC Category IB)* **A-II**[†]
17. Identify performance indicators of the effectiveness of organization-specific measures to prevent transmission of infectious agents (Standard and Transmission-Based Precautions), establish processes to monitor adherence to those performance measures and provide feedback to staff members. *(CDC Category IB)* **A-II**[†]

Education and Training

18. Provide job- or task-specific education and training on preventing transmission of infectious agents associated with healthcare during orientation to the healthcare facility; update information periodically during ongoing education programs. Target all healthcare personnel for education and training, including but not limited to medical, nursing, clinical technicians, laboratory staff; property service (housekeeping), laundry, maintenance and dietary workers; students, contract staff and volunteers. Document competency initially and repeatedly, as appropriate, for the specific staff positions. Develop a system to ensure that healthcare personnel employed by outside agencies meet these education and training requirements through programs offered by the agencies or by participation in the healthcare facility's program designed for full-time personnel. *(CDC Category IB)*
A-II[†]
19. Include in education and training programs, information concerning use of vaccines as an adjunctive infection control measure. *(CDC Category IB)* **A-II**[†]
20. Enhance education and training by applying principles of adult learning, using reading level and language appropriate material for the target audience, using online educational tools available to the institution, and having persons with content expertise available to answer questions. *(CDC Category IB)*
A-II[†]
21. Provide instructional materials (and the necessary supplies) for patients and visitors on recommended hand hygiene and Respiratory Hygiene/Cough Etiquette practices and the application of Transmission-Based Precautions. *(CDC Category II)* **A-IV**[†]
22. Hospitals should provide patients and their families and visitors with easy-to-understand information on what they can do to help prevent infection during and after the hospital stay. This education on infection prevention should encourage patients and their families/visitors to take an active role, including reminding health care providers to clean their hands. **A-IV**⁵

Surveillance

23. Monitor the incidence of targeted organisms and HAIs that are epidemiologically important, have substantial impact on outcomes, and for which effective preventive interventions are available; targeted organisms or HAIs may be deemed important at the national, local, and/or institutional level. Use information collected through surveillance of high-risk populations, organisms, procedures, and devices to detect transmission of infectious agents and to prioritize interventional strategies appropriate to the individual healthcare facility. *(CDC Category IA)* **A-II**[†]
24. Apply the following epidemiologic principles of infection surveillance:

- Use standardized definitions of infection
 - Use laboratory-based data (when available)
 - Collect epidemiologically-important variables (e.g., patient locations and/or clinical service in hospitals and other large multi-unit facilities, population-specific risk factors [e.g., low birth-weight neonates], underlying conditions that predispose to serious adverse outcomes)
 - Analyze data to identify trends that may indicate increased rates of transmission
 - Feedback information on trends in the incidence and prevalence of HAIs, probable risk factors, and prevention strategies and their impact to the appropriate healthcare providers, organization administrators, and as required by local and state health authorities. (*CDC Category IB*) **A-II**[†]
25. Develop and implement strategies to reduce risks for transmission and evaluate effectiveness. (*CDC Category IB*) **A-II**[†]
26. When transmission of epidemiologically-important organisms continues despite implementation and documented adherence to infection prevention and control strategies, obtain consultation from persons with knowledge and expertise relevant to the ongoing infection control problem to review the situation and recommend additional measures for control. (*CDC Category IB*) **A-II**[†]
27. Review periodically information on community or regional trends in the incidence and prevalence of epidemiologically-important organisms (e.g., influenza, RSV, pertussis, invasive group A streptococcal disease, MRSA, VRE) (including in other healthcare facilities) that may impact transmission of organisms within the facility. (*CDC Category II*) **B-IV**[†]

B. INFECTION PREVENTION AND CONTROL PROGRAM STAFFING

An effective infection prevention and control program, as described in the previous section, must be directed and managed by individuals with training in infection control and prevention. Health care professionals with the requisite training include infection control professionals (ICPs) and healthcare epidemiologists. As defined by HICPAC^d, an ICP is a person whose primary training is in either nursing, medical technology, microbiology, or epidemiology and who has acquired special training in infection control, and a healthcare epidemiologist is a person whose primary training is medical (M.D., D.O.) and/or masters or doctorate-level epidemiology who has received advanced training in healthcare epidemiology.¹⁵ The centrality of these professionals as essential elements of an effective program is supported by research and expert opinion, and reflected in regulations and accreditation requirements for hospital infection prevention and control programs.¹⁵⁻²¹

As to the staffing levels required for an effective hospital infection prevention and control program, the current recommendations of the relevant expert groups, accrediting and regulatory bodies all assert that adequate personnel resources must be provided, but stop short of recommending specific staffing ratios.¹⁵⁻¹⁸

The SENIC study conducted in 1975-76 established that hospital infection control programs that included a hospital epidemiologist in a leadership role, at least 1 ICP per 250 beds, and a surveillance program incorporating feedback of infection rates to surgeons decreased the prevalence of nosocomial infections by 30 – 50 %.¹⁶⁻¹⁷ In the more than 30 years since SENIC was conducted, the face of infection control has

^d **Infection control and prevention professional (ICP).** A person whose primary training is in either nursing, medical technology, microbiology, or epidemiology and who has acquired special training in infection control. Responsibilities may include collection, analysis, and feedback of infection data and trends to healthcare providers; consultation on infection risk assessment, prevention and control strategies; performance of education and training activities; implementation of evidence-based infection control practices or those mandated by regulatory and licensing agencies; application of epidemiologic principles to improve patient outcomes; participation in planning renovation and construction projects (e.g., to ensure appropriate containment of construction dust); evaluation of new products or procedures on patient outcomes; oversight of employee health services related to infection prevention; implementation of preparedness plans; communication within the healthcare setting, with local and state health departments, and with the community at large concerning infection control issues; and participation in research. Certification in infection control (CIC) is available through the Certification Board of Infection Control and Epidemiology.

Healthcare epidemiologist. A person whose primary training is medical (M.D., D.O.) and/or masters or doctorate-level epidemiology who has received advanced training in healthcare epidemiology. Typically these professionals direct or provide consultation to an infection control program in a hospital, long term care facility (LTCF), or healthcare delivery system (also see infection control professional).

changed dramatically, and the frequently cited staffing level of 1 ICP per 250 beds is agreed to be inadequate to meet the needs of the 21st century.

Since that landmark study there have been no comprehensive investigations of the infection outcomes associated with varying staffing levels.²¹ A very few studies which have looked at this relationship incidentally rather than as a primary focus of the study, have shown an inverse relationship between ICP staffing levels and infections rates.^{22,25}

Most of the studies that have been done relative to ICP staffing levels are surveys—asking hospitals to report their ICP FTEs along with numbers of beds, ICU beds, and sometimes outpatient visits and admissions.²³⁻³¹ These surveys show only what the situation currently is, and do not necessarily reflect what is optimal. The most recent studies show a range of staffing ratios from 1 ICP per 106 beds in university health consortium hospitals³⁰ to 1 per 115 in hospitals participating in NNIS,²⁴ to 1 per 191³¹ in hospitals affiliated with Hospital Corporation of America. Looking at these surveys as a group, there is a gradual trend over time of increasing ICP FTEs per beds, presumably because the responsibilities of the infection control program continue to grow, and the complexity of the care continues to increase.

The Certification Board of Infection Control (CBIC) has periodically surveyed ICPs regarding their job responsibilities and their infection prevention and control program's scope of work. These surveys show that both continue to expand over time.³²⁻³⁴ New areas of responsibility continue to be added, such as surge capacity planning, adherence monitoring for infection control practices, and consultation on facility renovation and construction. ICPs are also being asked to cover multiple settings with different infection control profiles, for example to provide infection control services to outpatient departments and long-term care facilities affiliated with their acute care hospitals.

A study conducted in 2000 with a panel of experts used a Delphi methodology to look at the job responsibilities of ICPs, the essential tasks of infection control and the time needed to complete each. Based on these time estimates, the panel recommended a staffing ratio of 1 ICP per 100 occupied beds, for the first 100 beds, and varying levels beyond that point based on institution size and patient population.³⁵

Since 2000 when the Delphi study was conducted, emerging environmental trends such as increasing threats of bioterrorism and pandemic influenza, and mounting prevalence of MDROs, have resulted in additional demands on ICPs' time to participate in preparedness planning, and the monitoring of

antimicrobial usage.^{15, 36} Most recently, mandated public reporting of HAIs has added a new layer of duties to the ICP's charge, the impact of which has not yet been measured. None of the studies published so far on public reporting have analyzed the actual time requirements, although depending on what is required these may be substantial. These circumstances have been interpreted by members of the Expert Panel to suggest that the recommended staffing level for ICPs should be somewhat higher than the 1 FTE per 100 beds proposed by the Delphi study. Other members of the Panel voiced concern with this conclusion as no recent studies have been done associating specific staffing levels with infection outcomes. There was strong agreement however that hospital decisions concerning appropriate staffing levels must be based on more than bed numbers, and should take into account the scope of the institution's clinical programs, the complexity of the health care system, characteristics of the patient population, unique needs of the facility and community, as well as the availability of tools (IT) for performing critical tasks.

Staffing Recommendations¹⁵⁻³⁷

1. Infection control responsibilities have expanded beyond the traditional acute inpatient setting to incorporate services to complex medical systems, including outpatient services and post-acute care; employee exposure and infection prevention; surge capacity and pandemic planning; bioterrorism preparedness; quality improvement projects; consultation on facility renovation and design; post discharge surveillance; and added accountability for mandatory reporting of HAIs. Increasing acuity of the patient population, emerging pathogens, escalating prevalence of MDROs, and the continuous introduction of new medical devices and therapies with infection potential all contribute to the need for expanded Infection Control Professional (ICP) staffing.

To achieve the goal of reducing HAIs and protecting patients, staff, and visitors from infection transmission, an effective infection prevention and control program requires adequate staffing. Current literature and expert opinion suggest that 1.0 to 1.5 ICP FTEs per 100 occupied beds may be required. Staffing levels in the higher end of this range may be warranted in hospitals with more complex case mix and clinical services. The availability of state-of-the-art information technology and allied personnel, such as surveillance technicians and data analysts, may extend the capacity of ICPs to accomplish infection control tasks. **A-IV**^{15,18, 23-33, 36-37}

2. An optimal hospital infection control program would be overseen by, or have under contract, consultation services by a certified infection control professional (ICP) and/or healthcare epidemiologist. **A-IV**^{15-21, 34}

3. An optimal hospital infection control program would have a team of support staff, with sufficient personnel dedicated to the program to accomplish the core and associated functions of the infection control program. Necessary support personnel include secretarial staff and IT support, and may also include surveillance technicians (denominator data collectors) and data managers. **A-IV**^{15, 18, 33, 35}

Hand Hygiene Recommendations

Source: Healthcare Infection Control Practices Advisory Committee, HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. Guideline for hand hygiene in health-care settings. MMWR Recomm Rep 2002 Oct 25;51(RR-16):1-48.

1. Indications for handwashing and hand antisepsis

- A. When hands are visibly dirty or contaminated with proteinaceous material or are visibly soiled with blood or other body fluids, wash hands with either a non-antimicrobial soap and water or an antimicrobial soap and water. **A-IV**[†]
- B. If hands are not visibly soiled, an alcohol-based hand rub is preferred for routinely decontaminating hands in all other clinical situations described in items below because it significantly reduces the number of microorganisms on the skin and is easy to use. **A-I**³⁸⁻⁴⁴
Alternatively, wash hands with an antimicrobial soap and water in all clinical situations described in items below. (C-J) **A-II**[†]
- C. Decontaminate hands before having direct contact with patients. **A-II**[†]
- D. Decontaminate hands before donning sterile gloves when inserting a central intravascular catheter. **A-II**[†]
- E. Decontaminate hands before inserting indwelling urinary catheters, peripheral vascular catheters, or other invasive devices that do not require a surgical procedure. It is unknown whether more intensive hand hygiene is required for prolonged non- surgical procedures and therefore current CDC hand hygiene guidelines should be followed in the interim. **A-II**⁴⁵
- F. Decontaminate hands after contact with a patient's intact skin (e.g., when taking a pulse or blood pressure, and lifting a patient). **A-II**[†]
- G. Decontaminate hands after contact with body fluids or excretions, mucous membranes, non-intact skin, and wound dressings if hands are not visibly soiled. **A-II**[†]
- H. Decontaminate hands if moving from a contaminated-body site to a clean-body site during patient care. **A-III**[†]

- I. Decontaminate hands after contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient. **A-III**[†]
- J. Decontaminate hands after removing gloves. **A-II**[†]
- K. Before eating and after using a restroom, wash hands with a non-antimicrobial soap and water or with an antimicrobial soap and water. **A-II**[†]
- L. Antimicrobial-impregnated wipes (i.e., towelettes) may be considered as an alternative to washing hands with non-antimicrobial soap and water. Because they are not as effective as alcohol-based hand rubs or washing hands with an antimicrobial soap and water for reducing bacterial counts on the hands of healthcare workers (HCWs), they are not a substitute for using an alcohol-based hand rub or antimicrobial soap. **B-II**[†]
- M. Based on in vitro data, alcohol is not effective at killing spores of organisms such as *Clostridium difficile* or *Bacillus anthracis*. (III) Although no direct comparison studies have been conducted, washing hands with water and soap physically removes spores from the skin and therefore may be more effective in this clinical setting. (IV) **B-V**⁴⁶⁻⁵⁰
 In the setting of an outbreak of a spore-forming organism such as *C. difficile*, washing hands with soap and water is recommended. **B-IV**⁴⁶⁻⁵⁰
- N. No recommendation can be made regarding the routine use of nonalcohol-based hand rubs for hand hygiene in health-care settings. Unresolved issue. **B-IV**[†]

For surgical antisepsis recommendations, please refer to *Hand/forearm antisepsis for surgical team members of the SSI prevention guideline*

Hand-hygiene technique

- 2. When decontaminating hands with an alcohol-based hand rub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Follow the manufacturer's recommendations regarding the volume of product to use. **A-II**[†]
- 3. When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 15

seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet. **A-II**[†]

Avoid using hot water, because repeated exposure to hot water may increase the risk of dermatitis. **A-II**[†]

4. Liquid, bar, leaflet or powdered forms of plain soap are acceptable when washing hands with a non-antimicrobial soap and water. When bar soap is used, soap racks that facilitate drainage and small bars of soap should be used. **B-III**[†]
5. Multiple-use cloth towels of the hanging or roll type are not recommended for use in health-care settings. **A-IV**[†]
6. Standard hand hygiene practices apply to neonatal ICUs; surgical scrubs are not routinely required. **A-III**⁵¹⁻⁵²

Selection of hand-hygiene agents

7. Provide personnel with efficacious hand-hygiene products that have low irritancy potential, particularly when these products are used multiple times per shift. This recommendation applies to products used for hand antisepsis before and after patient care in clinical areas and to products used for surgical hand antisepsis by surgical personnel. If hands are not visibly soiled, alcohol-based hand rubs (ABHRs) are preferred because ABHRs have a lower irritancy potential for skin. **B-II**⁵³⁻⁵⁶
8. To maximize acceptance of hand-hygiene products by healthcare workers, solicit input from these employees regarding the feel, fragrance, and skin tolerance of any products under consideration. The cost of hand-hygiene products should not be the primary factor influencing product selection. **B-II**[†]
9. When selecting non-antimicrobial soaps, antimicrobial soaps, or alcohol-based hand rubs, solicit information from manufacturers regarding any known interactions between products used to clean hands, skin care products, and the types of gloves used in the institution. **B-IV**[†]
10. Before making purchasing decisions, evaluate the dispenser systems of various product manufacturers or distributors to ensure that dispensers function adequately and deliver an appropriate volume of product. **B-III**[†]

11. Do not add soap to a partially empty soap dispenser. This practice of "topping off" dispensers can lead to bacterial contamination of soap. **A-II**[†]

Skin care

12. Provide HCWs with hand lotions or creams to minimize the occurrence of irritant contact dermatitis associated with hand antiseptics or handwashing. **A-I**[†]
13. Solicit information from manufacturers regarding any effects that hand lotions, creams, or alcohol-based hand antiseptics may have on the persistent effects of antimicrobial soaps being used in the institution. **B-III**[†]

Other Aspects of Hand Hygiene

14. Do not wear artificial fingernails or extenders when having direct contact with patients at high risk (e.g., those in intensive-care units or operating rooms). **A-II**[†]
Do not wear artificial nails in environments that require sterile conditions (e.g., pharmacies or sterile processing departments). **A-IV**[†]
15. Keep natural nail tips less than 1/4-inch long. **A-IV**[†]
16. Wear gloves when contact with blood or other potentially infectious materials, mucous membranes, and non-intact skin could occur. **A-IV**[†]
17. Remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient, and do not wash gloves between uses with different patients. **A-II**[†]
18. Change gloves during patient care if moving from a contaminated body site to a clean body site. **A-IV**[†]
19. No recommendation can be made regarding wearing rings in non-surgical healthcare settings. **B-V**[†]

Healthcare worker educational and motivational programs

20. As part of an overall program to improve hand hygiene practices of HCWs, educate personnel regarding the types of patient-care activities that can result in hand contamination and the advantages and disadvantages of various methods used to clean their hands. **A-III**[†]

21. Monitor HCWs' adherence with recommended hand hygiene practices with an accepted monitoring approach (refer to section 9 for details) and provide personnel with information regarding their performance. **A-II**⁵⁷⁻⁶⁷

Additionally, when outbreaks of infection occur or unusual pathogens are detected, assess the adequacy of healthcare worker hand hygiene and compliance with fingernail recommendations. **A-IV**⁵⁷⁻⁶⁷

22. Encourage patients and their families to remind HCWs to decontaminate their hands in addition to other efforts to improve compliance with hand hygiene. **B-II**⁶⁸⁻⁷⁰

Administrative measures

23. Make improved hand hygiene adherence an institutional priority and provide appropriate administrative support and financial resources. **A-II**[†]
24. Implement a multidisciplinary program designed to improve adherence of health personnel to recommended hand-hygiene practices. **A-II**[†]
25. As part of a multidisciplinary program to improve hand hygiene adherence, provide HCWs with a readily accessible alcohol-based hand-rub product. **A-II**[†]
26. To improve hand-hygiene adherence among personnel who work in areas in which high workloads and high intensity of patient care are anticipated, make an alcohol-based hand rub available at the entrance to the patient's room or at the bedside, in other convenient locations, or in individual pocket-sized containers to be carried by HCWs. **A-II**[†]
27. Store supplies of alcohol-based hand rubs in cabinets or areas approved for flammable materials. **A-IV**[†]

Performance indicators

Monitoring for adherence to hand hygiene should be done using an accepted approach and that same approach should be used consistently within a single institution. Some approved approaches include performance indicator A or B listed below. **A-IV**[†]

A. Periodically monitor and record adherence as the number of hand-hygiene episodes performed by personnel/number of hand-hygiene opportunities, by ward or by service. Provide feedback to personnel regarding their performance. **B-IV**[†]

B. Monitor the volume of alcohol-based hand rub (or detergent used for handwashing or hand antisepsis) used per 1,000 patient-days. **B-IV**[†]

Standard Precautions in Hospitals

Source: Siegel, J. D., E. Rhinehart, et al. (2007). 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. *Am J Infect Control* 35(10 Suppl 2): S65-164.

