**Slide 1**

Healthcare Associated Infections in 2017  
Acute Care Hospitals

Christina Brandeburg, MPH

Epidemiologist

Bureau of Infectious Disease and Laboratory Sciences

Katherine Fillo, Ph.D, RN-BC

Director of Clinical Quality Improvement

Bureau of Health Care Safety and Quality

Eileen McHale, RN, BSN

Healthcare Associated Infection Coordinator

Bureau of Health Care Safety and Quality

Public Health Council

July 11, 2018

**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 25 hospitalized patients, accounting for an estimated 722,000 infections and an associated 75,000 deaths during hospitalization.\*

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.

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)

DPH implements this responsibility in hospitals through the hospital licensing regulation. (105 CMR 130.000)

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)

Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care-associated infections.

**Slide 3**

Introduction

This HAI presentation is the ninth annual Public Health Council update:

It is an important component of larger efforts to reduce preventable infections in health care settings;

It presents an analysis of progress on infection prevention within Massachusetts acute care hospitals; and

It is based upon work supported by state funds and the Centers for Disease Control and Prevention (CDC).

It provides an overview of antibiotic resistance and stewardship activities.

**Slide 4**

Methods

This data summary includes the following statewide measures for the 2017 calendar year (January 1, 2017 – December 31, 2017) as reported to the CDC’s National Healthcare Safety Network (NHSN).

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

Central line associated bloodstream infections (CLABSI) in intensive care units

Catheter associated urinary tract infections (CAUTI) in intensive care units

Specific surgical site infections (SSI); and

Specific facility wide laboratory identified events (LabID)

\*National baseline data for each measure are based on a statistical risk model derived from 2015 national data.

\*All data were extracted from NHSN on June 11th, 2018.

**Slide 5**

Measures

The Standardized Infection Ratio (SIR) is calculated by dividing the actual number of infections by the predicted number of infections.

Central Line Utilization Ratio is calculated by dividing the number of central line days buy the number of patient days.

Urinary Catheter Utilization ratio is calculated by dividing the number of urinary catheter days by the number of patient days

**Slide 6**

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

What is an SIR?

The standardized infection ratio (SIR) is a summary measure used to track HAIs over time. It compares actual HAI rates in a facility or state with baseline rates derived from aggregate data from NHSN. The CDC adjusts the SIR for risk factors that are most associated with differences in infection rates. In other words, the SIR takes into account that different healthcare facilities treat patients with differences in disease type and severity.

**Slide 7**Massachusetts Central Line-Associated Bloodstream Infection (CLABSI) SIR, by ICU Type   
*January 1, 2017-December 31, 2017* Key Findings:

Three ICU types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data: Medical (T), Medical /Surgical (T), Surgical

One ICU type experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data: Burn) SIR, by ICU Type

**Slide 8**

CLABSI Adult & Pediatric ICU Pathogens for 2016 and 2017

**January 1, 2016-December 31, 2016**

Jan 1st- Dec 31st, 2016 n =176. gram-negative bacteria 17% ; multiple organisms, 11%; Candida albicans, 10%; yeast/fungus (other), 11%; staphylococcus aureus (not MRSA), 7%; Methicillin resistant staphylococcus aureus, 5%; coagulase negative staphylococcus, 17%; Enterococcus sp., 16%; gram-positive bacteria (other), 6%.

Jan 1st- Dec 31st, 2017 n =165. gram-negative bacteria 24% ; multiple organisms, 10%; Candida albicans, 12%; yeast/fungus (other), 14%; staphylococcus aureus (not MRSA), 8%; Methicillin resistant staphylococcus aureus, 2%; coagulase negative staphylococcus, 16%; Enterococcus sp., 9%; gram-positive bacteria (other), 5%.

**Slide 9**

Massachusetts Central Line-Associated Bloodstream Infection (CLABSI) SIR, by Massachusetts CLABSI SIR in NICUs, by Birth Weight Category *January 1, 2017-December 31, 2017.*

Key Findings:

Infants weighing 1001 grams-1500 grams at birth experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 20 CLABSIs reported in this ICU type.

