Slide 1

Health Care Associated Infections Calendar Year 2023: Acute Care Hospitals, Non-Acute Care Hospitals, Dialysis Centers

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Slide 2

Introduction

Healthcare-associated infections (HAIs) are infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting.

* + HAIs are among the leading causes of preventable death in the United States, affecting 1 in 17 hospitalized patients, accounting for an estimated 1.7 million infections and an associated 98,000 deaths.\*

The Massachusetts Department of Public Health (DPH) developed this data update as a component of the Statewide Infection Prevention and Control Program created pursuant to [Chapter 58 of the Acts of 2006](http://www.malegislature.gov/Laws/SessionLaws/Acts/2006/Chapter58).

* + Massachusetts law provides DPH with the legal authority to conduct surveillance, and to investigate and control the spread of communicable and infectious diseases. ([MGL c. 111,sections 6 & 7](http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section111))
  + DPH implements this responsibility in hospitals through the hospital licensing regulation. (105 CMR 130.000)
  + DPH implements this responsibility in dialysis centers through the out-of-hospital dialysis regulation. (105 CMR 145.000)
  + Section 51H of chapter 111 of the Massachusetts General Laws authorizes the Department to collect HAI data and disseminate the information publicly to encourage quality improvement. (<https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section51H>)

Haque M, Sartelli M, McKimm J, Abu Bakar M. Healthcare-associated Infections - an Overview. *Infect Drug Resist*. 2018;11:2321–2333.

Slide 3

Methods

The healthcare data summary includes the following statewide measures for the 2023 calendar year (January 1, 2023– December 31, 2023) as reported to the CDC’s National Healthcare Safety Network (NHSN).

DPH required measures are consistent with the Centers for Medicare and Medicaid Services (CMS) quality reporting measures.

Acute Care Hospitals (ACH)

* Central line-associated bloodstream infections (CLABSI) in intensive care units and wards
* Catheter-associated urinary tract infections (CAUTI) in intensive care units and wards
* Specific surgical site infections (SSI)
* Specific facility-wide laboratory identified events (LabID)

Non-acute Care Hospitals

* Central line-associated bloodstream infections (CLABSI) in intensive care units and wards
* Catheter-associated urinary tract infections (CAUTI) in intensive care units and wards
* Specific facility-wide laboratory identified events (LabID)

Dialysis Facilities

* Positive blood cultures
* IV antimicrobial starts
* Pus, redness or increased swelling at vascular access site

*National baseline data for each measure are based on a statistical risk model derived from national data*

*^ All data were extracted from NHSN on August 21, 2024*

Slide 4

Measures

Standardized Infection Ratio (SIR) = The actual number of infections divided by the predicted number oof infections.

Standard Utilization Ratio (SUR) = The number of device days divided by the predicted number of device days.

If the SIR/SUR > 1.0, more infections/device days were reported than predicted

If the SIR/SUR = 1.0, the number of infections/number of device days is equal to the predicted number

If the SIR/SUR < 1.0, fewer infections/device days were reported than predicted

Slide 5

How to Interpret SIRs/SURs and 95% Confidence Intervals (CIs)

The green horizontal bar represents the SIR/SUR, and the blue vertical bar represents the 95% confidence interval (CI). The 95% CI measures the probability that the true SIR/SUR falls between the two parameters.

* If the blue vertical bar crosses 1.0 (highlighted in orange), then the actual rate is not statistically significantly different from the predicted rate.
* If the blue vertical bar is completely above or below 1.0, then the actual is statistically significantly different from the predicted rate.

Slide 6

2023 Central Line-Associated Bloodstream Infections (CLABSI):  
Standard Infection Ratio in Adult and Pediatric ICUs and Wards

2023 Key Findings

Five unit types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were no unit types that experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

Slide 7

2023 Central Line: Standard Utilization Ratio   
in Adult and Pediatric ICUs and Wards

2023 Key Findings

Thirteen unit types experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data.

Five unit types experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data.