Hand Hygiene

1. During the delivery of healthcare, avoid unnecessary touching of surfaces in close proximity to the patient to prevent both contamination of clean hands from environmental surfaces and transmission of pathogens from contaminated hands to surfaces. **B-IV**[†]
2. When hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids, wash hands with either a nonantimicrobial soap and water or an antimicrobial soap and water. **A-IV**[†]
3. If hands are not visibly soiled, or after removing visible material with nonantimicrobial soap and water, decontaminate hands in the clinical situations described in 3 a-g. The preferred method of hand decontamination is with an alcohol-based hand rub. Alternatively, hands may be washed with an antimicrobial soap and water. Frequent use of alcohol-based hand rub immediately following handwashing with nonantimicrobial soap may increase the frequency of dermatitis. **A-IV**[†]

Perform hand hygiene:

A. Before having direct contact with patients. **A-IV**[†]

B. After contact with blood, body fluids or excretions, mucous membranes, nonintact skin, or wound dressings. **A-IV**[†]

C. After contact with a patient's intact skin (e.g., when taking a pulse or blood pressure or lifting a patient). **A-IV**[†]

D. If hands will be moving from a contaminated-body site to a clean-body site during patient care. **A-IV**[†]

E. After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient. **A-IV**[†]

F. Before doning gloves and after removing gloves. **A-IV**[†]

G. Before performing any invasive procedures. **A-IV**[†]

4. Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g., *C. difficile* or *Bacillus anthracis*) is likely to have occurred. The physical action of washing and rinsing hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores. **B-IV**[†]

5. A. Do not wear artificial fingernails or extenders if duties include direct contact with patients (e.g., those in ICUs or operating rooms). **A-IV**[†]

B. Do not wear artificial nails in food service areas or environments that require sterile conditions (e.g. pharmacies or sterile processing departments) **A-IV**[†]

Personal Protective Equipment (PPE)

6. Observe the following principles of use:

A. Wear PPE, as described in recommendations 7-9, when the nature of the anticipated patient interaction indicates that contact with blood or body fluids may occur. **B-IV**[†]

B. Prevent contamination of clothing and skin during the process of removing PPE (see Attachment A). **B-IV**[†]

C. Before leaving the patient's room or cubicle, remove and discard PPE. **B-IV**[†]

Gloves

7. A. Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, nonintact skin, or potentially contaminated intact skin (e.g., of a patient incontinent of stool or urine) could occur. **B-IV**[†]

B. Wear gloves with fit and durability appropriate to the task. **B-IV**[†]

- i. Wear disposable medical examination gloves for providing direct patient care.
- ii. Wear disposable medical examination gloves or reusable utility gloves for cleaning the environment or medical equipment.

C. Remove gloves after contact with a patient and/or the surrounding environment including medical equipment) using proper technique to prevent hand contamination (see Attachment A). Do not wear the same pair of gloves for the care of more than one patient. Do not wash gloves for the purpose of reuse since this practice has been associated with transmission of pathogens. **B-IV**[†]

D. Change gloves during patient care if the hands will move from a contaminated body-site (e.g., perineal area) to a clean body-site (e.g., face). **B-IV**[†]

Gowns

8. A. Wear a gown, that is appropriate to the task, to protect skin and prevent soiling contamination of clothing during procedures and patient-care activities when contact with blood, body fluids, secretions, or excretions is anticipated. **B-IV**[†]

- i. Wear a gown for direct patient contact if the patient has uncontained secretions or excretions.
- ii. Remove gown and perform hand hygiene before leaving the patient's environment. **B-IV**[†]

B. Do not reuse gowns, even for repeated contacts with the same patient. **B-IV**[†]

C. Routine donning of gowns upon entrance into a high risk unit (e.g., ICU, NICU, HSCT unit) is not indicated. **B-IV**[†]

Mouth, nose, eye protection

9. Use PPE to protect the mucous membranes of the eyes, nose and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions. Select masks, goggles, face shields, and combinations of each according to the need anticipated by the task performed. **B-IV**[†]

10. During aerosol-generating procedures (e.g., bronchoscopy, suctioning of the respiratory tract [if not using in-line suction catheters], endotracheal intubation) in patients who are not suspected of being infected with an agent for which respiratory protection is otherwise recommended (e.g., *M. tuberculosis*, SARS or hemorrhagic fever viruses), wear one of the following: a face shield that fully covers the front and sides of the face, a mask with attached shield, or a mask and goggles (in addition to gloves and gown). **B-IV**[†]

Respiratory Hygiene/Cough Etiquette

11. Educate healthcare personnel on the importance of source control measures to contain respiratory secretions to prevent droplet and fomite transmission of respiratory pathogens, especially during seasonal outbreaks of viral respiratory tract infections (e.g., influenza, RSV, adenovirus, parainfluenza virus) in communities. **A-IV**[†]
12. Implement the following measures to contain respiratory secretions in patients and accompanying individuals who have signs and symptoms of a respiratory infection, beginning at the point of initial encounter in a healthcare setting (e.g., triage, reception and waiting areas in emergency departments, outpatient clinics and physician offices). **A-IV**[†]
- A. Post signs at entrances and in strategic places (e.g., elevators, cafeterias) within ambulatory and inpatient settings with instructions to patients and other persons with symptoms of a respiratory infection to cover their mouths/noses when coughing or sneezing, use and dispose of tissues, and perform hand hygiene after hands have been in contact with respiratory secretions. **A-IV**[†]
- B. Provide tissues and no-touch receptacles (e.g., foot-pedal operated lid or open, plastic-lined waste basket) for disposal of tissues. **A-IV**[†]
- C. Provide resources and instructions for performing hand hygiene in or near waiting areas in ambulatory and inpatient settings; provide conveniently-located dispensers of alcohol-based hand rubs and, where sinks are available, supplies for handwashing. **B-IV**[†]
- D. During periods of increased prevalence of respiratory infections in the community (e.g., as indicated by increased school absenteeism, increased number of patients seeking care for a respiratory infection), offer masks to coughing patients and other symptomatic persons (e.g., persons who

accompany ill patients) upon entry into the facility or medical office and encourage them to maintain special separation, ideally a distance of at least 3 feet, from others in common waiting areas. **B-IV**[†]

- i. Some facilities may find it logistically easier to institute this recommendation year-round as a standard of practice. **A-IV**[†]

Patient Placement

13. Include the potential for transmission of infectious agents in patient-placement decisions. Place patients who pose a risk for transmission to others (e.g., uncontained secretions, excretions or wound drainage; infants with suspected viral respiratory or gastrointestinal infections) in a single-patient room when available. **B-IV**[†]

14. Determine patient placement based on the following principles: **A-IV**[†]

- Route(s) of transmission of the known or suspected infectious agent
- Risk factors for transmission in the infected patient
- Risk factors for adverse outcomes resulting from an HAI in other patients in the area or room being considered for patient placement
- Availability of single-patient rooms
- Patient options for room-sharing (e.g. cohorting patients with the same infection)

Patient-care equipment and instruments/devices

15. Establish policies and procedures for containing, transporting, and handling patient-care equipment and instruments/devices that may be contaminated with blood or body fluids. **A-IV**[†]

16. Remove organic material from critical and semi-critical instrument/devices, using recommended cleaning agents before high level disinfection and sterilization to enable effective disinfection and sterilization processes. **A-IV**[†]

17. Wear PPE (e.g., gloves, gown), according to the level of anticipated contamination, when handling patient-care equipment and instruments/devices that is visibly soiled or may have been in contact with blood or body fluids. **A-IV**[†]

Care of the Environment

18. Establish policies and procedures for routine and targeted cleaning of environmental surfaces as indicated by the level of patient contact and degree of soiling. **A-IV**[†]
19. Clean and disinfect surfaces that are likely to be contaminated with pathogens, including those that are in close proximity to the patient (e.g., bed rails, over bed tables) and frequently-touched surfaces in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients' rooms) on a more frequent schedule compared to that for other surfaces (e.g., horizontal surfaces in waiting rooms). **B-IV**[†]
20. Use EPA-registered disinfectants that have microbiocidal (i.e., killing) activity against the pathogens most likely to contaminate the patient-care environment. Use in accordance with manufacturer's instructions. **B-IV**[†]
 - A. Review the efficacy of in-use disinfectants when evidence of continuing transmission of an infectious agent (e.g., rotavirus, *C. difficile*, norovirus) may indicate resistance to the in-use product and change to a more effective disinfectant as indicated. **B-IV**[†]
21. In facilities that provide health care to pediatric patients or have waiting areas with child play toys (e.g., obstetric/gynecology offices and clinics), establish policies and procedures for cleaning and disinfecting toys at regular intervals. **B-IV**[†]

Use the following principles in developing this policy and procedures: **B-IV**[†]

 - Select play toys that can be easily cleaned and disinfected
 - Do not permit use of stuffed furry toys if they will be shared
 - Clean and disinfect large stationary toys (e.g., climbing equipment) at least weekly and whenever visibly soiled
 - If toys are likely to be mouthed, rinse with water after disinfection; alternatively wash in a dishwasher
 - When a toy requires cleaning and disinfection, do so immediately or store in a designated labeled container separate from toys that are clean and ready for use.
22. Include multi-use electronic equipment in policies and procedures for preventing contamination and for cleaning and disinfection, especially those items that are used by patients, those used during

delivery of patient care, and mobile devices that are moved in and out of patient rooms frequently (e.g., daily). **B-IV**[†]

A. No recommendation for use of removable protective covers or washable keyboards. **UI**[†]

Textiles and Laundry

23. Handle used textiles and fabrics with minimum agitation to avoid contamination of air, surfaces and persons. **B-IV**[†]

24. If laundry chutes are used, ensure that they are properly designed, maintained, and used in a manner to minimize dispersion of aerosols from contaminated laundry. **B-IV**[†]

Safe Injection Practices

The following recommendations apply to the use of needles, cannulas that replace needles, and, where applicable intravenous delivery systems.

25. Use aseptic technique to avoid contamination of sterile injection equipment. **A-IV**[†]

26. Do not administer medications from a syringe to multiple patients, even if the needle or cannula on the syringe is changed. Needles, cannulae and syringes are sterile, single-use items; they should not be reused for another patient nor to access a medication or solution that might be used for a subsequent patient. **A-IV**[†]

27. Use fluid infusion and administration sets (i.e., intravenous bags, tubing and connectors) for one patient only and dispose appropriately after use. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient's intravenous infusion bag or administration set. **A-IV**[†]

28. Use single-dose vials for parenteral medications whenever possible. **A-IV**[†]

29. Do not administer medications from single-dose vials or ampules to multiple patients or combine leftover contents for later use. **A-IV**[†]

30. If multidose vials must be used, both the needle or cannula and syringe used to access the multidose vial must be sterile. **A-IV**[†]
31. Do not keep multidose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable. **A-IV**[†]
32. Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients. **B-IV**[†]

Infection control practices for special lumbar puncture procedures

33. Wear a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture and spinal or epidural anesthesia). **B-IV**[†]

Worker Safety

34. Adhere to federal and state requirements for protection of healthcare personnel from exposure to bloodborne pathogens. For federal regulations refer to OSHA regulations for bloodborne pathogens 29 CFR 1910.1030 and for state requirements refer to the Massachusetts Department of Public Health Hospital Licensure Regulations 105 CMR 130.000. **A-IV**[†]

Contact Precautions in Hospitals

Source: Siegel, J. D., E. Rhinehart, et al. (2007). 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. *Am J Infect Control* 35(10 Suppl 2): S65-164.

A. General Principles

1. In addition to Standard Precautions, use Transmission-Based Precautions for patients with documented or suspected infection or colonization with highly transmissible or epidemiologically-important pathogens for which additional precautions are needed to prevent transmission (see Attachment B for type and duration of precautions recommended for multi-drug resistant organisms (MDROs), infection or colonization). **A-IV**[†]
2. Extend duration of Transmission-Based Precautions, (e.g., Droplet, Contact) for immunosuppressed patients with viral infections due to prolonged shedding of viral agents that may be transmitted to others. **A-IV**[†]

B. Contact Precautions

3. Use Contact Precautions as recommended in Appendix A (2007 HICPAC Isolation Precaution Guidelines pages 93-113) for patients with known or suspected infections or evidence of syndromes that represent an increased risk for contact transmission. For specific recommendations for use of Contact Precautions for colonization or infection with MDROs, go to the MDRO guideline (Management of Multidrug-Resistant Organisms in Healthcare Settings Guideline). **A-IV**⁷¹

Patient placement

4. In acute care hospitals, place patients who require Contact Precautions in a single-patient room when available. **B-IV**[†]

When single-patient rooms are in short supply, apply the following principles for making decisions on patient placement:

- A. Prioritize patients with conditions that may facilitate transmission (e.g., uncontained drainage, stool incontinence) for single-patient room placement. **B-IV**[†]

- B. Place together in the same room (cohort) patients who are infected or colonized with the same pathogen and are suitable roommates. **B-IV**[†]
- C. If it becomes necessary to place a patient who requires Contact Precautions in a room with a patient who is not infected or colonized with the same infectious agent:
- Avoid placing patients on Contact Precautions in the same room with patients who have conditions that may increase the risk of adverse outcome from infection or that may facilitate transmission (e.g., those who are immunocompromised, have open wounds, or have anticipated prolonged lengths of stay). **B-IV**[†]
 - Ensure that patients are physically separated (i.e., >3 feet apart) from each other. Draw the privacy curtain between beds to minimize opportunities for direct contact.) **B-IV**[†]
 - Change protective attire and perform hand hygiene between contact with patients in the same room, regardless of whether one or both patients are on Contact Precautions. **B-IV**[†]
- D. In ambulatory settings, place patients who require Contact Precautions in an examination room or cubicle as soon as possible. **B-IV**[†]

Use of Personal Protective Equipment

Gloves

5. Wear gloves whenever touching the patient's intact skin or surfaces and articles in close proximity to the patient (e.g., medical equipment, bed rails). Don gloves upon entry into the room or cubicle. **B-IV**[†]

Gowns

6. A. Wear a gown whenever anticipating that clothing will have direct contact with the patient or potentially contaminated environmental surfaces or equipment in close proximity to the patient. Don gown upon entry into the room or cubicle. Remove gown and observe hand hygiene before leaving the patient-care environment. **B-IV**[†]
- B. After gown removal, ensure that clothing and skin do not contact potentially contaminated environmental surfaces that could result in possible transfer of microorganism to other patients or environmental surfaces. **B-IV**[†]

Patient Transport

7. A. In acute care hospitals and long-term care and other residential settings, limit transport and movement of patients outside of the room to medically-necessary purposes. **B-IV**[†]
- B. When transport or movement in any healthcare setting is necessary, ensure that infected or colonized areas of the patient's body are contained and covered. **B-IV**[†]
- C. Remove and dispose of contaminated PPE and perform hand hygiene prior to transporting patients on Contact Precautions. **B-IV**[†]
- D. Don clean PPE to handle the patient at the transport destination. **B-IV**[†]

Patient-care equipment and instruments/devices

8. A. Handle patient-care equipment and instruments/devices according to Standard Precautions. **B-IV**[†]
- B. In acute care hospitals and long-term care and other residential settings, use disposable noncritical patient-care equipment (e.g., blood pressure cuffs) or implement patient-dedicated use of such equipment. If common use of equipment for multiple patients is unavoidable, clean and disinfect such equipment before use on another patient. **B-IV**[†]
- C. In ambulatory settings, place contaminated reusable noncritical patient-care equipment in a plastic bag for transport to a soiled utility area for reprocessing. **B-IV**[†]

Environmental Measures

9. Ensure that rooms of patients on Contact Precautions are prioritized for frequent cleaning and disinfection (e.g., at least daily) with a focus on frequently-touched surfaces (e.g., bed rails, overbed table, bedside commode, lavatory surfaces in patient bathrooms, doorknobs) and equipment in the immediate vicinity of the patient. **B-IV**[†]

Discontinue Contact Precautions

- 10.** No recommendation can be made as to when to discontinue contact precautions for both MDROs (see Attachment B) and *C. difficile*. **B-IV.** [†]

Environmental Measures for the Prevention and Management of Multi-drug Resistant Organisms (MDROs)

Source: Siegel JD, Rhinehart E, Jackson M, Chiarello L, Healthcare Infection Control Practices Advisory Committee. Management of multidrug-resistant organisms in healthcare settings. Atlanta (GA): Centers for Disease Control and Prevention; 2006. [Internet] Available from: <http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf>

Tier 1: *General Recommendations for Routine Prevention and Control of MDROs in Health Care Settings*

1. Clean and disinfect surfaces and equipment that may be contaminated with pathogens, including those that are in close proximity to the patient (e.g., bed rails, over-bed tables) and frequently touched surfaces in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients' rooms) on a more frequent schedule compared to that for minimal touch surfaces (e.g., horizontal surfaces in waiting rooms). **A-IV**[†]
2. Dedicate non-critical medical items to use on individual patients known to be infected or colonized with MDROs when possible. **B-IV**[†]
3. Focus on cleaning and disinfecting frequently touched surfaces (e.g., bedrails, bedside commodes, bathroom fixtures in the patient's room, doorknobs) and equipment in the immediate vicinity of the patient. **A-IV**[†]

Tier 2: *Recommendations for Intensified MDRO Control Efforts*

Institute one or more of the interventions described below when:

- 1) *incidence or prevalence of MDROs are not decreasing despite the use of routine control measures*
 - 2) *the first case or outbreak of an epidemiologically important MDRO is identified within the healthcare facility or unit*
 - 3) *Continue to monitor the incidence of the target MDRO infection and colonization; if the rates do not decrease, implement additional interventions as needed to reduce MDRO transmission*
4. Implement patient-dedicated use of non-critical equipment. **B-IV**[†]

5. Intensify and reinforce training of environmental staff who work in areas targeted for intensified MDRO control. Some facilities may choose to assign dedicated staff to targeted patient care areas to enhance consistency of proper environmental cleaning and disinfection services. **B-IV**[†]
6. Monitor cleaning performance to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and HCWs (e.g., bedrails, carts, bedside commodes, doorknobs, faucet handles). **B-IV**[†]
7. Obtain environmental cultures (e.g., surfaces, shared equipment) only when epidemiologically implicated in transmission. **B-IV**[†]
8. Vacate units, when possible, for environmental assessment and intensive cleaning when previous efforts to control environmental transmission have failed. **B-IV**[†]

Prevention of Ventilator Associated Pneumonia

Source: American Thoracic Society. Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia. Am J Respir Crit Care Med. 2005; 171: 388-416.