**Slide 10**

CLABSI NICU Pathogens for 2016 and 2017

January 1, 2016– December 31, 2016 n=28; Gram-negative bacteria (other) 18%; multiple organisms, 7%; Staphylococcus aureus not MRSA, 39%; Methicillin-resistant Staphylococcus aureus (MRSA) 4%; Coagulase negative staphylococcus, 14%; E.Coli 18%

January 1, 2017– December 31, 2017 *n=20;* Gram-negative bacteria (other) 10%; multiple organisms 10%; Staphylococcus aureus not MRSA, 40%; enterococcus sp., 5 ;Coagulase negative staphylococcus, 25%; E.coli, 5%.

**Slide 11**

State CLABSI SIR

Key Findings

For the past three years, adult ICUs experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

Over the past three years, neonatal ICUs have seen a decrease in the number of infections.

**Slide 12**

State Central Line (CL) Utilization Ratios

Key Findings

Discontinuing unnecessary central lines can reduce the risk for infection.

Central line (CL) utilization has remained relatively unchanged between 2015 and 2017.

\*The CL utilization ratio is calculated by dividing the number of CL days by the number of patient days.

**Slide 13** Massachusetts Catheter-Associated Urinary Tract infection (CAUTI) SIR, by ICU Type

January 1, 2017-December 31, 2017  
Key Findings

Two ICU types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data: Medical /Surgical (T) and Trauma.

One ICU type experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data: Neurosurgical

**Slide 14S**

CAUTI Adult & Pediatric ICU Pathogens for 2016 and 2017

Calendar Year 2016 January 1, 2016 – December 31, 2016 n=290

Escherichia coli 35%; Pseudomonas aeruginosa, 13%; Klebsiella pneumoniae, 12%; Coagulase- negative Staphylococcus, 2%; Enterococcus sp.,8%; Gram-positive bacteria (other), 8%; Gram-negative other, 14%; multiple organisms, 6%, Staphylococcus aureus not MRSA), 2%.

Calendar Year 2017 January 1, 2017 – December 31, 2017 n=305

Escherichia coli 34%; Pseudomonas aeruginosa, 12%; Klebsiella pneumoniae, 10%; Coagulase- negative Staphylococcus, 3%; Enterococcus sp.,10%; Gram-positive bacteria (other), 8%; Gram-negative other, 13%; multiple organisms, 8%; Staphylococcus aureus not MRSA), 2%.

**Slide 15**

State CAUTI SIR

Key Findings

Over the past three years, pediatric ICUs have seen an increase in the number of infections but are no different than predicted, based on 2015 national aggregate data.

There were 13 CAUTIs reported by 10 pediatric ICUs.

**Slide 16**

State Urinary Catheter Utilization Ratios

Key Findings

Discontinuing unnecessary urinary catheters can reduce the risk for infection.

Urinary catheter utilization in adult and pediatric ICUs has remained relatively unchanged between 2015 and 2017.

\*The urinary catheter utilization ratio is calculated by dividing the number of catheter days by the number of patient days**.**

**Slide 17**

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

Key Findings

For the past three years, MA acute care hospitals performing coronary artery bypass graft procedures (CABG) and colon procedures (COLO) experienced the same number of infections as predicted, based on 2015 national aggregate data.

There were 33 CABG SSIs reported in 2017. There were 173 COLO SSIs reported in 2017

**Slide 18**

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

Key Findings

In 2017, Massachusetts acute care hospitals performing knee prosthesis procedures (KPRO) and hip prosthesis procedures (HPRO) experienced the same number of infections as predicted, based on 2015 national aggregate data.

There were 69 KPRO SSIs and 76 HPRO SSIs reported in 2017**.**

**Slide 19**

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

Key Findings

In 2017, Massachusetts acute care hospitals performing abdominal hysterectomy (HYST) and vaginal hysterectomy (VHYS) procedures experienced the same number of infections as predicted based on 2015 national aggregate data.