Slide 8

CLABSI Acute Care Hospital Adult and Pediatric Pathogens for 2022 and 2023

ICU Pathogens

Calendar year 2022: ICU pathogens n = 198. *Staphylococcus aureus* (not MRSA), 5%; Methicillin resistant *staphylococcus aureus*, 1%; Coagulase negative *staphylococcus*, 12%; *Enterococcus* sp., 23%; Gram positive bacteria (other), 3%; Gram-negative bacteria 22%; *Candida albicans*, 11%; Yeast fungus (other), 14%; Multiple organisms, 10%;

Calendar year 2023: ICU pathogens n = 168. *Staphylococcus aureus* (not MRSA), 4%; Methicillin resistant *staphylococcus aureus*, 3%; Coagulase negative *staphylococcus*, 21%; *Enterococcus* sp., 17%; Gram positive bacteria (other), 4%; Gram-negative bacteria 16%; *Candida albicans*, 15%; Yeast fungus (other), 12%; Multiple organisms, 8%;

Ward Pathogens

Calendar year 2022: Ward pathogens n = 180. *Staphylococcus aureus* (not MRSA), 17%; Methicillin resistant *staphylococcus aureus*, 7%; Coagulase negative *staphylococcus*, 11%; *Enterococcus* sp., 13%; Gram positive bacteria (other), 1%; Gram-negative bacteria 23%; *Candida albicans*, 8%; Yeast fungus (other), 8%; Multiple organisms, 12%;

Calendar year 2023: Ward pathogens n = 170. *Staphylococcus aureus* (not MRSA), 12%; Methicillin resistant *staphylococcus aureus*, 5%; Coagulase negative *staphylococcus*, 12%; *Enterococcus* sp., 14%; Gram positive bacteria (other), 5%; Gram-negative bacteria 31%; *Candida albicans*, 2%; Yeast fungus (other), 5%; Multiple organisms, 15%;

Slide 9

2023 Central Line-Associated Bloodstream Infections (CLABSI):  
Neonatal ICUs by Birth Weight Category

2023 Key Findings

There were 12 CLABSIs reported in Neonatal ICUs.

There were no birthweight categories experiencing a significantly higher or lower number of infections than predicted, based on 2015

national aggregate data.

Four birthweight categories experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data.

Slide 10

CLABSI NICU Pathogens for 2022 and 2023

Calendar year 2022; n=17; *Staphylococcus aureus* (not MRSA), 23%; Coagulase-negative *Staphylococcus*, 23%; *Escherichia coli*, 18%; Gram-negative bacteria (other), 18%; Candida and other yeast/fungus, 6%; Multiple organisms, 12%

Calendar year 2023; n=12; *Staphylococcus aureus* (not MRSA), 25%; Coagulase-negative *Staphylococcus*, 9%; *Enterococcus* sp., 25%; *Escherichia coli*, 8%; Gram-negative bacteria (other), 8%; Candida and other yeast/fungus, 17%; Multiple organisms, 8%

Slide 11

2023 Catheter-Associated Urinary Tract Infections (CAUTI):  
Standard Infection Ratio in Adult and Pediatric ICUs and Wards

2023 Key Findings

Eight unit types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were no unit types that experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

Slide 12

2023 Catheter: Standard Utilization Ratio   
in Adult and Pediatric ICUs and Wards

2023 Key Findings

Fourteen unit types experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data.

Four unit types experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data.

Slide 13

CAUTI Acute Care Hospital Adult and Pediatric Pathogens for 2022 and 2023

ICU Pathogens

Calendar year 2022: ICU pathogens n = 200. Coagulase-negative *Staphylococcus*, 1%; *Enterococcus* sp., 13%; Gram positive bacteria (other), 2%; *Escherichia coli*, 35%; *Pseudomonas aeruginosa*, 16%; *Klebsiella pneumoniae*, 11%; Gram-negative bacteria 17%; Multiple organisms, 7%;

