

## In This Issue

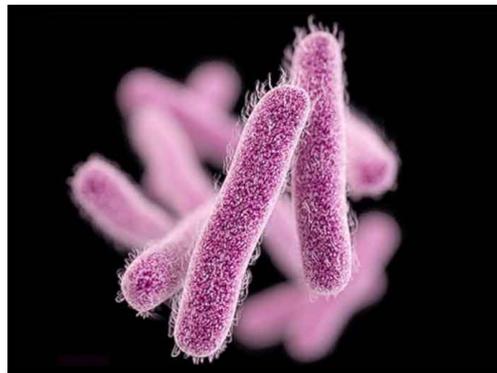
- Carbapenem-resistant Enterobacteriaceae
- CDC *C. auris* Alert
- Antibiotic Resistance Laboratory Network
- Antimicrobial Resistance Threats: 2018 Quarter 4 Data
- *Serratia marcescens* enzyme (SME) Carbapenemase
- Improving the Effectiveness of your Antimicrobial Stewardship Program
- Training & Resources
- News You Can Use
- Important Notices
- References

## CDC *C. auris* Alert: Updated Clinical Guidance Released

Since June 2016, when CDC first issued a [clinical alert](#) on the multidrug-resistant yeast, *Candida auris*, 523 clinical cases have been identified in 12 U.S. states. In 2016, CDC published guidance on identification, management, and control of *C. auris* and has updated the guidance as new information on this emerging organism becomes available. In the latest web update, dated December 21, 2018, found

## Carbapenem-resistant Enterobacteriaceae

[Carbapenem-resistant Enterobacteriaceae](#) (CRE) is one of the top antibiotic resistance threats identified in the Centers for Disease Control and Prevention's (CDC) [2013 AR Threats Report](#). CRE continue to be identified as an "Urgent Threat" due to the significant risks identified across several criteria including, but not limited to clinical



impact, transmissibility, and barriers to prevention. In 2017, Carbapenemase-producing Carbapenem-Resistant Enterobacteriaceae (CP-CRE) for *E. coli*, *Klebsiella* spp. and *Enterobacter* spp. became nationally notifiable. Philadelphia made CRE reportable in 2018 and the Pennsylvania Department of Health is in the process of making CP-CRE reportable. The department

continues to respond to voluntary reports of CP-CRE that are submitted by laboratories and healthcare facilities.

## Antibiotic Resistance Laboratory Network

The [Antibiotic Resistance Laboratory Network \(ARLN\)](#) supports nationwide lab capacity used to detect antibiotic resistance in healthcare, food and the community. Funded by the CDC, the ARLN also works to inform local responses to prevent the spread of antibiotic resistant bacteria and protect public. The ARLN includes labs in 50 states, five cities, and Puerto Rico, including seven regional labs and the National Tuberculosis Molecular Surveillance Center (National TB Center). Together, this network of laboratories monitors trends in antibiotic resistance and helps to identify and respond to outbreaks faster. The Pennsylvania Bureau of Laboratories (BOL) is part of this large network and is currently conducting mechanism testing, which includes phenotypic testing (modified Carbapenem Inactivation Method also known as mCIM) and genotypic testing for five carbapenemases (KPC, NDM, IMP, VIM, and OXA-48). Testing is also conducted to detect the *mcr-1* and *mcr-2* genes.

here

<https://www.cdc.gov/fungal/candida-auris/health-professionals.html> the notable changes include:

- A recommendation to screen patients for colonization with *C. auris* upon admission to a healthcare setting if they have a history of overnight hospitalization outside the United States in the last 12 months, especially 1) if hospitalized in a country with *C. auris* transmission, or 2) have a carbapenemase-producing organism.
- An expansion of the list of disinfectants that have been found to be effective against *C. auris*.
- An update on laboratory methods that will accurately identify *C. auris*.

Clinical infections with *C. auris* are nationally notifiable starting in 2019. Please contact the PADOH HAIP/AS team at [RA-DHHAI@pa.gov](mailto:RA-DHHAI@pa.gov) for further information or questions.

## Do You Have a Success Story Related to Your Work in AS/AR?

We would love to feature your facility or lab as a success story in a future edition of The Steward! Please send a brief summary related to preventing antimicrobial resistance or promoting stewardship activities to our resource mailbox at [RA-DHHAI@pa.gov](mailto:RA-DHHAI@pa.gov).

## Antimicrobial Resistance Threats: 2018 Quarter 4 Data\*

### Pennsylvania Department of Health

CP-CRE is not yet reportable throughout PA. The cases identified below were captured through voluntary reporting by healthcare facilities and laboratories, including the PA Bureau of Laboratories.