There were 47 HYST SSIs and 10 VHYS SSIs reported in 2017.

**Slide 20**

SSI Pathogens for 2016-2017 CABG, KPRO, HPRO, HYST, VHYS, COLO

January 1, 2016– December 31, 2016 n=409;

Staphylococcus aureus not MRSA, 14% ; Methicillin-resistant Staphylococcus aureus (MRSA) 8%; coagulase negative staphylococcus, 4%; gram-positive bacteria (other) 11%; Gram-negative bacteria 15%; multiple organisms, 28%; other, 3%; no organism identified, 17%.

January 1, 2017– December 31, 2017 n=408;

Staphylococcus aureus not MRSA, 11% ; Methicillin-resistant Staphylococcus aureus (MRSA) 5%; coagulase negative staphylococcus, 6%; gram-positive bacteria (other) 11%; Gram-negative bacteria (other) 20%; multiple organisms, 29%; other, 1%; no organism identified, 17%.

**Slide 21**

Statewide SSI Trends by Year 2015-2017

**Slide 22**

Summary of SSI Results

KPRO, HYST, VHYS, CABG HPRO COLO: Same as predicted

**Slide 23**

Laboratory Identified Events (LabID): Clostridium difficile (CDI) SIR

Key Findings

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

There were 2,186 CDI events reported in 2017.

**Slide 24**

Laboratory Identified Events (LabID): Methicillin-resistant Staphylococcus aureus (MRSA) SIR

Key Findings

For the past three years, Massachusetts acute care hospitals reporting MRSA events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were 150 MRSA events reported in 2017.

**Slide 25**

Statewide LabID Trends by Year 2015-2016

**Slide 26**

Summary of LabID Results

CDI and MRSA Lab ID Events: Significantly lower than predicted.

**Slide 27**

HAI Prevention Activities

External data validation of Clostridium difficile infections conducted at 20 acute care hospitals and 10 long-term care facilities in the fall of 2017 and spring of 2018. DPH plans to conduct data validation of specific NHSN measures to ensure completeness and accuracy of reported data.

Continued enrollment of long-term care facilities into NHSN for Clostridium difficile infection reporting.

Ongoing data sharing with the Neonatal Quality Improvement Collaborative (NeoQIC) to address opportunities for improvement.

Five hemodialysis infection prevention simulation trainings were held for hemodialysis nurses and technicians.

On-site Infection Control Assessment and Response (ICAR) visits expanding from nursing homes to long-term acute care facilities.

DPH monitors progress by providing quarterly Data Cleaning Reports and Targeted Assessment for Prevention (TAP) Reports for all hospitals to identify areas where focused infection prevention efforts are needed.

Outreach to hospitals with higher than expected SIRs to ensure the need for improvement has been addressed.

**Slide 28**

Antibiotic Resistance: Scope and Significance of the Issue

Antibiotic or antimicrobial resistance occurs when organisms are able to resist the effects of drugs. Bacteria are not killed by the antibiotic and continue to grow.

Some individuals may be at a greater risk for acquiring a drug resistant infection (individuals with co-morbidities, previous hospitalizations, antibiotic exposures, etc.). However, drug-resistant infections can affect anyone.

Infections with resistant organisms can be difficult to treat, are expensive and can have adverse effects.

Inevitably, bacteria are able to adapt to newly developed antibiotics and become resistant.

It is imperative to respond aggressively to prevent resistance and prevent the spread of existing resistant bacteria.

**Slide 29**

Antibiotic Resistance: Multi-Drug Resistant Organisms (MDROs) in Massachusetts by Organism

MDRO TYPE: 2016 Enterobacter cloacae, n=2; Klebsiella oxytoca and pneumoniae, n=15; Escherichia coli, n=5; Enterobacter aerogenes, n=8; Candida auris, n=0; Total= 50.

2017: Enterobacter cloacae, n=88; Klebsiella oxytoca and pneumoniae, n=78; Escherichia coli, n=3; Enterobacter aerogenes, n=17; Candida auris, n=7; Total= 222.