Calendar year 2023: ICU pathogens n = 149. Coagulase-negative *Staphylococcus*, 2%; *Enterococcus* sp., 11%; Gram positive bacteria (other), 3%; *Escherichia coli*, 34%; *Pseudomonas aeruginosa*, 9%; *Klebsiella pneumoniae*, 12%; Gram-negative bacteria 15%; Multiple organisms, 14%;

Ward Pathogens

Calendar year 2022: Ward pathogens n = 269. Coagulase-negative *Staphylococcus*, 2%; *Enterococcus* sp., 7%; Gram positive bacteria (other), 2%; *Escherichia coli*, 30%; *Pseudomonas aeruginosa*, 13%; *Klebsiella pneumoniae*, 11%; Gram-negative bacteria 18%; Multiple organisms, 16%;

Calendar year 2023: Ward pathogens n = 220. Coagulase-negative *Staphylococcus*, 2%; *Enterococcus* sp., 16%; Gram positive bacteria (other), 3%; *Escherichia coli*, 24%; *Pseudomonas aeruginosa*, 11%; *Klebsiella pneumoniae*, 10%; Gram-negative bacteria 21%; Multiple organisms, 12%;

Slide 14S

Acute Care Hospital Surgical Site Infections (SSI)  
Coronary Artery Bypass Graft (CABG) SIR and Colon Procedure (COLO) SIR

Key Findings

In 2023, MA acute care hospitals performing coronary artery bypass graft (CABG) surgeries experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 43 CABG SSIs reported in 2023.

There were 201 COLO SSIs reported in 2023.

Slide 15

Acute Care Hospital Surgical Site Infections (SSI)  
Knee Prosthesis (KPRO) SIR and Hip Prosthesis (HPRO) SIR

Key Findings

In 2023, MA acute care hospitals performing knee (KPRO) prosthesis procedures experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 53 KPRO SSIs reported in 2023.

There were 79 HPRO SSIs reported in 2023.

Slide 16

Acute Care Hospital Surgical Site Infections (SSI)  
Abdominal Hysterectomy (HYST) SIR and Vaginal Hysterectomy (VHYS) SIR

Key Findings

In 2023, MA acute care hospitals performing vaginal hysterectomy (VHYS) procedures experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 32 HYST SSIs reported in 2023.

There was 7 VHYS SSI reported in 2023.

Slide 17

Acute Care Hospital SSI Pathogens for 2022-2023  
CABG, KPRO, HPRO, HYST, VHYS, COLO

Calendar year 2022 January 1, 2022- December 31, 2022 n=360; *Staphylococcus aureus* (not MRSA), 13%; Methicillin-resistant *Staphylococcus*, 4%; Coagulase negative *staphylococcus*, 5%; *Enterococcus* sp., 4%; Gram-positive bacteria (other) 7%; *Escherichia coli*, 7%; *Pseudomonas aeruginosa*, 1%; *Klebsiella pnuemoniae*, 0.28%; Gram-negative bacteria (other), 5%; Candida and other yeast/fungus, 3%; Multiple organisms, 33%; No organism identified, 18%

Calendar year 2023 January 1, 2023- December 31, 2023 n=415; *Staphylococcus aureus* (not MRSA), 12%; Methicillin-resistant *Staphylococcus*, 3%; Coagulase negative *staphylococcus*, 5%; *Enterococcus* sp., 6%; Gram-positive bacteria (other) 6%; *Escherichia coli*, 5%; *Pseudomonas aeruginosa*, 2%; *Klebsiella pnuemoniae*, 1%; Gram-negative bacteria (other), 10%; Candida and other yeast/fungus, 2%; Multiple organisms, 28%; No organism identified, 20%; Other, 0.24%

Slide 18

Acute Care Hospital Laboratory Identified Events (LabID)  
*Clostridioides difficile* (CDI) SIR and *Methicillin-resistant Staphylococcus aureus* (MRSA) SIR

Key Findings

For the past seven years, MA hospitals reporting CDI and MRSA events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were 1,251 CDI events reported in 2023.

There were 192 MRSA events reported in 2023.

