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2020 Health Care Associated Infections:  
Acute Care Hospitals

Public Health Council

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**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](http://www.mass.gov/eohhs/docs/dph/regs/105cmr130.pdf))
  + 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.

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**Purpose**

This HAI presentation is the 12th 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
* 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
* It considers the impact of COVID-19 on Massachusetts acute care hospitals

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**Methods**

This data summary includes the following statewide measures for the 2020 calendar year (January 1, 2020 – December 31, 2020) 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.

* 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)

\* 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 August 9, 2021

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**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.

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

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

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

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**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.

The **green** horizontal bar represents the SIR, and the **blue** vertical bar represents the 95% confidence interval (CI). The 95% CI measures the probability that the true SIR 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.

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

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

\*SIRs and CIs are currently not calculated when the number of predicted infections is less than 0.5.

, by ICU Type

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**CLABSI: Standard Utilization Ratio in Adult and Pediatric ICUs and Wards**

Key Findings:

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

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**CLABSI Adult & Pediatric Pathogens for 2019 and 2020**Calendar Years 2019 and 2020 are depicted in a chart comparing ICU and Ward Pathogens.

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**CLABSI: Standard Infection Ratio in Neonatal ICUs**

Key Findings

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

There were 15 CLABSIs reported in Neonatal ICUs in 2020.

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**CLABSI:** **Standard Utilization Ratio in Neonatal ICUs**

Key Findings

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

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**CLABSI NICU Pathogens for 2019 and 2020**Two circle graphs comparing pathogens between calendar year 2019 and calendar year 2020.

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State CLABSI SIR in ICU and Wards**Key Findings

In 2020, adult ICUs experienced the same number of infections as predicted, based on 2015 national aggregate data.

Between 2015-2020, adult Wards experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

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State CLABSI SUR in ICU and Wards**Key Findings

In 2020 adult ICU’s, experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data.

Between 2015-2020, pediatric Wards experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data

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

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

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**CAUTI: Standard Utilization Ratio in Adult and Pediatric ICUs and Wards**Key Findings

Seven unit types experienced a significantly lower number of device days

than predicted, based on 2015 national aggregate data.

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**CAUTI Adult & Pediatric Pathogens for 2019 and 2020**

Calendar Years 2019 and 2020 are depicted in a chart comparing ICU and Ward Pathogens.

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**State CAUTI SIR in ICU and Wards**

Key Findings

In 2020, adult and pediatric ICUs experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

In 2020, adult and pediatric wards experienced the same number of infections than predicted, based on 2015 national aggregate data.

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**State CAUTI SUR in ICU and Wards**Key Findings

In 2020, adult and pediatric ICUs experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data.

For the past six years, adult Wards experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data.

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

In 2020, MA acute care hospitals performing colon surgeries (COLO) experienced a lower number of infections than predicted, based on 2015 national aggregate data.

There were 25 CABG SSIs reported in 2020.

There were 161 COLO SSIs reported in 2020.

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

Key Findings

For the past three years, Massachusetts acute care hospitals performing knee prosthesis procedures (KPRO) experienced significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 54 KPRO SSIs reported in 2020.

There were 52 HPRO SSIs reported in 2020.

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

Key Findings

In 2020, Massachusetts acute care hospitals performing abdominal hysterectomy (HYST) procedures experienced significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 46 HYST SSIs reported in 2020.

There were 5 VHYS SSIs reported in 2020.

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**SSI Pathogens for 2019-2020***CABG, KPRO, HPRO, HYST, VHYS, COLO*

Two circle graphs comparing pathogens between calendar year 2019 and calendar year 2020.

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**Statewide SSI Trends by Year  
2015-2020**

A line graph comparing Statistically Higher/Same/Lower than Predicted SSI between 2015-2020.

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**Laboratory Identified Events (LabID)  
*Clostridioides difficile (CDI) SIR***

Key Findings

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

There were 1,400 CDI events reported in 2020.

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

Key Findings

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

There were 189 MRSA events reported in 2020.

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**Statewide LabID Trends by Year**2015-2019

A line graph comparing Statistically Higher/Same/Lower than Predicted LabID between 2015-2020.