General Prophylaxis

1. Effective infection control measures: staff education, compliance with alcohol-based hand disinfection, and isolation to reduce cross-infection with multi-drug resistant pathogens should be used routinely. **A-I**[†]
2. Surveillance of ICU infections and preparation of timely data for infection control and to guide appropriate antimicrobial therapy in patients with suspected VAP^e or other nosocomial infections are recommended. **A-II**[†]

Intubation and mechanical ventilation

3. Intubation and reintubation should be avoided, if possible, as it increases the risk of VAP. **A-II**⁷²
4. Noninvasive ventilation should be used whenever possible in selected patients with respiratory failure. **A-I**⁷³⁻⁷⁴
 - 4-P.** Noninvasive ventilation should be *considered* whenever possible in pediatric patients with respiratory failure. **A-IV**[†]
5. Orotracheal intubation and orogastric tubes are preferred over nasotracheal intubation and nasogastric tubes to prevent nosocomial sinusitis and to reduce the risk of VAP, although direct causality has not been proved. **B-II**⁷⁵
 - 5-P.** Orotracheal intubation and orogastric tubes are preferred, particularly for emergency situations. Depending on particular circumstances related to age and indication, nasotracheal intubation can be considered as well. When inserting endotracheal tubes, “clean” technique should be followed (i.e., hand hygiene, gloves, face shield, with equipment placed on sterile drape). **B-IV**[†]

^e VAP – ventilator-associated pneumonia; HAP – hospital-acquired pneumonia

6. Oral and subglottic secretions are important contributors to the development of VAP, and hospitals should develop policies and procedures for the management of these secretions. These policies and procedures should include scheduled oral care and intermittent (i.e., at regular intervals and when repositioning the patient or tube) or continuous suctioning of subglottic secretions. **A-I**⁷⁶⁻⁷⁹
6-P. Oral and subglottic secretions are important contributors to the development of VAP, and hospitals should develop policies and procedures for the management of these secretions. These policies and procedures should include scheduled oral care and intermittent suctioning in pediatric patients (i.e., at regular intervals and when repositioning the patient or tube). **A-II**⁸⁰
7. The endotracheal tube should be of proper size and cuff pressure should be maintained at the minimal occluding volume to prevent leakage of bacterial pathogens around the cuff into the lower respiratory tract without inducing tracheal injury. **B-II**⁸¹⁻⁸²
7-P. Data in pediatrics about the role of cuffed endotracheal tubes (ETT) in the prevention of VAP is limited. However, the use of cuffed ETTs outside the neonatal intensive care units is recommended. The ETT should be of proper size and cuff pressure should be monitored and maintained to achieve: minimal occluding volume. **B-III**⁸³⁻⁸⁴
8. Contaminated condensate should be carefully emptied from ventilator circuits and condensate should be prevented from entering either the endotracheal tube or inline medication nebulizers. **A-II**⁸⁵⁻⁸⁷
9. Passive humidifiers or heat–moisture exchangers decrease ventilator circuit colonization, but have not consistently reduced the incidence of VAP, and thus they cannot be regarded as a pneumonia prevention tool. **B-I**⁸⁸⁻⁹⁰
10. Reduced duration of intubation and mechanical ventilation may prevent VAP and can be achieved by protocols to improve the use of sedation and to accelerate weaning. **A-II**⁹¹⁻⁹⁴

Aspiration, body position, and enteral feeding

11. Patients should be kept in the semirecumbent position (30–45°) rather than supine to prevent aspiration, especially when receiving enteral feeding. The degree of elevation should be measured (using validated instruments or bed markings) and documented every 8 hours. Before lowering the patient's head less than to 30% (e.g., when transporting or repositioning), secretions should be suctioned above and below the cuff to prevent microaspiration. **A-I**⁹⁵⁻⁹⁶
11-P. Data in pediatrics is very limited. However, intubated infants and children should have their head elevated 30–45°. Ideal positioning of intubated neonates is 15-30° head elevation and

cribs with adequate positioning features to achieve this should be used. The degree of elevation should be measured (using validated instruments or bed markings) and documented every 8 hours. Before lowering the patient's head (e.g., when transporting or repositioning), secretions should be suctioned above and below the cuff (if used) to prevent microaspiration. **A-IV**^{80, 87}

- 12.** Enteral nutrition is preferred over parenteral nutrition to reduce the risk of complications related to central intravenous catheters and to prevent reflux villous atrophy of the intestinal mucosa that may increase the risk of bacterial translocation **A-I**⁹⁷⁻⁹⁹

12-P. Enteral nutrition, either gastric or post-pyloric, is preferred over parenteral nutrition to reduce the risk of healthcare associated infections and to prevent reflux villous atrophy of the intestinal mucosa that may increase the risk of bacterial translocation **A-I**[†]

Modulation of colonization: oral antiseptics and antibiotics

- 14.** Although in some short-term studies routine prophylaxis of HAP with oral antibiotics (selective decontamination of the digestive tract or SDD), with or without systemic antibiotics, reduced the incidence of ICU-acquired VAP and has helped contain outbreaks of multi-drug resistant bacteria, it should be used selectively to control outbreaks and is NOT recommended for routine use. **B-II**¹⁰⁰⁻¹⁰⁴

14-P. Prophylaxis of HAP with oral antibiotics or selective decontamination of the digestive tract is NOT recommended for routine use. **B-IV**[†]

- 15.** Prophylactic administration of systemic antibiotics for 24 hours at the time of emergent intubation has been demonstrated to prevent ICU-acquired HAP in comatose and closed head injury patients, but its routine use is not recommended until more data on mortality and antibiotic resistance become available. **B-II**¹⁰⁵

15-P. Prophylactic administration of systemic antibiotics for 24 hours at the time of emergent intubation is not recommended for routine use. **B-IV**[†]

- 16.** There is consistent evidence that the use of oral care with antiseptic agents (but not oral antibiotics) can decrease the incidence of ventilator-associated pneumonia, although not the overall ICU length of stay or overall mortality. However, the optimal concentration and formulation of antiseptic agents to use for oral care remains unresolved, as does the optimal timing of oral care. Pending further data, at this time the panel recommends that health care facilities incorporate the regular use of an oral antiseptic agent into the routine care of patients receiving mechanical ventilation. **B-I**¹⁰⁶⁻¹¹⁰

16-P. Oral hygiene (removal of plaque from teeth and gums) is recommended at least every 12 hours. Oral care (removal of secretions from the oropharynx and moisturizing the mouth and lips) is recommended every 4 hours and before any manipulation of the ETT or position change of the ventilated patient. There are currently no data evaluating the safety or efficacy of oral antiseptic agents in the pediatric population, although their use can be considered. **B-IV**⁸⁰

- 17.** Use daily interruption or lightening of sedation to avoid constant heavy sedation and try to avoid paralytic agents, both of which can depress cough and thereby increase the risk of HAP. **A-II**¹¹¹⁻¹¹³

17-P. Use daily interruption of paralytic drugs and lightening of heavy sedation to avoid prolonged suppression of muscle tone and diaphragm function, which contribute to the retention of pulmonary secretions. The patient's capacity for unassisted breathing should be evaluated daily. Extubation readiness testing and the use of sedation protocols may be beneficial in critically ill pediatric patients but must be balanced against the risk of premature and self-extubation. **A-III**^{80, 87, 114}

Stress bleeding prophylaxis, transfusion, and hyperglycemia

- 18.** Comparative data from randomized trials suggest a trend toward reduced VAP with sucralfate, but there is a slightly higher rate of clinically significant gastric bleeding, compared with H2 antagonists. If needed, stress bleeding prophylaxis with either H2 antagonists or sucralfate is acceptable. There is limited information on the use of proton pump inhibitors for stress ulcer prophylaxis, but evidence suggests that these agents may increase the risk of *Clostridium difficile* disease. Pending additional data, proton pump inhibitor agents should not be used solely for stress ulcer prophylaxis in the ICU setting. **B-II**¹¹⁵⁻¹¹⁶

18-P. Gastrointestinal bleeding prophylaxis with either H2 antagonists or sucralfate does not appear to alter the risk for VAP. There is limited information on the use of proton pump inhibitors for stress ulcer prophylaxis, but evidence suggests that these agents may increase the risk of *Clostridium difficile* disease. Pending additional data, proton pump inhibitor agents should not be used solely for stress ulcer prophylaxis in the ICU setting. **B-IV**^{87, 117-118}

- 19.** Transfusion of red blood cell and other allogeneic blood products should follow a restricted transfusion trigger policy; leukocyte-depleted red blood cell transfusions can help to reduce HAP in selected patient populations. **A-I**¹¹⁹⁻¹²¹

20. To reduce nosocomial blood stream infections, duration of mechanical ventilation, ICU stay, and morbidity, intensive insulin therapy has been recommended. However, intensive insulin is also associated with an increased risk of hypoglycemia and most trials do not show a mortality benefit. Although data are still accumulating, insulin therapy should probably be used to maintain serum glucose levels between 100 and 150 mg/dl in most critically ill patients. More stringent control (between 80 and 110 mg/dl) can be considered in post-cardiac surgery patients. **B-II**¹²²⁻¹²⁸

20-P. Tight glycemic control may be beneficial in critically ill pediatric patients, but specific target ranges have not been studied. The risk must be balanced against the risk for unrecognized hypoglycemia as a result of insulin therapy. **UI**[†]

Prevention of Surgical Site Infections

Source: 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.

RECOMMENDATIONS FOR PREVENTION OF SURGICAL SITE INFECTIONS

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**¹²⁹
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**¹³⁰
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**¹³¹⁻¹³⁴
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**¹³⁵⁻¹³⁷
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 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**¹³⁷

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 *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 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 MRSA from prior hospitalizations.) **UI**¹³⁸⁻¹⁴²

Hand/forearm antisepsis for surgical team members

13. Keep nails short and do not wear artificial nails. (CDC category IB) **B-IV**
14. An 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**¹⁴³

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**¹⁴³

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**¹⁴⁴⁻¹⁴⁵
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. 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**^{144-148, 150}
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**¹⁵²⁻¹⁵³
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**^{144, 149-151}

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 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 EPA- registered hospital- grade germicidal agent at the end of each surgical procedure. **B-IV**¹⁴³

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 AAMI, 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/#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**¹⁴³

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 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, USP 797)^f 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**¹⁵⁴⁻¹⁵⁷
- 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**¹⁵⁸⁻¹⁶⁵
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**

^f The United States Pharmacopeial Convention, Inc. Web site. Available at <http://www.usp.org/pdf/EN/USPNF/generalChapter797.pdf>.

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, nor on the appropriate time to shower or bathe with an uncovered incision. (*CDC category UI*) **UI** [†]

Prevention of Bloodstream Infections

Source: O'Grady, N. P., M. Alexander, et al. (2002). Guidelines for the prevention of intravascular catheter-related infections. Centers for Disease Control and Prevention. MMWR Recomm Rep 51(RR-10): 1-29.

RECOMMENDATIONS FOR PLACEMENT OF INTRAVASCULAR CATHETERS IN ADULTS AND CHILDREN

Healthcare worker education and training

- 1.** Educate health-care workers regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections. (*CDC category IA*) **A-IV**
- 2.** Formally assess knowledge of and adherence to guidelines periodically for all persons who insert and manage intravascular catheters. (*CDC category IA*) **A-IV**
 - 2-P.** Develop, update and disseminate institutional policies and procedures regarding the safe use of intravascular catheters that address all relevant patient populations and clinical settings. **A-II[†]**
- 3.** Ensure adequate staffing levels of consistent and appropriately-educated health care workers in ICUs to minimize the incidence of Catheter-Associated Bloodstream Infections (CABSI). (*CDC category IB*) **A-IV[†]**

Surveillance

- 4.** Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or BSI, the dressing should be removed to allow thorough examination of the site. (*CDC category IB*) **A-IV**
 - 4-P.** In addition to the above: In pediatrics, the frequency of catheter site monitoring should be consistent with institutional policies, but at a minimum of every nursing shift. **A-IV[†]**
- 5.** Encourage patients to report to their health-care provider any changes in their catheter site or any new discomfort. (*CDC category II*) **A-IV**

6. Record the operator, date, and time of catheter insertion and removal, and dressing changes on a standardized form. (*CDC category II*) **A-IV**
7. Do not routinely culture catheter tips. (*CDC category IA*) **A-IV**

Hand hygiene

8. Observe proper hand-hygiene procedures either by washing hands with conventional antiseptic-containing soap and water or with waterless alcohol-based gels or foams. Observe hand hygiene before and after palpating catheter insertion sites, as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained. (*CDC category IA*) **A-IV**
9. Use of gloves does not obviate the need for hand hygiene. (*CDC category IA*) **A-IV**

Aseptic technique during catheter insertion and care

10. Maintain aseptic technique for the insertion and care of intravascular catheters. (*CDC category IA*) **A-IV**
11. Wearing clean gloves rather than sterile gloves is acceptable for the insertion of peripheral intravascular catheters if the access site is not touched after the application of skin antiseptics. Wear sterile gloves for the insertion of arterial and central catheters. (*CDC category IA*) **A-IV**
12. Wear clean exam gloves when removing vascular access dressings.
Wear sterile gloves when manipulating the insertion site of any arterial or central venous vascular access device and for applying sterile dressings to any arterial or central venous vascular access device insertion site. (*CDC category IC*) **A-IV**

Catheter insertion

13. Do not routinely use arterial or venous cutdown procedures as a method to insert catheters. (*CDC category IA*) **A-IV**

Catheter site care

- 14.** Use a chlorhexidine-based antiseptic for skin preparation prior to insertion of any vascular access device in patients over 2 months of age. **B-I** Povidine iodine can be used for patients with known or suspected contraindications (i.e. allergy, hypersensitivity) to chlorhexidine unless other contraindication exists. **B-IV**¹⁶⁶⁻¹⁶⁹

14-P. The FDA has not approved the use of chlorhexidine in infants aged less than 2 months and there is limited safety data for this population. Consequently, no recommendation can be made for the use of chlorhexidine in this population. **UI**¹⁶⁷⁻¹⁷³

- 15.** Prep skin surfaces with appropriate agent(s) according to manufacturer's guidelines and allow agent(s) to remain on skin until dry. (*CDC category IB*) **B-IV**
- 16.** Do not apply organic solvents (e.g., acetone and ether) to the skin before insertion of catheters or during dressing changes. (*CDC category IA*) **A-IV**

Catheter-site dressing regimens

- 17.** Use either sterile gauze or sterile, transparent, semipermeable dressing to cover the catheter site. (*CDC category IA*) **B-IV**¹⁷⁴

- 18.** The utility of dressings for tunneled CVC sites that are well healed is an unresolved issue. (*CDC category II*) **UI**

18-P. Dressings will most likely be needed for all tunneled CVC sites in children, including those that are well-healed. **B-IV**[†]

- 19.** Gauze dressings that prevent visualization of the insertion site should be changed routinely every 48 hours on central sites and immediately if the integrity of the dressing is compromised.

Gauze used in conjunction with a transparent semipermeable membrane (TSM) dressing should be considered a gauze dressing and changed every 48 hours.

If the patient is diaphoretic, or if the site is bleeding or oozing, a gauze dressing is preferable to a transparent, semi-permeable dressing. (*CDC category II*) **B-IV**¹⁷⁸

- 20.** Replace catheter-site dressing if the dressing becomes damp, loosened, or visibly soiled. (*CDC category IB*) **B-IV**

21. For central vascular access devices, the optimal time interval for changing TSM dressings is dependent on the dressing material, age and condition of the patient, infection rate reported by the organization, environmental conditions, and manufacturer's labeled uses and directions; TSM dressing should be changed at least weekly. (*CDC category II*) **B-IV**¹⁷⁸
22. Do not use topical antibiotic ointment or creams on insertion sites (except when using dialysis catheters) because of their potential to promote fungal infections and antimicrobial resistance. (*CDC category IA*) **B-IV**
23. Do not submerge the catheter under water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower). Patients with permanent catheters that traverse the skin should avoid swimming. (*CDC category II*) **B-IV**¹⁷⁹
- 23-P. For infants and toddlers, the catheter hub should be kept away from the diaper area and any stoma or gastrostomy site. **B-IV**[†]

Selection and replacement of intravascular catheters

24. Select the catheter, insertion technique, and insertion site with the lowest risk for complications (infectious and noninfectious) for the anticipated type and duration of IV therapy. (*CDC category IA*) **A-IV**
25. Promptly remove any intravascular catheter that is no longer essential. (*CDC category IA*) **A-IV**
26. Do not routinely replace central venous or arterial catheters solely for the purposes of reducing the incidence of infection. (*CDC category IB*) **A-IV**
27. Replace peripheral venous catheters at least every 72–96 hours in adults to prevent phlebitis. Leave peripheral venous catheters in place in children until IV therapy is completed, unless complications (e.g., phlebitis and infiltration) occur. (*CDC category IB*) **A-IV**
28. When adherence to aseptic technique cannot be ensured (i.e., when catheters are inserted during a medical emergency), replace all catheters as soon as possible and after no longer than 48 hours. (*CDC category II*) **A-IV**

28-P. When adherence to aseptic technique cannot be ensured (i.e., when catheters are inserted during a medical emergency), *consider* replacing all catheters as soon as possible within 48 hours. Given the difficulties of vascular access in infants and toddlers, this may not be possible in all cases. **B-IV**[†]

29. Do not remove CVCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected. In most cases of CVC-associated bacteremia or fungemia, the CVC should be removed.