Slide 19

Long-Term Acute Care Hospitals (LTAC) and Inpatient Rehabilitation Facilities (IRF)  
2023 Central Line-Associated Bloodstream Infections (CLABSI) and Catheter-Associated Urinary Tract   
Infections (CAUTI): Standard Infection Ratio (SIR)

Key Findings

In 2023, LTACs experienced a significantly lower number of catheter-associated urinary tract infections (CAUTI) than predicted, based on 2015 national aggregate data.

Slide 20

Long-Term Acute Care Hospitals (LTAC) and Inpatient Rehabilitation Facilities (IRF)  
2023 Central Line and Catheter: Standard Utilization Ratio (SUR)

Key Findings

In 2023, LTACs and IRFs experienced a significantly lower number of central line days than predicted, based on 2015 national aggregate data.

In 2023, LTACs experienced a significantly lower number of urinary catheter days and IRFs experienced a significantly higher number of urinary catheter days than predicted, based on 2015 national aggregate data.

Slide 21

Long-Term Acute Care Hospitals (LTAC) and Inpatient Rehabilitation Facilities (IRF)  
2023 *Clostridioides difficile* (CDI) SIR and *Methicillin-resistant Staphylococcus aureus* (MRSA) SIR

Key Findings

In 2023, LTACs and IRFs experienced a significantly lower number of CDI infections than predicted, based on 2015 national aggregate data.

In 2023, LTACs experienced a significantly lower number of MRSA infections than predicted, based on 2015 national aggregate data.

Slide 22

Dialysis Center Bloodstream Infections (BSI):  
Standard Infection Ratio by Access Type

Key Findings

For the past four years, all hemodialysis access types (central venous catheters (CVC), arteriovenous fistulas and arteriovenous grafts) experienced a significantly lower number of infections than predicted, based on 2014 national aggregate data.

Slide 23

Dialysis Antimicrobial Start Rates by Year and Access Type  
2017-2023

Key Findings

Antimicrobial and vancomycin start rates are highest in those with any kind of central venous catheter.

Slide 24

DPH HAI Prevention and Response Activities

* Comprehensive proactive and responsive on-site Infection Control Assessment and Response (ICAR) visits are conducted at a variety of healthcare facilities.  During these visits, an epidemiologist and public health nurse:
  + Discuss facility infection prevention and control (IPC) policies and practices.
  + Observe hand hygiene, PPE use, environmental cleaning and disinfection, wound care, point of care, blood glucose testing, and vaccine storage, and provide feedback and coaching to the facility staff.
  + Provide a comprehensive report to facility leadership with resources and recommendations for improvement.
  + Glo Germ kits are distributed for teaching hand hygiene and environmental cleaning and disinfection.
  + *NEW* IPC priority checklist for facility leadership and a staff IPC Bingo Card were developed and co-branded by CDC.
* Conducted webinars for nursing home staff on topics such as:
  + IPC in Wound Care: A Guide for the Clinician
  + IPC in Skilled Nursing Facilities
  + Enhanced Barrier Precautions for Skilled Nursing Facilities
  + Respiratory Viral Illness

Slide 25

DPH HAI Prevention and Response Activities (Cont.)

* Promote CDC’s National Training Collaborative, Project Firstline, and develop MA-specific infection control training content and learning programs for frontline healthcare workers.
* Conducted three in-person simulation trainings for dialysis nurses, technicians and infection preventionists on CDC's dialysis evidence-based best practice recommendations.
  + Program content and materials shared with multiple state health departments to promote dialysis training nationwide.
* *NEW* Developed public-facing interactive maps for dialysis and non-acute hospital HAI data.