2018: enterobacter cloacae, n=71; Klebsiella oxytoca and pneumoniae, n=33; Escherichia coli, n=40; Enterobacter aerogenes, n=5; Candida auris, n=0; other =1. Total= 150.

\*Data are current as of June 30, 2018 and are subject to change

**Slide 30**

Antibiotic Resistance: MDROs in Massachusetts   
Candida auris Example

Confirmed 2017 n=2017; 2018, n=0;

Contact 2017 n=75; 2018, n=10.

Suspect 2017 n=0; 2018, n= 1.

DPH provides epidemiologic investigation support and guidance when specific MDROs are suspected to mitigate any exposure.

Activities include: Provide detailed infection control recommendations; Recommend retrospective and prospective laboratory surveillance; Coordinates colonization screening of close contacts in collaboration with regional laboratory**.**

**Slide 31**

Antibiotic Stewardship: What is it?

Studies indicate that between 30-50% of antibiotics prescribed in hospitals and between 40-75% of antibiotics prescribed in nursing homes is unnecessary\*.

Improved prescribing practices can help reduce rates of Clostridium difficile and antibiotic resistance. Appropriate antibiotic prescribing can improve patient outcomes and reduce healthcare costs.

[**https://www.cdc.gov/antibiotic-use/healthcare/**](https://www.cdc.gov/antibiotic-use/healthcare/)

[**https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html**](https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html)

**Slide 32**

Antibiotic Resistance and Antibiotic Stewardship: MDPH Reporting and Laboratory Testing

Electronic laboratory reporting (ELR) of mandatory MDROs of concern into the Massachusetts Virtual Epidemiologic Network (MAVEN).

Mandatory submission of MDRO isolates to the Massachusetts State Public Health Laboratory

for advanced testing; Identify novel resistance mechanisms; Identify Candida auris.

**Slide 33**

Antibiotic Resistance and Antibiotic Stewardship: Prevention and Educational Activities

NEW - Nine part webinar series for long-term care and long-term acute care facilities, “Navigating Infection Control and Antibiotic Stewardship in Long-term Care” with three “ask the experts” calls.

NEW - Collection, monitoring and reporting of facility-level antibiotic use data in long-term care facilities (n=45).

NEW - “Bug of the Month” webinar series targeting MDROs of concern for all facility types.

Publication of annual statewide antibiogram.

Provides bug-drug combinations of interest for benchmarking purposes (https://www.mass.gov/service-details/massachusetts-antibiograms)

Engagement with subject matter experts and stakeholders during quarterly statewide HAI/AR Technical Advisory Group (TAG) meetings.

**Slide 34**

Antibiotic Resistance and Antibiotic Stewardship: Antibiograms

Graph describing Statewide Staphylococcus aureus Susceptibility Rates – 2017

**Slide 35**

Antibiotic Resistance and Antibiotic Stewardship:   
Next Steps

Awarded competitive funding from the Council of State and Territorial Epidemiologists (CSTE) to modify the infection control assessment and response (ICAR) tool for use in long-term acute care hospitals (LTACHs) and to conduct enhanced education for managing and containing MDROs.

Plan to collect and analyze NHSN antibiotic use (AU) data from a sample of acute care facilities to better understand trends in antibiotic use and monitor stewardship activities.

Support and collaborate with two national Leadership in Epidemiology, Antimicrobial Stewardship and Public Health (LEAP) fellows, selected to improve the utility of the statewide antibiogram data and to enhance AS activities in long-term care facilities.

Engage additional infection preventionists in use of MAVEN system for ease in response and containment of MDROs.

**Slide 36**

Contact Information

Thank you for the opportunity to present this information today.

Please direct any questions to: Eileen McHale, RN, BSN, Healthcare Associated Infection Coordinator, Bureau of Health Care Safety and Quality, [Eileen.mchale@state.ma.us](mailto:Eileen.mchale@state.ma.us)