(CDC category II) **B-IV**¹⁸⁰

30. Do not use guidewire techniques to replace catheters in patients suspected of having catheter-related infection. (CDC category IB) **A-IV**

Replacement of administration sets[^], needleless systems, and parenteral fluids

Administration sets

31. Replace administration sets, including secondary sets and add-on devices, no more frequently than at 72-hour intervals, unless catheter-related infection is suspected or documented. (CDC category IA) **A-IV**

32. Replace tubing used to administer lipid emulsions (those combined with amino acids and glucose in a 3-in-1 admixture or infused separately) within 24 hours of initiating the infusion. (CDC category IB)
If the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 72 hours. (CDC category II)

Administration sets and add-on filters that are used for blood and blood components shall be changed within 4 hours. **B-IV**

33. Replace tubing used to administer lipid-based medication formulations such as propofol every 6 to 12 hours or according to manufacturer's recommendations. (CDC category IA) **A-IV**

33-P. In pediatrics, propofol should be used with caution and according to institutional policies; the product has age restrictions for certain indications. **UI**[†]

[^] Administration sets include the area from the spike of tubing entering the fluid container to the hub of the vascular access device. However, a short extension tube might be connected to the catheter and might be considered a portion of the catheter to facilitate aseptic technique when changing administration sets.

Needleless intravascular devices

34. Change the needleless components at least as frequently as the administration set. (*CDC category II*) **B-IV**
35. Change caps no more frequently than every 72 hours or according to manufacturer's recommendations. (*CDC category II*) **B-IV**
36. Ensure that all components of the system are compatible to minimize leaks and breaks in the system. (*CDC category II*) **A-IV**
37. Minimize contamination risk by wiping the access port with an appropriate antiseptic and accessing the port only with sterile devices. (*CDC category IB*) **B-IV**¹⁸¹
38. Complete the infusion of lipid-containing solutions (e.g., 3-in-1 solutions) within 24 hours of hanging the solution. (*CDC category IB*) **A-IV**
39. Complete the infusion of lipid emulsions alone within 12 hours of hanging the emulsion. If volume considerations require more time, the infusion should be completed within 24 hours. (*CDC category IB*) **A-IV**
40. Complete infusions of blood or other blood products within 4 hours of hanging the blood. (*CDC category II*) **A-IV**
41. No recommendation can be made for the hang time of other parenteral fluids. (*CDC category UI*) **UI**

IV injection ports

42. Clean injection ports with 70% alcohol or an iodophor before accessing the system. (*CDC category IA*) **A-IV**
43. Cap all stopcocks when not in use. Replace with new sterile caps after each use. (*CDC category IB*) **A-IV**¹⁷⁸

In line filters

44. Do not use filters routinely for infection-control purposes. (*CDC category IA*) **A-IV**

IV-therapy personnel

45. Designate trained personnel who demonstrate competency for the insertion and maintenance of intravascular catheters. (*CDC category IA*) **A-IV**

Prophylactic antimicrobials

46. Do not administer intranasal or systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or BSI. (*CDC category IA*) **B-IV**

PERIPHERAL VENOUS CATHETERS, INCLUDING MIDLINE CATHETERS IN ADULT AND CHILDREN

Selection of peripheral catheter

47. Select catheters on the basis of the intended purpose and duration of use, known complications (e.g., phlebitis and infiltration), and experience of individual catheter operators. (*CDC category IB*) **B-IV**
48. Avoid the use of steel needles for the administration of fluids and medication that might cause tissue necrosis if extravasation occurs. (*CDC category IA*) **B-IV**
49. Use a midline catheter or PICC when the duration of IV therapy will likely exceed 6 days. (*CDC category IB*) **B-IV**
- 49-P. Consider a midline catheter or PICC when the duration of IV therapy will likely exceed 6 days. **B-IV**[†]

Selection of peripheral-catheter insertion site

50. In adults, use an upper- instead of a lower-extremity site for catheter insertion. Replace a catheter inserted in a lower-extremity site to an upper extremity site as soon as possible. (*CDC category IA*) **A-IV**
51. In pediatric patients, the hand, external jugular vein, antecubital space, dorsum of the foot, or the scalp can be used as catheter insertion sites. (*CDC category II*) **B-IV**[†]
52. Evaluate the catheter insertion site daily, by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of

possible CABSIs, an opaque dressing should be removed and the site inspected visually. (*CDC category II*) **A-IV**

52-P. In pediatrics, evaluate the catheter insertion site per institutional policies, with a minimum frequency of every nursing shift. **A-IV[†]**

53. Remove peripheral venous catheters if the patient develops signs of phlebitis (e.g., warmth, tenderness, erythema, and palpable venous cord), infection, or a malfunctioning catheter. (*CDC category IB*) **A-IV**

54. In adults, replace short, peripheral venous catheters at least 72–96 hours to reduce the risk for phlebitis. If sites for venous access are limited and no evidence of phlebitis or infection is present, peripheral venous catheters can be left in place for longer periods, although the patient and the insertion sites should be closely monitored. (*CDC category IB*) **A-IV**

55. Do not routinely replace midline catheters to reduce the risk for infection. (*CDC category IB*) **A-IV**

56. In pediatric patients, assess each day whether there is a continued clinical indication for the peripheral venous catheter; remove promptly when no longer needed. Peripheral venous catheters can be left in place until IV therapy is completed, unless a complication (e.g., phlebitis and infiltration) occurs. (*CDC category IB*) **A-IV**

Catheter and catheter-site care

57. Do not routinely apply prophylactic topical antimicrobial or antiseptic ointment or cream to the insertion site of peripheral venous catheters. (*CDC category IA*) **A-IV**

CENTRAL VENOUS CATHETERS, INCLUDING PICCS, HEMODIALYSIS, AND PULMONARY ARTERY CATHETERS, IN ADULT AND CHILDREN

General principles

- 58.** Use a CVC with the minimum number of ports or lumens essential for the management of the patient. (CDC category IB) **A-IV**
- 59.** a.) Institutions should institute a comprehensive strategy that include the following components: hand hygiene, educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a 2% chlorhexidine preparation for skin antisepsis during CVC insertion (if appropriate for age), avoidance of femoral site in adults, and daily assessment of the need for the catheter. **A-II**¹⁸²⁻¹⁸⁷
- b.) Institutions who want to further reduce central line infections should consider other new technologies such as antimicrobial impregnated catheters, and antiseptic dressings. **A-I**^{175-177, 188-197}
- 60.** No recommendation can be made for the use of impregnated catheters in children. (CDC category UI) **UI**
- 61.** Designate personnel who have been trained and exhibit competency in the insertion of catheters to supervise trainees who perform catheter insertion. (CDC category IA) **A-IV**
- 62.** Use totally implantable access devices or cuffed devices for patients who require long-term, intermittent vascular access. For patients requiring frequent or continuous access, a PICC or tunneled CVC is preferable. (CDC category II) It should be noted that in the inpatient setting the risk of infection with PICCs is comparable to that of other non-cuffed CVCs. **B-IV**¹⁹⁸
- 63.** Use a cuffed CVC for dialysis if the period of temporary access is anticipated to be prolonged (e.g., >3 weeks). (CDC category IB) **B-IV**
- 64.** Use a fistula or graft instead of a CVC for permanent access for dialysis. (CDC category IB) **A-IV**
- 65.** Do not use hemodialysis catheters for blood drawing or applications other than hemodialysis except during dialysis or under emergency circumstances. (CDC category II) **A-IV**

66. Use povidone-iodine antiseptic ointment at the hemodialysis catheter exit site after catheter insertion and at the end of each dialysis session only if this ointment does not interact with the material of the hemodialysis catheter per manufacturer's recommendation. (*CDC category II*) **A-IV**

Selection of catheter insertion site

67. Weigh the risk and benefits of placing a device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement). (*CDC category IA*) **A-IV**
68. Use a subclavian site (rather than a jugular or a femoral site) in adult patients to minimize infection risk for nontunneled CVC placement. (*CDC category IA*) In adult patients the use of the femoral site for CVCs should be avoided except when emergency circumstances or lack of vascular access precludes the use of other sites. When a femoral catheter is placed emergently, it should be electively replaced as quickly as possible. **A-II**¹⁹⁹⁻²⁰²
- 68-P.** In pediatrics, the subclavian, internal jugular, femoral and antecubital sites are acceptable for nontunneled CVC placement. The saphenous vein can be used in non-ambulatory patients and PICC lines can be placed in the temporal and posterior auricular veins in infants. **B-IV**²⁰³⁻²⁰⁴
69. Place catheters used for hemodialysis and pheresis in a jugular vein rather than a subclavian vein to avoid venous stenosis if catheter access is needed. Femoral veins could be used if no other access is available. **B-IV**

Maximal sterile barrier precautions during catheter insertion

70. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and a large sterile sheet, for the insertion of CVCs (including PICCs) or guidewire exchange. (*CDC category IA*) **A-IV**
71. Use a sterile sleeve to protect pulmonary artery catheters during insertion. (*CDC category IB*) **A-IV**

Replacement of catheter

72. Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections. (*CDC category IB*) **A-IV**

- 73.** Do not remove CVCs or PICCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected. (*CDC category II*) **A-IV**
- 74.** Do not use guidewire exchanges routinely for nontunneled catheters to prevent infection. (*CDC category IB*) **A-IV**
- 75.** Use a guidewire exchange to replace a malfunctioning nontunneled catheter if no evidence of infection is present. (*CDC category IB*) **A-IV**
- 76.** Use a new set of sterile gloves before handling the new catheter when guidewire exchanges are performed. (*CDC category II*) **A-IV**

Catheter and catheter- site care

- 77.** Designate one port exclusively for parenteral nutrition if a multilumen catheter is used to administer parenteral nutrition. (*CDC category II*) **A-IV**

There is no recommendation on the need to reserve a port of a multilumen catheter for the future use of parenteral nutrition. **UI**

- 78.** There is no recommendation on the routine use of antimicrobial agent lock solutions to prevent CABSIs. (*CDC category II*) **UI**^{197, 205-209}

78-P. Evidence is emerging concerning the safety and efficacy of ethanol locks in preventing and treating catheter-related BSIs in certain high-risk pediatric patients requiring long-term IV access (i.e., home parenteral nutrition, oncology, dialysis). Ethanol locks may decrease the need for line removal and eradicate persistent pathogens in catheter-related infections. While no specific recommendation can be made for or against their use at this time due to limited data, the ethanol lock technique is a reasonable alternative when other approaches have been ineffective.

UI^{205, 210-211}

- 79.** Replace the catheter-site dressing when it becomes damp, loosened, or soiled or when inspection of the site is necessary. (*CDC category IA*) **A-IV**

80. Replace dressings used on short-term CVC sites every 48 hours for gauze dressings and at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing. (*CDC category IB*) **A-IV**
81. Replace dressings used on tunneled or implanted CVC sites no more than once per week, until the insertion site has healed. (*CDC category IB*) **A-IV**
82. No recommendation can be made regarding the necessity for any dressing on well-healed exit sites of long-term cuffed and tunneled CVCs. (*CDC category UI*) **UI**
83. No recommendation can be made for the use of sutureless securement devices to reduce the incidence of CABSIs. (*CDC category UI*) **UI**
84. Ensure that catheter-site care is compatible with the catheter material. (*CDC category IB*) **B-IV**
85. Use a sterile sleeve for all pulmonary artery catheters. (*CDC category IB*) **A-IV**

ADDITIONAL RECOMMENDATIONS FOR PERIPHERAL ARTERIAL CATHETERS AND PRESSURE MONITORING DEVICES FOR ADULT AND CHILDREN

Maximal sterile barrier precautions during catheter insertion

86. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and an appropriately sized sterile drape, for the insertion of peripheral arterial catheters. **A-IV**

Selection of pressure monitoring system

87. Use disposable, rather than reusable, transducer assemblies when possible. (*CDC category IB*) **A-IV**

Replacement of catheter and pressure monitoring system

88. Do not routinely replace peripheral arterial catheters to prevent catheter-related infections. (*CDC category II*) **A-IV**
89. Replace disposable or reusable transducers at 96-hour intervals. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced. (*CDC category IB*) **A-IV**

Care of pressure monitoring systems

- 90.** Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile. (*CDC category IA*) **A-IV**
- 91.** Minimize the number of manipulations of and entries into the pressure monitoring system. Use a closed-flush system (i.e., continuous flush), rather than an open system (i.e., one that requires a syringe and stopcock), to maintain the patency of the pressure monitoring catheters. (*CDC category II*) **A-IV**
- 92.** When the pressure monitoring system is accessed through a diaphragm rather than a stopcock, wipe the diaphragm with an appropriate antiseptic before accessing the system. (*CDC category IA*) **A-IV**
- 93.** Do not administer dextrose containing solutions or parenteral nutrition fluids through the pressure monitoring circuit. (*CDC category IA*) **A-IV**

Sterilization or disinfection of pressure monitoring systems

- 94.** Use disposable transducers. (*CDC category IB*) **A-IV**
- 95.** Sterilize reusable transducers according to the manufacturers' instructions if the use of disposable transducers is not feasible. (*CDC category IA*) **A-IV**

Umbilical Catheters

- 96.** Remove and do not replace umbilical artery or umbilical vein catheters if any signs of CABS, vascular insufficiency, or thrombosis are present. (*CDC category II*) **A-IV**²¹²⁻²¹³
- 97.** No recommendation can be made for treating through an umbilical venous catheter suspected of being infected. (*CDC category II*) **UI**²¹²⁻²¹³
- 98.** Replace umbilical venous catheters only if the catheter malfunctions. (*CDC category II*) **A-IV**²⁰⁹⁻²¹⁰
- 99.** Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Adverse events in infants have been reported with all available products (e.g., alcohol, iodine and chlorhexidine) and safety data are limited. Therefore, institutions must weigh risks and benefits of individual products

when making their choice of specific antiseptic. Tincture of iodine should be avoided because of the potential effect on neonatal thyroid function. (*CDC category IB*) **B-III**²¹²

100. Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance. (*CDC category II*) **A-IV**

101. Add low doses of heparin (0.25–1.0 U/ml) to the fluid infused through umbilical arterial catheters. (*CDC category II*) **A-IV**

102. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days. (*CDC category II*) **A-IV**

103. Umbilical venous catheters should be removed as soon as possible when no longer needed but can be used up to 14 days if managed aseptically. (*CDC category II*) **A-IV**

Best Practice Recommendations 9

Prevention of Catheter-Associated Urinary Tract Infections

Source: Lo E, Nicolle L, et al. Detection and Prevention of Catheter-Associated Urinary Tract Infections in Acute Care Hospitals. Infect Control Hosp Epidemiol (in press 2008).

Note: excerpted with permission of the IDSA/SHEA HAI Task Force 2008; evidence rating taken directly from their original document, according to criteria below:

CATEGORY/GRADE	DEFINITION
Strength of Recommendation	
A	Good evidence to support a recommendation for use.
B	Moderate evidence to support a recommendation for use.
C	Poor evidence to support a recommendation.
Quality of Evidence	
I	Evidence from ≥ 1 properly randomized, controlled trial.
II	Evidence from ≥ 1 well-designed clinical trial, without randomization; from cohort or case-controlled analytic studies (preferably from >1 center); from multiple time-series; or from dramatic results from uncontrolled experiments.
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Strategies for Prevention of Catheter-Associated Urinary Tract Infections (CAUTI)

The Centers for Disease Control published guidelines for prevention of catheter associated urinary tract infections in 1981.²¹⁴ These guidelines provide recommendations for catheter use, catheter insertion, catheter care, placement of catheterized patients, and bacteriologic monitoring. These guidelines are currently being updated for the first time since 1981. The Department of Health in Great Britain published guidelines for preventing infections associated with the insertion and maintenance of short term indwelling urethral catheters in acute care in 2001,²¹⁵ updated in 2006.²¹⁶

Comprehensive Cochrane reviews with meta-analysis evaluating interventions to prevent complications of short-term indwelling urinary catheters have recently been reported²¹⁷⁻²²². Consistent observations are the limited number of studies addressing any specific question, small study numbers, low quality of most studies, and heterogeneity in results, particularly when addressing morbidity.

The following section highlights important recent findings:

Options to use of an indwelling urethral catheter

- A prospective, randomized comparative trial reported that use of external condom catheter drainage for men compared to a short-term indwelling urethral catheter reduced acquisition of bacteriuria, adverse outcomes, and was more acceptable to the patient.²²³
- A randomized study reported in and out catheterization was as effective as an indwelling catheter for management of post-operative retention²²⁴
- Some studies have reported fewer complications with use of a suprapubic catheter, but the surgical procedure required to insert the suprapubic catheter is associated with additional risks. A randomized, controlled trial comparing suprapubic to urethral catheterization for men undergoing elective laparotomy reported a similar occurrence of urinary infection in the two groups²²⁵. Current evidence is not sufficient to support routine use of a supra-pubic catheter for short-term catheterization to prevent symptomatic urinary infection or other complications.²¹⁷⁻²¹⁸

Catheter materials

- Reviews and meta-analyses of silver coated and other antibacterial urinary catheters consistently conclude that evidence does not support a recommendation for uniform use of such devices.^{221, 226-227}
- Silver alloy catheters may decrease bacteriuria, but have not been shown to decrease symptomatic infection or other undesirable outcomes.²²⁶⁻²²⁷ Some of the variability in outcomes reported in trials of silver catheters may be attributable to whether the comparator catheter is silicone or latex.²²⁸ A recent prospective, cross-over study comparing a silver alloy, silicone based hydrogel-coated catheter with a silicone-based hydrogel catheter reported no difference in symptomatic or asymptomatic infection, or bloodstream infections attributable to a urinary source.²²⁹

Limiting duration of catheterization

- Indwelling urethral catheters are frequently used when not indicated or, if indicated, remain in situ beyond the necessary time.²³⁰⁻²³²
- Optimal approaches to limit catheter use and duration may be dependent on facility characteristics. Approaches reported to be effective include:
 - Implementing procedure specific guidelines for post-operative catheter removal²³³
 - Guidelines to manage post-operative retention, which may include use of bladder scanners²³⁴
 - Providing reminders to physicians to review the need for continued catheterization and to remove catheters promptly when no longer indicated²³⁵⁻²³⁷

- Development of care plans directing nurse removal of catheters for patients who meet pre-specified criteria ²³⁸
- Surveillance: Feedback of unit specific urinary infection rates to nursing staff and health care staff has been effective in decreasing infection rates ²³⁹⁻²⁴⁰

A. Basic Practices for Prevention of CAUTI: Recommended for all acute care hospitals

Provide appropriate infrastructure for preventing CAUTI

1. Provide and implement written guidelines for catheter use, insertion, and maintenance. A-II

- Develop and implement facility criteria for acceptable indications for indwelling urinary catheter use.
- Indications for indwelling urethral catheter use are limited, and include. ^{230, 241}
 - Peri-operative use for selected surgical procedures
 - Urine output monitoring in critically ill patients
 - Management of acute urinary retention and urinary obstruction
 - To assist in pressure ulcer healing for incontinent residents
 - As an exception, at patient request to improve comfort

2. Ensure that trained personnel insert urinary catheters. B-III

3. Ensure that supplies necessary for aseptic technique catheter insertion are available. A-II

4. Implement a system for documenting in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who inserted catheter, and date and time of catheter removal.