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**DPH HAI COVID-19 Activities**

* DPH Epidemiologists are assigned to each long-term care facility with a COVID-positive resident and/or healthcare personnel to effectively manage outbreak responses and control measures.
* Epidemiologists are also assigned to COVID-19 clusters in other high risk patient settings including hospitals, assisted living residences, dialysis centers, inpatient psychiatric units, substance use disorder facilities, prisons, jails and homeless shelters.
* Comprehensive on-site Infection Control Assessment and Response (ICAR) visits are conducted at licensed nursing homes. During these visits an epidemiologist and public health nurse:
  + Discuss facility infection prevention and control policies and practices;
  + Observe of screening areas, hand hygiene, PPE use, environmental cleaning, breakrooms, testing, vaccine storage, and designated COVID-19 care areas; and
  + Provide feedback and coaching to the facility staff.
* Daily statewide long-term care facility and weekly facility-level case counts were published on the COVID-19 Interactive Data Dashboard. Internal review of healthcare associated COVID-19 data collected through DPH’s surveillance system continues to be monitored routinely.
* Weekly analysis of nursing home data submitted to the LTCF COVID-19 Module in NHSN to monitor trends over time and to identify facilities with staffing or PPE shortages and those with lower resident and/or staff vaccination rates.
* Promote CDC’s National Training Collaborative, Project Firstline, and develop MA-specific infection control training content and learning programs for frontline healthcare workers in partnership with the Population Health Exchange (PHX) at Boston University.

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Antibiotic Resistance: Urgent Threats in MA  
CDC 2019 AR Threats Report**

**More than 2.8 million antibiotic-resistant infections occur in the U.S. each year, and more than 35,000 people die** as a result.

Dedicated prevention and infection control efforts are working to reduce the number of infections and deaths caused by antibiotic-resistant germs, but the number of people facing antibiotic resistance is still too high.

* **Urgent threats targeted in MA through surveillance, detection**

**and containment**

* + **Carbapenem-resistant *Acinetobacter***
  + *Candida auris*
  + *Clostridioides difficile*
  + **Carbapenem-resistant *Enterobacterales***

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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 carbapanemase 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

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Antibiotic Resistance Surveillance:   
Reporting and Laboratory Testing**

* Electronic laboratory reporting (ELR) of mandatory MDROs of concern into the Massachusetts Virtual Epidemiologic Network (MAVEN)
* Mandatory submission of selected MDRO isolates to the Massachusetts State Public Health Laboratory (MA SPHL) for advanced testing here and at our partner ARLN laboratory, 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

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Antibiotic Resistance Surveillance:  
Carbapenemase-producing Organisms (CPOs) in MA**A bar graph depicting Carbapenemase Gene Targets identified in Massachusetts between 2017 – 2020.

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Antibiotic Stewardship**

* Studies indicate that between 30-50% of antibiotics prescribed in hospitals and between 40-75% of antibiotics prescribed in nursing homes are unnecessary\*
* Improved prescribing practices can help reduce rates of *Clostridioides 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/longtermcare/prevention/antibiotic-stewardship.html>

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Antibiotic Stewardship: Prevention and Educational Activities**

* ***NEW****: 34* acute care hospitals participating in NHSN antibiotic use (AU) module to better understand  
  trends in antibiotic use and to monitor stewardship activities- will soon have access to antibiotic prescribing data for 50% of all acute-care facilities in MA
* Collection, monitoring, and benchmarking of facility-level antibiotic use data in long-term care facilities (106 facilities reported at least one month of data in 2020, average of 58 participating facilities each month)
* ***NEW****:* Renewed collaboration with antibiotic stewardship (AS) experts from Tufts Medical Center to enhance AS support and activities in our long-term care facilities
* Held a statewide webinar for long-term care facilities on MDROs and Infection Control (n=150 participants) in February, 2020
* Publication of 10-year trends in MA Hospital Antibiograms : <https://doi.org/10.1017/ice.2020.395>
* Engagement with subject matter experts and stakeholders during quarterly statewide HAI/AR Technical Advisory Group (TAG) meetings with formation of Antibiotic Use Subcommittee

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Contact Information**  
  
Thank you for the opportunity to present this information today.

Please direct any questions to:

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