Slide 26

Antibiotic Resistance:   
Targeting Carbapenemase-producing Organisms (CPO) in MA

* Carbapenems are a class of antibiotics often considered a “last resort” to treat infections caused by Enterobacterales, *Pseudomonas*, and *Acinetobacter*
* One way these organisms are resistant to carbapenems is by   
  producing carbapenemases
* A carbapenemase is an enzyme that can break down (and thus resist)   
  many classes of antibiotics, including carbapenems, making infections   
  with these organisms harder to treat
* Genes that program the organism to produce a carbapenemase   
  can be shared between bacteria
* Carbapenemase gene targets: KPC, NDM, VIM, OXA and IMP

Slide 27

Antibiotic Resistance Surveillance:   
Reporting and Laboratory Testing Methods

* Electronic laboratory reporting (ELR) of multidrug-resistant organisms (MDROs) of concern into the Massachusetts Virtual Epidemiologic Network (MAVEN) is mandatory for clinical laboratories
* Mandatory submission of selected MDRO isolates to the Massachusetts State Public Health Laboratory (MA SPHL) for advanced testing at MA SPHL and at our regional Antimicrobial Resistant Laboratory Network (ARLN), the Wadsworth Center in New York:
  + Identify novel resistance mechanisms such as genes that code for carbapenemase production or   
    colistin resistance
  + Identify *Candida auris*
  + Test swabs to identify colonization with target organisms to detect transmission within a healthcare facility
  + Conduct whole-genome sequencing to determine relatedness of organisms to identify transmission pathways within and across healthcare facilities

Slide 28

Antibiotic Resistance Surveillance: Candida auris and

Carbapenemase-producing Organism (CPO) Cases in MA

Slide 29

Antibiotic Resistance Surveillance:  
Carbapenemase-producing Organisms (CPOs) in MA

Slide 30

Antibiotic Stewardship

* Studies indicate that about 30% of all antibiotics prescribed in hospitals and between 40-75% of antibiotics prescribed in nursing homes are unnecessary\*
* Improved prescribing ractices can help reduce rates of *Clostridioides difficile* and antibiotic resistance
* Appropriate antibiotic prescribing can improve patient outcomes and reduce healthcare costs

[\*Core Elements of Hospital Antibiotic Stewardship Programs | Antibiotic Prescribing and Use | CDC](https://www.cdc.gov/antibiotic-use/hcp/core-elements/hospital.html)

[Core Elements of Antibiotic Stewardship for Nursing Homes | Antibiotic Prescribing and Use | CDC](https://www.cdc.gov/antibiotic-use/hcp/core-elements/nursing-homes-antibiotic-stewardship.html)

Slide 31

Antibiotic Stewardship: Prevention and Educational Activities

* From July 2023-June 2024, DPH was a host health department to one of four [IDSA/SHEA Leadership in Epidemiology, Antimicrobial Stewardship, and Public Health Fellows](https://www.idsociety.org/professional-development/fellows-in-training-career--education-center/leap-fellowship/leap-fellows/).
  + In addition to collaborating with the health department, Dr. Kap Sum Foong of Tufts Medical Center piloted a program to remove unnecessary antibiotic allergy labels in long term care facilities.
* Continued collection and analysis of facility-level antibiotic use data voluntarily submitted by long-term care facilities.
  + 86 facilities reported at least one month of data in 2023, on average 59 facilities reported each month.
  + Updated AS Honor Roll highlighting facilities with consistent participation: <https://infectioncontrolma.org/antibiotic-stewardship-long-term-care-honor-roll.php>

Slide 32

Antibiotic Stewardship: Prevention and Educational Activities Continued

* Ongoing collaboration with antibiotic stewardship (AS) experts from Tufts Medical Center to enhance AS support and activities in long-term care facilities, including monthly office hours.
* Re-established the Antimicrobial Use (AU) Subcommittee of the statewide HAI/AR Technical Advisory Group to provide guidance on how to best leverage NHSN AU module data for understanding trends in antibiotic use, monitoring stewardship activities, and obtaining a comprehensive, statewide picture of antibiotic use in the acute care setting.
  + Currently, DPH has access to NHSN AU data for 47 acute care hospitals.
  + Hospitals participating in the CMS Promoting Interoperability (PI) Program must begin reporting AUR Surveillance data in calendar year 2024.

Slide 33

Thank you for the opportunity to present this information today.

Please direct any questions to:

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