A-II

- Include documentation in nursing flow sheet, nursing notes or physician orders. Documentation should be accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes.
 - Electronic documentation that is searchable is preferred, if available.
- ##### **5. Ensure that there are sufficient trained personnel and technology resources to support surveillance for catheter use and outcomes. A-III**

Perform surveillance for CAUTI

6. Identify the patient groups or units on which to conduct surveillance based on frequency of catheter use and potential risk (e.g. types of surgery, obstetric, critical care). **B-III**
7. Use standardized criteria for defining a CAUTI to identify patients who have a CAUTI (numerator data). **A-II**
8. Collect catheter days (denominator data) on all patients in the patient groups or units being monitored. **A-II**
9. Calculate CAUTI rates for target populations. **A-II**
10. Measure the use of indwelling urinary catheters **B-II**, including:
 - The percentage of patients with an indwelling urinary catheter inserted during hospitalization.
 - Percentage of catheter use with accepted indications.
 - Duration of indwelling catheter use.
11. Use surveillance methods for case finding that are appropriate for the institution and documented to be valid. **A-III**

Education and Training

12. Educate HCW about catheter related UTI's, including alternatives to indwelling catheters, procedures for catheter insertion, management and removal. **A-III**

Catheter insertion: Measures to Prevent Infection

13. Insert urinary catheters only when necessary for patient care, and leave in place only as long as indications remain. **A-II**
14. Consider other methods of management including condom catheters or in and out catheterization, where appropriate. **A-I**
15. Practice hand hygiene (based on CDC or World Health Organization Guidelines) immediately before insertion of the catheter and before and after any manipulation of the catheter site or apparatus. **A-III**
16. Insert catheters following aseptic technique and using sterile equipment. **A-III**
17. Use gloves, drape and sponges, a sterile or antiseptic solution for cleaning the urethral meatus, and a single-use packet of sterile, lubricant jelly for insertion. **A-III**
18. Use as small a catheter as possible consistent with proper drainage, to minimize urethral trauma.

B-III

Ensure appropriate management of indwelling catheters

19. Properly secure indwelling catheters after insertion to prevent movement and urethral traction. **A-III**
20. Maintain a sterile, continuously closed drainage system. **A-I**
21. Disconnection of the catheter and drainage tube is prohibited unless the catheter must be irrigated.

A-I

22. Replace the collecting system using aseptic technique and after disinfecting the catheter-tubing junction when breaks in aseptic technique, disconnection, or leakage occur. **B-III**
23. For examination of fresh urine, collect a small sample by aspirating urine from the sampling port with a sterile needle and syringe after cleansing the port with disinfectant. Transport urine specimens for culture promptly to the laboratory. **A-III**
24. Obtain larger volumes of urine for special analyses aseptically from the drainage bag. **A-III**
25. Maintain unobstructed urine flow. **A-II**
26. Empty the collecting bag regularly using a separate collecting container for each patient. Avoid touching the draining spigot to the collecting container. **A-II**
27. Keep the collecting bag below the level of the bladder at all times. **A-III**
28. Cleaning of the meatal area with antiseptic solutions is unnecessary. Routine hygiene is appropriate. **A-I**
29. To minimize cross-infection, avoid placing infected and uninfected patients with indwelling catheters in the same room or in adjacent beds. **C-III**

B. Special Approaches for Prevention of CAUTI: *Recommended for use in locations and/or populations within the hospital for which outcome data and/or risk assessment suggest lack of effective control despite implementation of basic practices.*

30. Implement an organization-wide program to identify and remove catheters that are no longer necessary using one or more methods documented to be effective. **A-II**
 - Develop and implement institutional policy requiring continual, usually daily, review of the necessity of continued catheterization.
 - Electronic or other types of reminders may be useful.

- Implement automatic stop orders requiring renewal of order for continuation of the indwelling catheter.
 - Use standardized reminders placed into patient charts or part of the electronic patient record.
 - Implement daily ward rounds by nursing and physician staff to review all patients with urinary catheters and ascertain continuing necessity.
- 31. Develop a protocol for management of post-operative urinary retention, including nurse directed use of intermittent catheterization and use of bladder scanners. *B-I***
- If bladder scanners are used, indications for use must be clearly stated, and nursing staff must be trained on their use.
- 32. Establish a system for analyzing and reporting data on catheter use and adverse events from catheter use. *B-III***
- Define and monitor adverse outcomes in addition to CAUTI including catheter obstruction, unintended removal, catheter trauma, or reinsertion within 24 hours of removal.
 - For analysis, stratify measurements of catheter use and adverse outcomes by relevant risk factors (e.g., sex, age, ward, duration). Review data in a timely fashion, and report to appropriate stakeholders.

C. Approaches That Should Not Be Considered a Routine Part of CAUTI Prevention

- 33. Do not routinely use silver coated or other antibacterial catheters. *A-I***
- 34. Do not screen for asymptomatic bacteruria in catheterized patients. *A-II***
- 35. Do not treat asymptomatic bacteruria in catheterized patients except prior to invasive urologic procedures. *A-I***
- 36. Avoid catheter irrigation. *A-I***
- Do not perform continuous irrigation of the bladder with antimicrobials as a routine infection prevention measure.
 - If obstruction is anticipated; closed continuous irrigation may be used to prevent obstruction.
 - To relieve obstruction due to clots, mucus, or other causes, an intermittent method of irrigation may be used.
- 37. Do not use systemic antibiotics routinely as prophylaxis. *A-II***

38. Do not change catheters routinely. *A-III*

Unresolved Issues

39. Use of antiseptic solution versus sterile saline for meatal cleaning prior to catheter insertion

40. Use of antimicrobial coated catheters for selected patients at high risk of infection

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ATTACHMENT A⁴

Figure. 1
Example of Safe Donning and Removal of Personal
Protective Equipment (PPE)

DONNING PPE

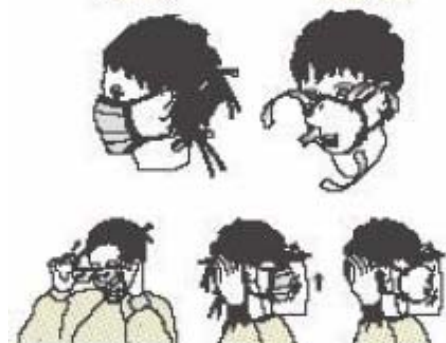
GOWN

- Fully cover torso from neck to knees, arms to end of wrist, and wrap around the back
- Fasten in back at neck and waist



MASK OR RESPIRATOR

- Secure ties or elastic band at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



GOGGLES/FACE SHIELD

- Put on face and adjust to fit



GLOVES

- Use non-sterile for isolation
- Select according to hand size
- Extend to cover wrist of isolation gown

SAFE WORK PRACTICES

- Keep hands away from face
- Work from clean to dirty
- Limit surfaces touched
- Change when torn or heavily contaminated
- Perform hand hygiene

⁴ Source: Figure 1 excerpted from The [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007](#). The Healthcare Infection Practices Advisory Committee, pgs. 129-136.

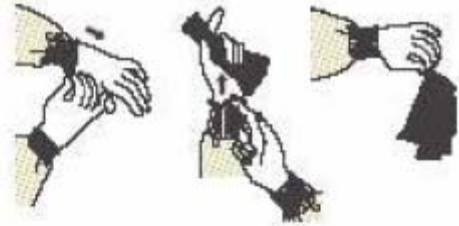
ATTACHMENT A (continued)

REMOVING PPE

Remove PPE at doorway before leaving patient room or in anteroom

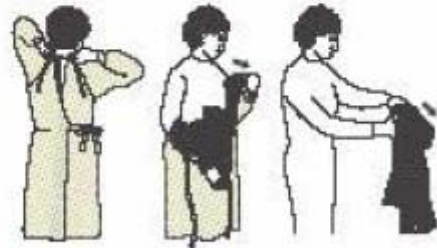
GLOVES

- Outside of gloves are contaminated!
- Grasp outside of glove with opposite gloved hand; peel off
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist



GOGGLES/FACE SHIELD

- Outside of goggles or face shield are contaminated!
- To remove, handle by “clean” head band or ear pieces
- Place in designated receptacle for reprocessing or in waste container



GOWN

- Gown front and sleeves are contaminated!
- Unfasten neck, then waist ties
- Remove gown using a peeling motion; pull gown from each shoulder toward the same hand
- Gown will turn inside out
- Hold removed gown away from body, roll into a bundle and discard into waste or linen receptacle



MASK OR RESPIRATOR

- Front of mask/respirator is contaminated – DO NOT TOUCH!
- Grasp ONLY bottom then top ties/elastics and remove
- Discard in waste container

HAND HYGIENE

Perform hand hygiene immediately after removing all PPE!

ATTACHMENT B^g

Appendix A (excerpted from 2007 HICPAC Guidelines for Isolation Precautions)

Preamble The mode(s) and risk of transmission for each specific disease agent included in Appendix A were reviewed. Principle sources^{833, 1043, 1044} consulted for the development of disease-specific recommendations for Appendix A included infectious disease manuals and textbooks. The published literature was searched for evidence of person-to-person transmission in healthcare and non-healthcare settings with a focus on reported outbreaks that would assist in developing recommendations for all settings where healthcare is delivered. Criteria used to assign Transmission-Based Precautions categories follow:

- A Transmission-Based Precautions category was assigned if there was strong evidence for person-to-person transmission via droplet, contact, or airborne routes in healthcare or non-healthcare settings and/or if patient factors (e.g., diapered infants, diarrhea, draining wounds) increased the risk of transmission
- Transmission-Based Precautions category assignments reflect the predominant mode(s) of transmission
- If there was no evidence for person-to-person transmission by droplet, contact or airborne routes, Standard Precautions were assigned
- If there was a low risk for person-to-person transmission and no evidence of healthcare-associated transmission, Standard Precautions were assigned
- Standard Precautions were assigned for bloodborne pathogens (e.g., hepatitis B and C viruses, human immunodeficiency virus) as per CDC recommendations for Universal Precautions issued in 1988⁷⁸⁰. Subsequent experience has confirmed the efficacy of Standard Precautions to prevent exposure to infected blood and body fluid.^{778, 779, 866}

Additional information relevant to use of precautions was added in the comments column to assist the caregiver in decision-making. Citations were added as needed to support a change in or provide additional evidence for recommendations for a specific disease and for new infectious agents (e.g., SARS-CoV, avian influenza) that have been added to Appendix A. The reader may refer to more detailed discussion concerning modes of transmission and emerging pathogens in the background text and for MDRO control in Appendix B.

^g Source: Appendix A excerpted from The [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007](#). The Healthcare Infection Practices Advisory Committee, pgs. 93-113.

ATTACHMENT B (continued)

APPENDIX A¹
TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type [†]	Duration [†]	Comments
Multidrug-resistant organisms (MDROs), infection or colonization (e.g., MRSA, VRE, VISA/VRSA, ESBLs, resistant <i>S. pneumoniae</i>)	S/C		MDROs judged by the infection control program, based on local, state, regional, or national recommendations, to be of clinical and epidemiologic significance. Contact Precautions recommended in settings with evidence of ongoing transmission, acute care settings with increased risk for transmission or wounds that cannot be contained by dressings. See recommendations for management options in Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006 870. Contact state health department for guidance regarding new or emerging MDRO.

¹ Type of Precautions: A, Airborne Precautions; C, Contact; D, Droplet; S, Standard; when A, C, and D are specified, also use S.

[†] Duration of precautions: CN, until off antimicrobial treatment and culture-negative; DI, duration of illness (with wound lesions, DI means until wounds stop draining); DE, until environment completely decontaminated; U, until time specified in hours (hrs) after initiation of effective therapy; Unknown: criteria for establishing eradication of pathogen has not been determined

Below is a bibliography of evidence used to revise preexisting recommendations. Please refer to the source guideline for additional references.

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***Recommendations Related to
Reporting of Healthcare-Associated Infection
Measures***

Recommendations Concerning Reporting of Healthcare Associated Infections

The following section of this report details the twelve specific recommendations in the area of HAI reporting made by the Massachusetts HAI Expert Panel for the consideration by the Lehman Center and the Department of Public Health.

The selection of measures for HAI reporting was guided by the recommendations of the Healthcare Infection Control Practices Advisory Committee⁴ who emphasized the importance of considering frequency, severity and preventability of HAIs along with the ability to detect and report them accurately. The types of infections that best fulfill these criteria are bloodstream infections (BSI) and surgical site infections (SSI). Ventilator-associated pneumonia (VAP) was also considered, but urinary tract infections (UTI) were not since HICPAC has determined there is “less prevention effectiveness relative to the burden of data collection and reporting” of UTIs⁴.

Thus far, most public information on hospital performance used to monitor quality of care is based solely on *process measures* (actions taken by healthcare providers that improve care and reduce risk of complications). However, there is also interest in monitoring the results of these processes through *outcome measures* such as rates of specific infections. The Task Groups and Expert Panel considered both types of measures in their deliberations.

Early in the deliberations, the Expert Panel identified three potential levels of reporting for HAI-related process and outcome measures:

- To the public for use by consumers, insurers and all stakeholders
- To the Betsy Lehman Center for monitoring and quality improvement purposes, but not for public dissemination
- Within the institution only, for tracking performance and results of quality improvement activities

Some HAI measures raise serious concerns about difficulties with standardization across hospitals, which could lead to false reassurance, unfounded fears, and other unintended consequences. For this reason, the second level (Betsy Lehman Center without public distribution) was chosen as a reasonable compromise in selected instances, since it provides an opportunity to study the results with input from experts and appropriate stakeholders. In situations in which inter-hospital methods and definitions vary widely or evidence supporting the validity of the measure is lacking, internal tracking within the hospital for self-assessment was determined to be the limit of utility.

A. GENERAL CONCEPTS CONCERNING REPORTING OF HAI RELATED MEASURES^h

Recommendation 1

Guidelines for Selection of Measures for Public Reporting of HAI-related measures

1. The measures used for reporting of specific healthcare-associated infections, as well as the process measures used to prevent such infections, should be based on objective definitions that can be consistently applied by all Massachusetts hospitals that are subject to the reporting requirements. **A-IV**
2. Outcome measures used for reporting (e.g. rates of specific healthcare-associated infections) should be developed to allow for an appropriate level of risk adjustment in relation to factors such as patient population and severity of illness. **B-IV**

Recommendation 2¹⁻⁶

Guiding Principles for a public reporting system for HAI from the perspective of hospital infection prevention and control programs

Common Goals of Public Reporting and Infection Control Programs

The primary goal of hospital infection prevention and control programs is to protect patients, employees and visitors from transmission of infection. The stated rationales for mandatory public reporting of HAIs are to inform the public as they make their health care choices, and to improve health care quality by reducing HAI rates. As mandated public reporting is put in place, it is critically important to design a reporting system that can function synergistically with hospital infection control and performance improvement programs, to work toward their common goals of reducing HAIs and improving patient safety.

1. The reporting system should collect and report healthcare data that are useful not only to the public, but also to the facility (hospital) for its infection control and prevention efforts. **B-IV**
2. Hospitals should use the reporting data to provide feedback to their health care providers about the facility's performance, to provide additional information to guide the hospital's ongoing efforts to prevent HAI, with the added opportunity to compare the facility's data with others in the health care system. **B-IV**

^h The definitions used in this reporting system are definitions for surveillance only and are not to be used as tools for diagnosis or treatment.

Resource Allocation for Reporting

Anticipating the likely establishment of mandatory public reporting of HAIs in the near future, directors of hospital infection prevention and control programs are concerned about the additional resources that will be necessary to collect, analyze, and report the required data. It is essential that the demands of data collection and submission for public reporting do not undermine the core functions and activities of infection prevention and control programs by diverting time and resources from them. It is also important to recognize that hospitals in Massachusetts vary widely in the levels of personnel and non-personnel resources (such as IT infrastructure) devoted to infection control as identified in the Survey of Infection Control Programs and Practices in Massachusetts Hospitals.

As stated in Joint Public Policy Committee's Essentials of Public Reporting: A Tool Kit: "Each institution must assess the scope of its infection control program to ensure that adequate resources are available for any additional surveillance activities needed to meet the legislative mandates of public reporting. In today's healthcare environment, in addition to their traditional roles, infection control professionals (ICPs) have expanded obligations in various aspects of health care delivery that include, but are not limited to, construction and renovation activities, employee and occupational health, bioterrorism and pandemic influenza preparation, disaster planning and outpatient services. Therefore, additional personnel and resources must offset any further burden placed on ICPs by public reporting."

- 3.** To avoid duplication of efforts, data collection requirements of the public reporting system (with regard to measures selected, definitions, populations surveyed and surveillance criteria), should, to the extent possible, be consistent with the recommendations and requirements of national organizations and agencies, for example, CDC, CMS, and the Joint Commission. **A-IV**
- 4.** Reporting requirements should be phased in gradually to enable hospitals to modify their surveillance activities as needed, ensure reliability of data to be reported, and assess needs for additional resources. **B-IV**
- 5.** Requirements for public reporting of HAIs should take into consideration the likely costs to hospitals, and the risk that public reporting may divert resources from infection prevention to data collection unless compensatory resources are made available. **B-IV**

With increasing numbers of process and outcome indicators being monitored for quality improvement, public health, regulatory and accreditation purposes, the volume of patient care data to be collected, analyzed and displayed continues to increase. The availability of automated databases and information technology (IT) support is pivotal to valid and timely measurement and reporting of health care indicators. Results of the

Survey of Infection Control Programs and Practices in Massachusetts Hospitals indicate that hospitals in Massachusetts vary widely in their IT capacity for infection control.

- 6.** Requirements for public reporting of HAIs should take into consideration the need for increased investment in appropriate information technology and information services support in hospitals to facilitate the data collection and analysis required. **A-IV**
- 7.** The Massachusetts Department of Public Health should provide or facilitate initial and ongoing training for hospital staff in the data collection and data submission processes required by the public reporting system. **B-IV**

ICP Oversight of Data Collection for Public Reporting

The Healthcare Infection Control Practices Advisory Committee (HICPAC) guidelines on public reporting of HAI recommend that states “use established public health surveillance methods when designing and implementing mandatory HAI reporting systems.” HAI surveillance requires trained, professional personnel to collect, validate, analyze, and interpret the data. In addition, as it is likely that the public reporting system may require the submission of certain measures that may, in many hospitals, be collected by entities other than infection control e.g., quality improvement or employee health, increased communication and coordination among these entities may be necessary. A multidisciplinary advisory group composed of infection control experts and representatives of other key stakeholders will help to ensure the smooth and effective functioning of the reporting system, once established, and the quality and utility of its products/reports.

- 8.** Data collection for public reporting of HAIs should be overseen by individuals with training in infection control and prevention, as defined by the Healthcare Infection Control Practices Advisory Committee (HICPAC). **A-IV**
- 9.** Hospitals should facilitate collaboration and cooperation between their departments of infection control, quality improvement, employee health, and others involved in the prevention and control of HAIs, to ensure that the data required by the reporting system are collected efficiently, and used effectively, by the institution to improve quality of care. **A-IV**
- 10.** The Department of Public Health should appoint an Advisory Committee, to meet regularly, composed of, but not limited to, the Department's director of infectious disease, a representative of the Betsy Lehman Center, infection control professionals, hospital administrators, hospital epidemiologists, quality improvement professionals, health care providers, consumers, and technical experts (e.g., microbiologist, statistician). The purpose of the Advisory Committee would be to advise the Department on the ongoing implementation of the reporting system, and

to assist the Department in the promulgation and review of regulations regarding the surveillance, reporting, and prevention of HAIs. **A-IV**

Assessment of Reporting Impacts

Mandatory public reporting of HAI may have both positive and negative effects on hospital infection control programs. Potential beneficial effects of public reporting on hospital infection prevention and control programs include increased institutional focus on infection control, facilitation of enhanced collaboration between infection control and quality improvement programs, expansion of IT infrastructure for infection control, and increased allocation of resources to infection control. Potential detrimental effects include the diversion of resources from prevention of infections, additional strain on overloaded hospital infection control programs, and creation of incentives to underreport infections. As yet, there is little published information on the role or effectiveness of public reporting in reducing HAIs.

11. The effects of public reporting of HAIs should be periodically assessed. A plan for such assessment should be built into the public reporting system from the outset. **A-IV**

Recommendation 3⁷⁻¹²

Statement on the Use of Administrative Data for Public Reporting of HAIs

Several states have used administrative claims data to provide the public with comparative data on selected healthcare outcomes. While these data are easily accessible, inexpensive, and comprehensive across a large population, numerous studies have challenged their validity and accuracy for use in identifying clinical events such as HAIs.

Use of administrative data (such as hospital discharge diagnostic codes) alone for public reporting of healthcare-associated infections leads to substantial misclassification and should not be adopted. **A-II**

B. RECOMMENDATIONS CONCERNING PUBLIC REPORTING OF HAI-RELATED MEASURES

Recommendation 4¹³⁻¹⁹

Public Reporting of Central Venous Catheter –Associated Bloodstream Infection (CVC-BSI) Rates in Intensive Care Unitsⁱ

Outcome measures for public reporting should be selected based on frequency, severity, preventability, and ability to detect and report accurately and consistently across hospitals. CVC-BSIs are the second leading cause of HAI-related mortality in U.S. hospitals (after ventilator-associated pneumonia) and are therefore recommended as a reportable measure by expert authorities. Furthermore, 89% of Massachusetts hospitals currently track CVC-BSI rates in ICUs. For these reasons:

- 1. Facilities designated by the Massachusetts Department of Public Health (MDPH) as **Acute Care Hospitals** should be mandated to track and report **laboratory-confirmed CVC-BSI rates in ICUs** to MDPH. **A-IV****

Intensive care unit patients are at a greater risk of acquiring HAIs due to the number of procedures and seriousness of comorbidities.

- 2. ICUs should be defined as **All Intensive Care Units**. These include: medical ICUs (MICU), surgical ICUs (SICU), combined medical/surgical ICUs, neonatal ICUs (NICU), pediatric ICUs (PICU), coronary care units (CCU), neuro/neurosurgery ICUs (NSICU) cardiac surgery ICUs (CSICU), trauma ICUs, and burn ICUs. **A-II****

Expert authorities and various studies have acknowledged the challenge of diagnosing laboratory-confirmed bloodstream infections in a standardized manner. This is largely due to the subjectivity in classifying cultures that are positive for bacteria commonly considered part of the skin flora. In order to guarantee standardization of rates for inter-hospital comparison, the following is recommended:

- 3. Reporting to MDPH should be restricted to BSIs that:**
 - a. Meet the current National Healthcare Safety Network (NHSN) criterion 1 for Laboratory-Confirmed Bloodstream Infection (LCBI). (Attachment C) and**
 - b. A central or umbilical catheter was in place at the time of or within 48 hours before the onset of LCBI. **A-II****

ⁱ Note: The definitions used in this reporting system are definitions for surveillance only and are not to be used as tools for diagnosis or treatment.

Both HICPAC⁴ and the Joint Commission⁷⁰ recommend the use of catheter (or device) days as a denominator for calculating BSI rates to adjust for potential differences in risk factors. Although labor intensive, most (78%) of Massachusetts hospitals currently use catheter-days for BSI rate calculation.

- 4. Rates will be calculated based on central venous catheter days. Calculation equation A-II:**

$$\text{CVC-BSI rate} = \frac{\text{\# of CVC-BSIs}}{\text{Total Catheter-days}} \times 1,000$$

5. Definitions:

- a) Central Venous Catheters – should be based on the most current NHSN definition (Attachment C). **A-IV**
 - b) Catheter-days – total number of days of exposure to the central venous catheter by all of the patients in the observed ICU. This could be obtained through a daily count or through use of a once-weekly sampling method (Attachment C).³⁰ **A-IV**
- 6. Numerator** – the number of CVC-BSI diagnosed in an intensive care unit patient while a central venous catheter is in place or within 48 hours after the CV catheter was discontinued. CVC-BSIs that develop within 48 hours of patient transfer out of the ICU are also included (Attachment C). **A-IV**
- 7. Denominator** – sum of catheter-days (as defined above) of all patients in the specific ICU. A patient with more than one (1) CV catheter on a given day is counted only once for that day. **A-IV**

For inter-hospital comparisons, healthcare-associated infection rates must account for dissimilarities in underlying conditions and severity of illness between patients. The risk of acquiring a bloodstream infection varies across hospitals and across types of intensive care units.

8. Stratification

- a) By type of ICU. **A-IV**
 - b) By hospital type (teaching versus non-teaching). **A-IV**
 - c) By hospital size (using appropriate bed size categories). **A-IV**
- 9. Data Collection/Reporting Periods:**
- a) Hospitals should submit data at least quarterly or according to NHSN requirements. **A-IV**
 - b) Reports should be released to the public every **six (6) months**. **B-IV**

Recommendation 5 ²⁰⁻²⁵

Public Reporting of Surgical Site Infections for Total Hip and Total Knee Arthroplasties

Outcome measures for public reporting should be selected based on frequency, severity, preventability, and ability to detect and report accurately and consistently across hospitals. Surgical site infections (SSI) are the second most frequent HAI in U.S. hospitals (after UTIs). They are associated with significant morbidity and considerably extend the length of hospitalization. Expert authorities have identified SSI as a high priority outcome measure for public reporting.

In order to assure comparability of rates across hospitals, collection of standardized data for specific, high-volume operations is recommended. The definition of SSIs for hip and knee arthroplasties are highly uniform across facilities and in Massachusetts, over 95% of hospitals perform these procedures. In addition, process measures for these two procedures are monitored as part of the Surgical Care Improvement Project (SCIP).

For these reasons:

- 1.** Facilities designated by the Massachusetts Department of Public Health (MDPH) as **Acute Care Hospitals** should be mandated to track and report to MDPH rates of surgical site infections^j resulting from the following operative procedures (see Attachment D): **B-IV**
 - a) Total Hip Replacements B-IV**
 - b) Total Knee Replacements B-IV**

Deep incisional and organ/space SSI cause the greatest morbidity and mortality. Superficial site infections are less likely to result in death or injury and their identification is difficult to standardize across hospitals. Furthermore, superficial site infections are more likely and are often diagnosed and treated in the ambulatory setting where access to data is variable.

- 2.** Reporting to MDPH will be restricted to **deep incisional and organ/space SSI** (Attachment D). **B-IV**
- 3.** Rates will be calculated as follows: **A-IV**

$$\text{SSI rate} = \frac{\text{Number of SSI}}{\text{Number of surgeries}} \times 100$$

^j Reported SSI rates will not be surgeon-specific

Both HICPAC⁴ and the Healthcare-Associated Infection Working Group of the Joint Public Policy Committee² emphasize the importance of standardization of definitions and the use of established methods for collecting/reporting surveillance data.

- 4. Definitions:** Surgical Site Infection subtype definitions should be based on the most current NHSN definition. (Attachment D). **A-IV**
- 5. Numerator:** The number of SSIs related to the specified operative procedure. Cases shall be assigned to the numerator based on the month of surgery. **B-IV**
- 6. Denominator:** The number of the selected operative procedures performed in the reporting month. **A-IV**

To enable comparability between hospitals, rates must be stratified according to patients' risk of developing SSI. The NNIS risk index is a well-established and recommended method of risk adjusting rates for inter-hospital comparison. Although some studies have offered methods of risk adjustment that consider independent risk factors for each procedure individually and achieve high predictive values, these methods are not well-established and require computerized input of data from operating rooms. Expert authorities have recommended the use of the NNIS risk index as the optimal method of risk stratification at this time.

- 7. Risk Adjustment** should be performed using the National Nosocomial Infection Surveillance (NNIS) risk index. **A-II**

Studies have shown that over half of SSIs do not become evident until after hospital discharge. Expert authorities have recommended postdischarge surveillance for SSIs to account for these infections. However, there is a great deal of variability among institutions with regard to methods of postdischarge surveillance of SSIs. The literature also indicates that certain methods (physician or patient surveys) are highly inconsistent. Therefore, in order to ensure comparability across hospitals:

- 8. Post Discharge Surveillance** should be conducted by review of readmission data to identify potential SSIs occurring within 30 days after a procedure not involving an implant or within one year if implant is in place and the infection appears related to the operative procedure. **The numerator must only include SSIs identified during readmission, to any hospital** (hospitals must report infections to the operating hospital as per Joint Commission recommendations). **B-II**

C. RECOMMENDATIONS CONCERNING REPORTING OF HAI-RELATED MEASURES TO THE BETSY LEHMAN CENTER^k

Recommendation 6²⁶⁻³³

Reporting of Central Venous Catheter Bloodstream Infection (CVC-BSI) Rates^l

While common skin contaminants are recognized as a major cause of CVC-BSI, no standardized definitions exist that allow for accurate inter-hospital comparisons of rates of CVC-BSI caused by these organisms. For the purpose of better understanding the role of common skin contaminants in CVC-BSI and the validity of relevant reporting definitions for CVC-BSI, the following is recommended:

Hospitals should report rates for all CVC-BSI occurring in **all intensive care units that:**

- a.** Fulfill current criteria 2 or 3 of the NHSN surveillance definition for laboratory confirmed bloodstream infection (LCBI) (Attachment C).
- and b.** A central or umbilical catheter was in place at the time of or within 48 hours before the onset of LCBI to the Betsy Lehman Center or its designee. **B-II**

These data should be reviewed by a Betsy Lehman Center-appointed advisory committee for use in quality improvement, trend analysis, research, and the evaluation of possible phase-in for public reporting.

- a) The (at least) two positive blood cultures must be obtained within **two days** of each other. **B-II**
- b) The (at least) two positive blood cultures must share an identical **antibiogram** (per NHSN definition). **B-II**
- c) **Catheter-days** should be used as the denominator for calculating all CVC-BSI rates noted above. **A-II**
- d) Catheter-days may be determined through use of a **once-weekly sampling method** (Attachment C).³⁰ **A-II**
- e) Data reported to the Betsy Lehman Center **shall not be released publicly.** **A-IV**

^k For Betsy Lehman Center reporting, hospital-specific rates must remain confidential.

^l For additional detail, please refer to Recommendation 4: Public Reporting of Central Venous Catheter –Associated Bloodstream Infection (CVC-BSI) Rates in Intensive Care Units.

Recommendation 7 ²⁰⁻²⁵

Reporting of Surgical Site Infections for Total Hysterectomies and Coronary Artery Bypass Grafts

Outcome measures for public reporting should be selected based on frequency, severity, preventability, and ability to detect and report accurately and consistently across hospitals. Although SSIs resulting from certain surgeries are frequent and severe, their definitions are difficult to standardize across hospitals. This makes them unsuitable for public reporting at this time. The importance of these SSIs, however, merits collection of data by a central agency for possible future implementation as a publicly reported measure.

1. Facilities designated by the Massachusetts Department of Public Health (MDPH) as Acute Care Hospitals should be mandated to track and report to the Betsy Lehman Center or its designee rates of surgical site infections^m resulting from the following operative procedures (see Attachment D) **B-IV**:
 - a) **Total Abdominal Hysterectomies B-IV**
 - b) **Total Vaginal Hysterectomies B-IV**
 - c) **Coronary Artery Bypass Grafts (CABGs) B-IV**

Deep incisional and organ/space SSI cause the greatest morbidity and mortality. Superficial site infections, in contrast, are less likely to result in death or injury and their identification is difficult to standardize across hospitals. Furthermore, superficial site infections are more likely to be diagnosed and treated in the ambulatory setting where access to data is variable.

2. Reporting to the Betsy Lehman Center or its designee should be restricted to **deep incisional and organ/space SSI** (Attachment D). **B-IV**
3. Rates are calculated as follows: **B-IV**
$$\text{SSI rate} = \frac{\text{Number of SSI}}{\text{Number of surgeries}} \times 100$$

Both HICPAC⁴ and the Healthcare-Associated Infection Working Group of the Joint Public Policy Committee² emphasize the importance of standardization of definitions and the use of established methods for collecting/reporting surveillance data.

4. **Definitions:** Surgical Site Infection subtype definitions should be based on the most current NHSN definition. (Attachment D). **B-IV**

^m Reported SSI rates will not be surgeon-specific

- 5. Numerator:** The number of SSIs related to the specified operative procedure. Rates should be calculated separately for deep incisional and organ/space SSIs. Cases shall be assigned to the numerator based on the month of surgery. **B-IV**
- 6. Denominator:** The number of the selected operative procedures performed in the reporting month. **B-IV**

To enable comparability between hospitals, rates must be stratified according to patients' risk of developing SSI. The NNIS risk index is a well-established and recommended method of risk adjusting rates for inter-hospital comparison. Although some studies have offered methods of risk adjustment that consider independent risk factors for each procedure individually and achieve high predictive values, these methods are not well-established and require computerized input of data from operating rooms. Expert authorities have recommended the use of the NNIS risk index as the optimal method of risk stratification at this time.

- 7. Risk Adjustment** should be performed using the National Nosocomial Infection Surveillance (NNIS) risk index. **B-II**

Studies have shown that over half of SSIs do not become evident until after hospital discharge. Expert authorities have recommended postdischarge surveillance for SSIs to account for these infections. There is, however, a great deal of variability among institutions with regard to methods of postdischarge surveillance of SSIs. The literature also indicates that certain methods (physician or patient surveys) are highly inconsistent. Therefore, in order to ensure comparability across hospitals:

- 8. Post Discharge Surveillance** should be conducted by review of readmission data to identify potential SSIs occurring within 30 days after a procedure not involving an implant or within one year if implant is in place and the infection appears related to the operative procedure. **The numerator must only include SSIs identified during readmission, to any hospital** (hospitals must report infections to the operating hospital as per Joint Commission recommendations). **B-II**
- 9.** Data shall be reported to the Lehman Center or its designee for a period of **one year (pilot year)**. **B-IV**

10. Data collected during the pilot year should be **reviewed by a Betsy Lehman Center-appointed advisory committee**. Based on these data, the committee should decide whether to recommend public reporting for the above measures. **B-IV**

Recommendation 8 ³⁴⁻³⁸

Reporting of Ventilator-Associated Pneumonia Process Measures

Pending rigorous definition and a feasibility evaluation, the Panel **recommends** that the following measures be reported at least annually to the Betsy Lehman Center (for internal use but not public disclosure): **B-II**

- a) **The daily application of protocol-driven assessments for readiness to discontinue mechanical ventilation**
- b) **Elevation of the head of the patient's bed**

In addition, we recommend reporting of the time and resources required to collect these measures.

Creation of Adequately Explicit Measures and Reporting Standards: Because public reporting of VAP process measures is a new undertaking with possible adverse consequences, the Panel recommends that a group be convened to create adequately explicit measurement standards and techniques for meaningful intra- and inter- hospital comparisons. This group should consider intermittent, rather than continuous, measurement schemes; these may provide similarly actionable data with fewer required resources. The reporting standards and measurement schemes should be studied and subject to public comment prior to broad implementation. **B-IV**

Ongoing Assessment of Measures: A group should be formed to evaluate the data collected by the Lehman Center, to assess the burden of data collection, and to make future recommendations about additional reporting. Measure selection should be re-visited on an annual basis or more frequently. **B-IV**

Other possible measures: For possible future measure selection, the Panel believes the weight of present evidence about possible VAP prevention process measures falls into four categories: **B-IV**

- a) Improvements in the reliability of the following processes are likely to be associated with a reduction in the rate of ventilator-associated pneumonia: **B-IV**
 - The daily application of protocol-driven assessments for readiness to discontinue mechanical ventilation
 - Elevation of the head of the patient's bed

- Daily lightening of sedation in appropriate patients
 - Frequent oral care
 - The use of oral antiseptics
- b) At this time, the published evidence is insufficient to support a bundle methodology to reduce the rate of ventilator-associated pneumonia, although such a set of measures may well be shown to be effective in the future. **B-IV**
- c) The evidence argues that prophylaxis against deep venous thrombosis has no relationship to ventilator-associated pneumonia. **B-IV**
- d) The evidence argues that provision of prophylaxis against stress ulceration can increase the risk of nosocomial infection. In particular, proton pump inhibitors might increase the risk of *Clostridium difficile*-related infections and have been associated with an increased risk of community-acquired pneumonia. Although stress ulcer prophylaxis is likely to be important for other reasons in the critically ill, and overall benefits may outweigh risks, it cannot be recommended as a method to reduce ventilator-associated pneumonia. **B-IV**

Recommendation 9 ³⁹⁻⁴⁴

MRSA Prevalence Survey in Massachusetts Acute Care Facilities

Methicillin resistant Staph aureus (MRSA) is the most common multidrug-resistant organism causing HAIs³⁹. There is no general consensus on how to optimally prevent HAI MRSA, although significant efforts to develop effective approaches to control infection and transmission of MRSA are currently underway. Therefore it is likely that recommendations will change over the next few years.

A facility's MRSA burden is a combination of community-acquired MRSA brought into the facility and hospital-acquired MRSA, and includes patients with active infection and those with asymptomatic colonization. A general consensus among experts in the field is that the determination of the overall burden of MRSA is especially important when trying to decide which prevention or control method should be implemented; however no consensus exists on a uniform approach. Methods for determining the overall burden of MRSA include: 1) surveillance of clinical cultures 2) active culturing of all patients at a single point in time (point prevalence) 3) actively culturing all patients on an ongoing basis (active surveillance program). According to

the survey on infection control and prevention programs in Massachusetts conducted in February 2007, 97% of respondents were engaged in surveillance of microbiology results for new cases of MRSA, and 50% were doing surveillance cultures on selected patients at admission.

After extensive review of current literature and discussion, the expert panel concluded that the optimal approach at this time is to implement a point prevalence study to be performed in all acute care hospitals in Massachusetts on a bi-annual basis. Point prevalence surveys represent valuable tools that hospitals can use to estimate their overall MRSA burden. This information can then be used by hospitals to shape their individual strategy for MRSA prevention, efforts which may include a range of interventions including hospital-wide or special risk group active surveillance. The decision regarding approaches to MRSA surveillance and prevention should also include consideration of the risks of MRSA transmission to patients⁴⁰, the potential benefits of active surveillance in decreasing the risk, and the resources required for active surveillance compared with other infection control program activities.

There remains considerable controversy around the benefit of active surveillance for all hospitals as the relative benefit of an active surveillance program vs. the risk and cost has not been established. Expert opinion is divided, but there is some consensus that the decisions and approach towards including active surveillance in the infection control program needs to be individualized for each hospital. In addition, experts have stressed that the implementation of an active surveillance program is resource-intensive and careful planning needs to be done before such a program is put into place. Other hospital departments besides the infection control department need to be involved in the creation of an active surveillance program including the microbiology laboratory, nursing, medical staff, environmental services, and hospital administration.^{41,42} Therefore the Expert panel concurred that hospital-wide active surveillance in all acute care hospitals should not be recommended at this time.

<p>All acute care hospitals in Massachusetts will conduct a MRSA prevalence survey to identify the number of inpatients infected or colonized with MRSA (similar to the recent national prevalence study of MRSA conducted by the Association for Professionals in Infection Control and Epidemiology [APIC]). Facilities will complete the survey for one day during the second quarter of</p>

2008. Existing microbiology, medical, and infection control records will be used to identify patients; additional patient culturing will be needed only in ICUs as noted below. The DPH HAI Technical Advisory Committee will determine the specific survey protocol in accordance with the methods, definitions and tools used by APIC in their 2006 national survey.

To complement and enhance the APIC MRSA prevalence survey approach, the following additional step should be added. On the day of the survey, hospitals should obtain MRSA nasal cultures on all ICU patients at their facility including patients who have had a history of MRSA colonization. Patients in the ICUs that are actively being treated for documented MRSA do not require a nasal surveillance culture for purposes of this survey. ICUs are defined as all intensive care units, including but not limited to medical ICUs (MICU), surgical ICUs (SICU), combined medical/surgical ICUs, neonatal ICUs (NICU), pediatric ICUs (PICU), coronary care units (CCU), neurosurgery ICUs (NSICU), cardiac ICUs (CSICU), trauma ICUs and burn ICUs.

The recommended technique for screening is as follows:

Both anterior nares should be cultured using a single sterile standard swab. The swab should be rotated in each nares two to five times clockwise and counterclockwise. The process should gently rub across the mucous membranes about three-fourths of an inch into the nasal passage (adult) so that squamous epithelial cells from inside the nose are obtained. Isolation of MRSA should be on mannitol salt agar or comparable media, such as CHROMagar or PCR.

Interpretation of the results will be directed by the MDPH HAI Technical Advisory Committee. Point prevalence for the ICUs conducting MRSA screening is calculated as the number of patients infected or colonized with MRSA divided by the total number of patients cultured plus those who were not cultured due to active MRSA infection. Acute care facilities with multiple ICUs should do separate point prevalence calculations for each hospital unit.

It is expected that facilities will use these prevalence estimates to guide MRSA prevention activities as recommended by the most current CDC Management of Multidrug-Resistant Organisms in Healthcare Settings Guidelines.

Hospitals will submit their prevalence survey data to the Betsy Lehman Center or its designee, for interpretation by the HAI Technical Advisory Committee. Appropriate feedback to individual hospitals will be determined, but no public release of hospital-specific information should occur at this time. All opportunities for meaningful use of the data to inform prevention activities will be

explored by the technical advisors. The results of these point prevalence surveys can also help inform MDPH's statewide control efforts however the results should not be used for inter-hospital comparisons. Institution-level findings should be interpreted with caution by the MDPH and its HAI Technical Advisory Committee in light of sample size and other limitations. With direction from its technical advisors, MDPH should repeat the MRSA prevalence survey in Massachusetts acute care facilities on a bi-annual basis. **A-IV**

Recommendation 10⁴⁵⁻⁵⁷

Reporting of Influenza Vaccination Rates of Health Care Personnel

As stated by CDC in its 2006 recommendations for influenza vaccination of healthcare personnel (HCP)⁴⁵, a substantial body of evidence shows that “vaccination of health care personnel reduces transmission of influenza in healthcare settings, staff illness and absenteeism, and influenza-related morbidity and mortality among persons at increased risk for severe influenza illness”. CDC and expert groups including APIC⁴⁶, SHEA⁴⁷ and the National Foundation for Infectious Diseases (NFID)⁴⁸ recommend annual influenza vaccination for HCP, and, in addition, advocate institutional monitoring of HCP influenza vaccination rates, for the purposes of performance feedback to providers and administrators, and evaluation of the impact of in-house vaccination programs.

The influenza vaccination rate of health care personnel has been suggested as one process measure (a measure of adherence to recommended health care practices) that can be used as an indicator of the quality of a hospital's patient safety programs. Both HICPAC⁴⁹ and SHEA⁵⁰ have put it forward it as a potential process measure for public reporting.

In 2007⁵¹, Joint Commission standards were revised to require hospitals to establish/enhance employee influenza vaccination programs and to monitor influenza vaccination rates of their staff. Thus Joint Commission-accredited hospitals will be tracking HCP vaccination rates. However, there will likely be variability in how hospitals define and collect data for the numerator and denominator of this rate, and at this point in time, vaccination rates may not be comparable across hospitals. For a process measure to be publicly reported, it is essential that it be defined and measured in such a way as to be reasonably comparable across institutions. For this reason, the Expert Panel has recommended that hospitals initially report their HCP influenza vaccination rates to the Betsy Lehman Center only, not for public release, so that measurement methods can be reconciled and a standard, comparable approach agreed upon. NHSN is currently planning to add an HCP influenza vaccination module to its system (pending

OMB approval), and this may provide a sanctioned, standard method that hospitals can use to measure the influenza vaccination rates of their health care personnel.

1. Facilities designated by the Massachusetts Department of Public Health (MDPH) as Acute Care Hospitals are mandated to track and report influenza vaccination rates of health care personnel to the Betsy Lehman Center, for a pilot period of at least one year. This pilot period will be used to assess the reliability of the rate as defined, and the comparability of the rate across hospitals. Revisions to numerator and denominator definitions will be made as necessary based on experience. **B-IV**

2. Once the method for calculating the influenza vaccination rate of health care personnel is determined to be valid and comparable across hospitals, MDPH with its HAI Technical Advisory Group should consider making the hospital-specific rates publicly reportable. **C-IV**

3. Rates will be calculated as follows: (prevalence)

$$\frac{\text{\# HCP who received current season's flu vaccine by March 30}}{\text{\# HCP working in the hospital as of March 30}} \times 100 = \% \text{ of eligible HCP vaccinated} \quad \textbf{B-IV}$$

Definitions:

4. Numerator – Health care personnel (HCP) who have received the current season's influenza vaccination. Vaccination may have been received either at the hospital where the individual works or at an outside location. **B-IV**

5. Denominator – Health care personnel (HCP) working at the hospital as of the date specified in the numerator. In line with CDC guidelines, HCP are defined as all persons working in health-care settings who have the potential for exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. HCP might include (but are not limited to) physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the health-care facility, and persons (e.g., clerical, dietary, housekeeping, maintenance, and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCP. **B-IV**

6. In the event of a vaccine shortage, the numerator and the denominator definitions will be restricted to those categories of health care personnel (HCP) prioritized by MDPH as eligible for vaccine during the period of vaccine shortage. **B-IV**

Data Collection Methods:

7. Hospitals will conduct an annual survey of health care personnel to find out how many individuals have received the current season's influenza vaccine. **B-IV**

Data Collection/ Reporting Periods:

8. Hospitals are to submit data to the Betsy Lehman Center on an annual basis, within 90 days after March 30. **B-IV**

9. At periodic intervals during the influenza season, hospitals should monitor internally the influenza vaccination rates of their HCP, to assess vaccination coverage within their facility, and take steps to improve it. **B-IV**

D. RECOMMENDATIONS CONCERNING INTERNAL TRACKING/REPORTING OF HAI-RELATED MEASURES

Recommendation 11⁵⁸⁻⁶⁵

Internal, Non-Public Reporting of Central Venous Catheter Bloodstream Infection (CVC-BSI) Rates

Although all CVC-BSI occurring within hospitals are of clinical importance, public reporting of hospital-wide CVC-BSI rates is not recommended at this time. However, in addition to publicly reporting NHSN criterion 1 CVC-BSI from ICUs, acute care hospitals must track and report CVC-BSI rates in the following manner:

Recommend that hospitals **internally** track all CVC-BSIs occurring on all inpatient units that fulfill criteria 1 or 2 or 3ⁿ of the NHSN surveillance definition (Attachment C) to use for internal quality improvement efforts. **B-IV**

- a) Catheter-days are preferred as the denominator for calculating CVC-BSI rates. If catheter-days are not available, patient-days may be used. **B-II**
- b) Catheter-days may be determined through use of a once-weekly sampling method (see Attachment C). **B-II**

Recommendation 12⁶⁶⁻⁶⁹

Internal Surveillance of Ventilator-Associated Pneumonia

Benchmarking the quality of care for ventilated patients is laudable in principle but challenging in practice. Clinical diagnosis, CDC surveillance criteria, and quantitative cultures of lower pulmonary tract specimens all suffer from limited accuracy and reproducibility. These limitations make perceived VAP rates difficult to interpret and potentially misleading regardless of which definition is used. This is especially true when trying to compare different institutions that can reasonably apply each of these definitions in different ways.

In the absence of a rigorous gold standard to measure VAP, the Panel recommends against requiring hospitals to report VAP rates. Individual institutions should conduct internal VAP surveillance using an internally consistent technique in order to assess the impact of care measures adopted to improve the quality of care for ventilated patients. **A-II**

ⁿ Criterion 3 (patients below 12 months of age) has been referred to the Pediatric Affinity Group for further consideration

Recommendation 13

Use of the National Healthcare Safety Network (NHSN) System

Participation of Massachusetts acute care hospitals in the National Healthcare Safety Network (NHSN) will provide an accessible and efficient vehicle for public reporting of healthcare-associated infections. The measures selected to date for hospital-level data release (CVC-BSI and SSI) can be managed appropriately through NHSN without adding substantial costs or implementation delays. Potential for flexibility of the data elements captured, consistency with other measures under consideration and potential for comparison to national data also have positive bearing on the choice of NHSN. The Task Group supports the use of NHSN as the initial HAI reporting framework. **A-IV**

Recommendation 14⁷¹

Internal Surveillance of *Clostridium difficile*-associated disease (CDAD)

Because standardized case and surveillance definitions for *Clostridium difficile*-associated disease (CDAD) have just been made available, the MRSA/Other MDRO Task Group does not recommend rates of CDAD be reported publicly or to the Betsy Lehman Center at this time.

Individual institutions should continue to conduct internal CDAD surveillance using an internally consistent definition. The *Clostridium difficile* case and surveillance definitions proposed by McDonald et al should be reevaluated once data on their use are available. In addition, several new national guidelines from IDSA, SHEA and CDC will be published in 2008 and these guidelines should be consulted for their recommendations regarding the detection of *Clostridium difficile*-associated disease. **B-IV**

Recommendation 15

Electronic collection of laboratory data on Multiple-Drug Resistant Organisms (MDROs) by the Massachusetts Department of Public Health

During the last twenty years there has been increasing recognition of infections due to multi-drug resistant organisms. Of particular concern is a growing incidence of methicillin-resistant Staphylococcus aureus (MRSA) both in the healthcare and community settings. While the original MRSA strains were limited only to hospital settings, in the late 1990's a new MRSA strain emerged in community settings.

Although sophisticated laboratory testing can distinguish between healthcare and community MRSA strains, at this time such testing is beyond the capabilities of most clinical laboratories.

At this time both technical concerns as well as biological changes in this bacterial pathogen prevent scientifically rational public reporting of MRSA rates on an institutional level. For the purposes of future monitoring and evaluation, the MRSA and other MDRO Task Group support MDPH's efforts to develop and implement methods to electronically collect laboratory data on certain MDROs including invasive MRSA isolates, VRE and *Staph aureus* annual antibiograms. In order for these data to be useful for future monitoring and evaluation of rates, the data collection and reporting system must be standardized using national guidelines across all acute care hospitals in Massachusetts. **B-IV**

For a summary of selected reporting measures refer to Attachment E.

Editorial note on reporting of catheter-associated urinary tract infections (CAUTI):

Given that urinary tract infections are the most common HAI and that most are associated with having a bladder catheter, some have assumed that these infections would be logical choices for public reporting. However, most patients with CAUTI have no symptoms and morbidity is limited. Furthermore, the standard CDC definition for symptomatic urinary tract infection can be difficult to apply to patients with indwelling catheters, leading HICPAC ⁵ to exclude CAUTI from its list of recommended HAI measures. They noted that “monitoring these infections likely has less prevention effectiveness relative to the burden of data collection and reporting”. The forthcoming IDSA/SHEA guidelines are in agreement with HICPAC in not proposing mandatory reporting of this outcome. In the future, the potential utility of reporting process measures related to CAUTI will be considered.

ATTACHMENT C

Definition of Laboratory-confirmed bloodstream infection (LCBSI)^o

LCBSI criteria 1 and 2 may be used for patients of any age, including patients ≤ 1 year of age.
LCBSI must meet one of the following three criteria:

Criterion 1:

Patient has a recognized pathogen cultured from one or more blood cultures
and
organism cultured from blood is not related to an infection at another site. (See Notes 1 and 2 below.)

Criterion 2:

Patient has at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$), chills, or hypotension
and
signs and symptoms and positive laboratory results are not related to an infection at another site
and
common skin contaminant (i.e., diphtheroids [*Corynebacterium* spp.], *Bacillus* [not *B. anthracis*] spp., *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions. (See Notes 3 and 4 below)

Criterion 3:

Patient ≤ 1 year of age has at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$, rectal), hypothermia ($<37^{\circ}\text{C}$, rectal), apnea, or bradycardia
and
signs and symptoms and positive laboratory results are not related to an infection at another site
and
common skin contaminant (i.e., diphtheroids [*Corynebacterium* spp.], *Bacillus* [not *B. anthracis*] spp., *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions. (See Notes 3, 4 and 5 below)

Notes:

1. In criterion 1, the phrase “one or more blood cultures” means that at least one bottle from a blood draw is reported by the laboratory as having grown organisms (i.e., is a positive blood culture).
2. In criterion 1, the term “recognized pathogen” does not include organisms considered common skin contaminants (see criteria 2 and 3 for a list of common skin contaminants). A few of the recognized pathogens are *S. aureus*, *Enterococcus* spp., *E. coli*, *Pseudomonas* spp., *Klebsiella* spp., *Candida* spp., etc.
3. In criteria 2 and 3, the phrase “two or more blood cultures drawn on separate occasions” means 1) that blood from at least two blood draws were collected within two days of each other (e.g., blood draws on Monday and Tuesday or Monday and Wednesday would be acceptable for blood cultures drawn on separate occasions, but blood draws on Monday and Thursday would be too far apart in time to meet this criterion), and 2) that at least one bottle from each blood draw is reported by the

^o Source: NHSN Patient Safety Reporting Protocol, 2008. The NHSN definition for Laboratory-confirmed bloodstream infection (LCBSI) has been revised effective January 1, 2008. Voting and recommendations related to LCBSI are consistent with NHSN changes.

laboratory as having grown the same common skin contaminant organism (i.e., is a positive blood culture). (See Note 4 for determining sameness of organisms.)

- a. For example, an adult patient has blood drawn at 8 a.m. and again at 8:15 a.m. of the same day. Blood from each blood draw is inoculated into two bottles and incubated (four bottles total). If one bottle from each blood draw set is positive for coagulase-negative staphylococci, this part of the criterion is met.
 - b. For example, a neonate has blood drawn for culture on Tuesday and again on Saturday and both grow the same common skin contaminant. Because the time between these blood cultures exceeds the two-day period for blood draws stipulated in criteria 2 and 3, this part of the criteria is not met.
 - c. A blood culture may consist of a single bottle for a pediatric blood draw due to volume constraints. Therefore, to meet this part of the criterion, each bottle from two or more draws would have to be culture-positive for the same skin contaminant.
4. There are several issues to consider when determining sameness of organisms.
- a. If the common skin contaminant is identified to the species level from one culture, and a companion culture is identified with only a descriptive name (i.e., to the genus level), then it is assumed that the organisms are the same. The speciated organism should be reported as the infecting pathogen (see examples below).
 - b. If common skin contaminant organisms from the cultures are speciated but no antibiograms are done or they are done for only one of the isolates, it is assumed that the organisms are the same.
 - c. If the common skin contaminants from the cultures have antibiograms that are different for two or more antimicrobial agents, it is assumed that the organisms are not the same (see table below).
 - d. For the purpose of NHSN antibiogram reporting, the category interpretation of intermediate (I) should not be used to distinguish whether two organisms are different.

Culture	Companion Culture	Report as...
<i>S. epidermidis</i>	Coagulase-negative staphylococci	<i>S. epidermidis</i>
<i>Bacillus</i> spp. (not anthracis)	<i>B. cereus</i>	<i>B. cereus</i>
<i>S. salivarius</i>	<i>Strep viridans</i>	<i>S. salivarius</i>

Organism Name	Isolate A	Isolate B	Interpret as...
<i>S. epidermidis</i>	All drugs S	All drugs S	Same
<i>S. epidermidis</i>	OX R CEFAZ R	OX S CEFAZ S	Different
<i>Corynebacterium</i> spp.	PENG R CIPRO S	PENG S CIPRO R	Different
<i>Strep viridans</i>	All drugs S	All drugs S except ERYTH (R)	Same

5. For patients ≤ 1 year of age, the following temperature equivalents for fever and hypothermia may be used: Fever: 38°C rectal/tympanic/temporal artery = 37°C oral = 36°C axillary Hypothermia: 37°C rectal/tympanic/temporal artery = 36°C oral = 35°C axillary.

Other definitions

Acute Care Hospitals – all facilities designated as acute care by the Massachusetts Department of Public Health.

Central Venous Catheters^P – An intravascular catheter that terminates at or close to the heart or in one of the great vessels which is used for infusion, withdrawal of blood, or hemodynamic monitoring. The following are considered great vessels for the purpose of reporting central-line infections and counting central-line days in the NHSN system: aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, external iliac veins, and common femoral veins.

- NOTE: An introducer is considered an intravascular catheter
- NOTE: In neonates, the umbilical artery/vein is considered a great vessel.
- NOTE: Neither the location of the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of these vessels or in or near the heart to qualify as a central line.
- NOTE: Pacemaker wires and other nonlumened devices inserted into central blood vessels or the heart are not considered central lines, because fluids are not infused, pushed, nor withdrawn through such devices.

Clarification for Massachusetts reporting: CV catheters include peripherally inserted central catheters (PICC) and temporary dialysis catheters inserted in the ICU

Catheter-days – total number of days of exposure to the central venous catheter by all of the patients in the observed ICU. The count could be performed each day, or a once-weekly sampling methodology may be done. A patient with more than one (1) CV catheter on a given day is counted only once for that day.

Catheter-day sampling methodology-Definitions above apply here, except counts may be performed one day per week. The count determined by this method is applied to each of the following six days. Sampling should be limited to hospitals with more than 100 beds.³⁰

Intensive Care Units (ICUs) – include medical ICUs (MICU), surgical ICUs (SICU), combined medical/surgical ICUs, neonatal ICUs (NICU), pediatric ICUs (PICU), coronary care units (CCU), neuro/neurosurgery ICUs (NSICU) cardiac surgery ICUs (CSICU), trauma ICUs, and burn ICUs

^P to be updated based on the NHSN definition updates

ATTACHMENT D

Definition of Surgical Site Infections (SSI):⁹

A **superficial incisional SSI** must meet the following criteria:

Infection occurs within 30 days after the operative procedure

and

involves only skin and subcutaneous tissue of the incision

and

patient has at least one of the following:

- a. purulent drainage from the superficial incision.
- b. organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
- c. at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon, and is culture-positive or not cultured. A culture-negative finding does not meet this criterion.
- d. diagnosis of superficial incisional SSI by the surgeon or attending physician.

NOTE: There are two specific types of superficial surgical incisional SSIs:

1. Superficial Incisional Primary (SIP) – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)
2. Superficial Incisional Secondary (SIS) – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

A **deep incisional SSI** must meet the following criteria:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operative procedure

and

involves deep soft tissues (e.g., fascial and muscle layers) of the incision

and

patient has at least one of the following:

- a. purulent drainage from the deep incision but not from the organ/space component of the surgical site
- b. a deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or not cultured when the patient has at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$), or localized pain or tenderness. A culture-negative finding does not meet this criterion.
- c. an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- d. diagnosis of a deep incisional SSI by a surgeon or attending physician.

NOTE: There are two specific types of deep surgical incisional SSIs:

1. Deep Incisional Primary (DIP) – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)
2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

⁹ Source: NHSN Patient Safety Protocol, May 24, 2007

An **organ/space SSI** involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. Specific sites are assigned to organ/space SSI to further identify the location of the infection. Individual definitions are available from the NHSN.

An **organ/space SSI** must meet the following criteria:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operative procedure

and

infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure

and

patient has at least one of the following:

- a. purulent drainage from a drain that is placed through a stab wound into the organ/space
- b. organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
- c. an abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- d. diagnosis of an organ/space SSI by a surgeon or attending physician.

Other definitions:

Operative procedure is a procedure 1) that is performed on a patient who is an inpatient; and 2) takes place during an operation (defined as a single trip to the operating room [OR] where a surgeon makes at least one incision through the skin or mucous membrane, including laparoscopic approach, and closes the incision before the patient leaves the OR.

Inpatient: A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

Implant: A nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during an NHSN operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes. Screws, wires, and mesh that are left permanently are considered implants.

ATTACHMENT E

Summary Chart of HAI-Related Measures as recommended by the Massachusetts Expert Panel, January 31th 2008

HAI Measures Approved by Expert Panel			
Outcome Measures	Reporting Level		
	Public ¹	BLC ²	Internal ³
✓ CVC-BSI in ICUs – true pathogens (CDC criterion 1)*	♦		
✓ CVC-BSI in ICUs – skin contaminants (CDC criterion 2 and 3)*		♦	
✓ CVC-BSI outside of ICUs – true pathogens and skin contaminants (CDC criteria 1 and 2)*			♦
✓ SSI resulting from hip arthroplasty	♦		
✓ SSI resulting from knee arthroplasty	♦		
✓ SSI resulting from hysterectomy (vaginal and abdominal)		♦	
✓ SSI resulting from coronary artery bypass graft		♦	
✓ Ventilator-Associated Pneumonia (VAP)			♦
Point prevalence of methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)		♦	
<i>Clostridium difficile</i> -associated disease (CDAD)			♦
Process Measures			
VAP prevention: Daily application of protocol-driven assessments for ventilation		♦	
VAP prevention: Elevation of the head of the patient's bed		♦	
✓ Influenza vaccination of healthcare workers (new to NHSN for 2008)		♦	

✓ = Measure found in National Healthcare Safety Network (NHSN)

¹ Public – Data submitted to the Department of Public Health

² BLC – Betsy Leman Center for Patient Safety and Medical Error Reduction

³ Internal – For reporting hospital's own use only

CVC-BSI – central-venous catheter-associated bloodstream infection

ICU – intensive care unit

SSI – surgical site infection

* please see [Attachment C](#) in *Recommendations Related to Reporting of Healthcare-Associated Infection Measures*

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Appendix

Task Group Membership

MEMBERS OF THE BLOODSTREAM INFECTION AND SURGICAL SITE INFECTION TASK GROUP

Task Group Leader

Richard T. Ellison III, MD

*Hospital Epidemiologist
Professor of Medicine, Molecular Genetics and
Microbiology
University of Massachusetts Memorial Medical
Center*

JSI Coordinator

Laurie Robert

*Epidemiologist
JSI*

Mary Alexander, RN

*Chief Executive Officer
Infusion Nurse's Society*

Eric Alper, MD

*Internal Medicine
UMASS Memorial Medical Center*

Terri Botti

*Director of Laboratory Services
Heywood Hospital*

Karen Boudreau, MD

*Medical Director
Healthcare Quality Improvement
Blue Cross Blue Shield of MA*

Mari-Kim Bunnell, MD

*OB/GYN
New England Obstetrics and Gynecology
Associates*

Stephen Heard, MD

*Chair of Anesthesia
UMASS Memorial Medical Center*

Cathy Korn, RN, MPH, CIC

*Infection Control Professional
Boston Medical Center*

Sandra Mathis, RN, CIC

*Infection Control Professional
UMASS Memorial Medical Center*

Edward Peskin, MD

*Associate Professor
UMASS Medical School*

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*

Mary Ellen Scales, RN, MSN, CIC

*Manager
Infection Control
Baystate Medical Center*

Gerald Steinberg, MD

*Safety Officer
Cambridge Health Alliance*

Carol Wojnarowski, RN, BSN, CIC

*Manager
Infection Control
Holyoke Medical Center*

Deborah Yokoe, MD

*Hospital Epidemiologist
Brigham and Women's Hospital*

Kathy Walther, RN

*Nurse Educator
Infusion Nurse's Society*

MEMBERS OF THE OPTIMAL INFECTION CONTROL PROGRAM COMPONENTS TASK GROUP

Task Group Leader

Mary Ellen Scales, RN, MSN, CIC

Manager

Infection Control

Baystate Medical Center

JSI Coordinator

Deborah Dean

Health Education Specialist

JSI

Kathleen Arias

President

Association for Professionals in Infection
Control and Epidemiology

Evie Bain, RN

Occupational Health & Safety

Massachusetts Nurses Association

Wanda Carey, RN, BSN, CIC

Infection Control Professional

Caritas Norwood Hospital

Richard T. Ellison III, MD

Hospital Epidemiologist

*Professor of Medicine, Molecular Genetics and
Microbiology*

University of Massachusetts Memorial Medical
Center

Angela Laramie

Occupational Health, Sharp Injury Reporting

Massachusetts Department of Public Health

Jim Liljestrand, MD

Medical Director

Quality Improvement

MassPro

Michael Mitchell, MD

Director

Microbiology Services

University of Massachusetts Memorial Medical
Center

Gail Potter-Bynoe, BS, CIC

Manager

Infection Control

Children's Hospital Boston

Linda Riley, RN

Infection Prevention Coordinator

Cooley-Dickenson Hospital

Robert Duncan, MD

Epidemiologist

Lahey Clinic Medical Center

Thomas Sandora, MD

Pediatric Infectious Disease

Children's Hospital Boston

Kenneth Sands, MD

Senior Vice President

Health Care Quality

Beth Israel-Deaconess Medical Center

Patricia Stone, RN, PhD

Columbia University

Carol Sulis, MD

Hospital Epidemiologist

Associate Professor of Medicine

Boston Medical Center

Sharon Wright, MD

Hospital Epidemiologist

Beth-Israel Deaconess Medical Center

MEMBERS OF THE PUBLIC REPORTING AND COMMUNICATION TASK GROUP

Task Group Leader

Richard Olans, MD

Director, Infectious Disease

Hallmark Health Hospitals

JSI Coordinator

Laurie Kunches, PhD

Project Director

JSI

Ann Baras, RN

Nursing Instructor

North Shore Community College

Ann Marie Bourque, NP

President

New England Chapter of the National Conference of Gerontological Nurse

Lou Ann Bruno-Murtha, MD

Medical Director

Infection Control Division Chief

Infectious Diseases

Cambridge Health Alliance

Wanda Carey, RN, BSN, CIC

Infection Control Professional

Caritas Norwood Hospital

Susan Coffin, MD

Medical Director

Infection Prevention and Control

Children's Hospital of Philadelphia

Kathleen Gordon, RN

Director

Patient-Family Relations

Brigham and Women's Hospital

Denise Graham

Senior Director Public Policy

Association for Professionals in Infection Control and Epidemiology

Paula Griswold, MS

Executive Director

Massachusetts Coalition for the Prevention of Medical Errors

Gillian Haney

Director

Office of Integrated Surveillance and Informatics Services

Bureau of Communicable Disease Control

Massachusetts Department of Public Health

Linda Kenney

President, Executive Director

Medically Induced Trauma Support Services

Angela Laramie

Occupational Health, Sharp Injury Reporting

Massachusetts Department of Public Health

Kathy Mazor, EdD

Communications Researcher

UMass Medical School

Michael Mitchell, MD

Director

Microbiology Services

University of Massachusetts Memorial Medical Center

Sharon-Lise Normand, PhD

Professor of Biostatistics

Harvard Medical School

Linda Riley, RN

Infection Prevention Coordinator

Cooley-Dickenson Hospital

Christine Schuster, RN

Chief Executive Officer and President

Emerson Hospital

David Smith, MHSA

Senior Director

Health Data Analysis & Research

Massachusetts Hospital Association

Thomas Sullivan, MD

Cardiologist in Private Practice

Women's Health Center Cardiology

Deborah Wachenheim

Consumer Health Quality Coordinator

Health Care for All

Carol Wojnarowski, RN, BSN, CIC

Manager

Infection Control

Holyoke Medical Center

MEMBERS OF THE VENTILATOR-ASSOCIATED PNEUMONIA TASK GROUP

Task Group Leader

Donald Craven, MD

Chair

Infectious Disease

Lahey Clinic Medical Center

JSI Coordinator

Laurie Kunches, PhD

Project Director

JSI

Daniel Barrieau, RRT, CPFT

Director

Respiratory Care Services

Cooley-Dickenson Hospital

Martha Curley, RN, PhD, FAAN

University of Pennsylvania School of Nursing

Richard T. Ellison III, MD

Hospital Epidemiologist

Professor of Medicine, Molecular Genetics and Microbiology

University of Massachusetts Memorial Medical Center

Jane Foley, RN

Director of Operations, Nursing

Beth-Israel Deaconess Medical Center

Gail Garvin, RN, CIC

Infection Control Professional

Boston Medical Center

Michael Howell, MD

Associate Director of Medical Critical Care

Beth Israel Deaconess Medical Center

Michael Klompas, MD

Infectious Disease Fellow

Brigham and Women's Medical Center

Tricia Lemon, BSN, MPH, CIC

Infection Control Professional

Tufts New England Medical Center

Michael Mitchell, MD

Director

Microbiology Services

University of Massachusetts Memorial Medical Center

Debra Morrow, RN

Infection Control Coordinator

Cardiac Intensive Care Unit

Children's Hospital Medical Center

Mary Ellen Scales, RN, MSN, CIC

Manager

Infection Control

Baystate Medical Center

Carol Wojnarowski, RN, BSN, CIC

Manager

Infection Control

Holyoke Medical Center

Paula Wright, RN, BSN, CIC

Manager

Infection Control

Mass General Hospital

MEMBERS OF THE MRSA AND OTHER SELECTED PATHOGENS TASK GROUP

Task Group Leader

Philip Carling, MD

Director

Infectious Diseases and Hospital Epidemiology
Caritas Carney Hospital

JSI Coordinator

Jeanne Day

Epidemiologist

JSI

Eric Alper, MD

Internal Medicine

University of Massachusetts Memorial Medical
Center

Barbara Bolstorff

Epidemiologist

Massachusetts Department of Public Health

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

Infectious Diseases

Cambridge Health Alliance

Wanda Carey, RN, BSN, CIC

Manager

Infection Control

Caritas Norwood Hospital

Sally Fontecchio, RN, CIC

Infection Control Director

UMASS Memorial Medical Center

Paula Griswold, MS

Executive Director

Massachusetts Coalition for the Prevention of
Medical Errors

Sarah Haessler, MD

Infectious Disease Physician

Baystate Medical Center

Jo Ann Harris, MD

Director

Division of Pediatric Infectious Disease
University of Kansas Medical Center

David Hooper, MD

Internal Medicine, ID

Massachusetts General Hospital

Susan Huang, MD

Assistant Hospital Epidemiologist

Brigham and Women's Hospital

Sheryl Katzanek

Director of Patient-Family Relations

Boston Medical Center

Susan Marino MS, MT(ASCP), CIC

Infection Control Professional

Brigham and Women's Hospital

Gary Noskin, MD

Associate Chief Medical Officer

Hospital Epidemiologist

Northwestern Memorial Hospital

Trish Phelan

Microbiology Supervisor

Cape Cope Healthcare

Jeannie Sanborn, RN, MS, CIC

Infection Control Professional

Heywood Hospital

MEMBERS OF THE PEDIATRIC AFFINITY GROUP

Task Group Leader

Peter Laussen, MD

Director

Cardiac Intensive Care Unit

Children's Hospital Boston

JSI Coordinator

Laurie Kunches, PhD

Project Director

JSI

Martha Curley, RN, PhD, FAAN

University of Pennsylvania

School of Nursing

Jane Foley, RN

Director of Operations

Nursing

Beth-Israel Deaconess Medical Center

Gail Garvin, RN, CIC

Infection Control Nurse

Boston Medical Center

Debra Morrow, RN

Infection Control Coordinator

Cardiac Intensive Care Unit

Children's Hospital Boston

Natan Noviski, MD

Chief

Pediatric Critical Care Medicine

MassGeneral Hospital for Children

Christine Parrish, RN, MS, MSN, CIC

Infection Control Nurse

Baystate Medical Center

Mary Ellen Scales, RN, MSN, CIC

Manager

Infection Control

Baystate Medical Center

MEMBERS OF THE AD HOC CAUTI COMMITTEE

JSI Coordinator

Laurie Kunches, PhD

Project Director

JSI

Lou Ann Bruno-Murtha, MD

Medical Director

Infection Control Division Chief

Infectious Diseases

Cambridge Health Alliance

Wanda Carey, RN, BSN, CIC

Manager

Infection Control

Caritas Norwood Hospital

Richard T. Ellison III, MD

Hospital Epidemiologist

Professor of Medicine, Molecular Genetics and Microbiology

University of Massachusetts Memorial Medical Center

Lisa Hirschhorn, MD, MPH

Senior Clinical Consultant HIV/AIDS

JSI Research and Training Institute

Gail Potter-Bynoe, BS, CIC

Manager

Infection Control

Children's Hospital Boston

Deborah Yokoe, MD

Infectious Disease Clinician

Brigham and Women's Hospital

Stephen Zinner, M.D.

Chair, Department of Medicine

Mount Auburn Hospital