Carbapenemase mechanism	Count (10/1/2018 – 12/31/2018)
KPC	4
NDM	1
IMP	0
OXA-48	1
VIM	0
mCIM positive with no genotype detected	0
Resistance mechanism	Count (10/1/2018 – 12/31/2018)
mcr-1 gene	0
mcr-2 gene	0
Any novel resistance gene	0

### Philadelphia Department of Public Health

All Carbapenem-resistant Enterobacteriaceae (CRE) is reportable in the City of Philadelphia as of March 2018.

Carbapenemase mechanism	Count (10/1/2018 – 12/31/2018)
KPC	46
NDM	2
IMP	0
OXA-48	0
VIM	0
mCIM positive with no genotype detected*	3
Resistance mechanism	Count (10/1/2018 – 12/31/2018)
mcr-1 gene	0
mcr-2 gene	0
Any novel resistance gene	0

Footnotes: \*Philadelphia's number for *mCIM positive with no genotype detected* includes CRE isolates that were tested for carbapenemase production in clinical laboratories, but were not submitted for mechanism testing by PDPH due to limitations in testing capacity. These isolates may have tested positive for carbapenemase production via methods other than mCIM (i.e. MHT, Carba-NP)

## Do You Know About TRAIN PA?

TRAIN PA is a learning management system and it is the most comprehensive catalog of public health training opportunities for professionals. TRAIN is a free service for learners. TRAIN contains courses from CDC and health departments across the United States. You will find live and prerecorded trainings here as well as a searchable course catalog. There is also a built-in tracking system to track your learning on TRAIN PA. Many courses offered here also include continuing education credits.

### To access TRAIN PA, just go to:

<https://www.train.org/pa/>

You will then need to click on the "Create an Account" button found on the left side of the screen.

Once you are logged in, use the search tool to locate training topics or if you have a course ID, you can enter that number.

## *Serratia marcescens* Enzyme (SME) Carbapenemase

Contributed by: Jane M. Gould, MD, FAAP & Julie Paoline, MA, CPHA, CIC

One genus of the Enterobacteriaceae family that may be overlooked when we consider CP-CRE is *Serratia*. These gram-negative bacteria commonly cause healthcare-associated infections in the blood (catheter-associated bacteremia), urinary tract and wounds.

A recent epidemiological investigation in Pennsylvania revealed additional information on this less common Enterobacteriaceae genus. Carbapenem-resistant *Serratia marcescens* were isolated from two sterile sites, blood and synovial fluid, in a hospitalized patient in an acute care facility. The laboratory personnel immediately recognized this as CRE and performed the modified Carbapenem Inactivation Method (mCIM) for phenotypic detection of carbapenemase production, which yielded a positive result. A positive mCIM meets the criteria for a confirmed case of CP-CRE, therefore, these isolates were forwarded to PA BOL for confirmation and mechanism testing. Upon receipt, both phenotypic and genotypic testing were conducted. The results confirmed a positive mCIM, however none of the five carbapenemases (KPC, NDM, IMP, VIM, and OXA-48) were detected.

In consultation with the ARLN, it was discovered that *Serratia* have a unique carbapenemase mechanism. *Serratia marcescens* enzymes (SME-1, SME-2, SME-3) are class A carbapenemases found on the chromosome of *S. marcescens* and have not been associated with any mobile genetic elements. Hopkins et al. reports that the SME gene was first identified in the United Kingdom in 1982, however the true proportion of SME carbapenemases is unknown due to limited systematic testing. The same report indicates that SME genes have been identified in the United States, Canada, Argentina and a single isolate from Switzerland.

There is no current method widely available to U.S. healthcare facilities to detect the SME gene. Therefore, when a mCIM-positive *S. marcescens* is identified in a patient with an overnight stay at a healthcare facility, enhanced surveillance for additional *Serratia marcescens* should be conducted in addition to the infection prevention and control recommendations in the [CDC CRE Toolkit](#) and the [DOH CRE Toolkit](#). Typically, these strains differ from other carbapenemase-producing organisms because they usually maintain susceptibility to expanded-spectrum cephalosporins (such as ceftazidime and cefepime) while being resistant to other  $\beta$ -lactams.

## HAIP/AS Training & Resources

### LUNCH & LEARN WEBINAR SERIES

The Pennsylvania Department of Health, Bureau of Epidemiology, Healthcare Associated Infection Prevention/Antimicrobial Stewardship (HAIP/AS) team presents a Lunch & Learn Series of webinars for hospital infection preventionists (1 Act 58 CE for nurses – pending). These sessions will be recorded for future viewing and will be made available via TRAIN PA.

This quarterly series of webinars will be presented on the following dates from noon-1pm:

- January 22<sup>nd</sup> – The State of the HAIP/AS Program (Available on TRAIN PA ID **1084645**)
- April 23<sup>rd</sup> – TBD
- July 23<sup>rd</sup> – TBD
- October 22<sup>nd</sup> – TBD

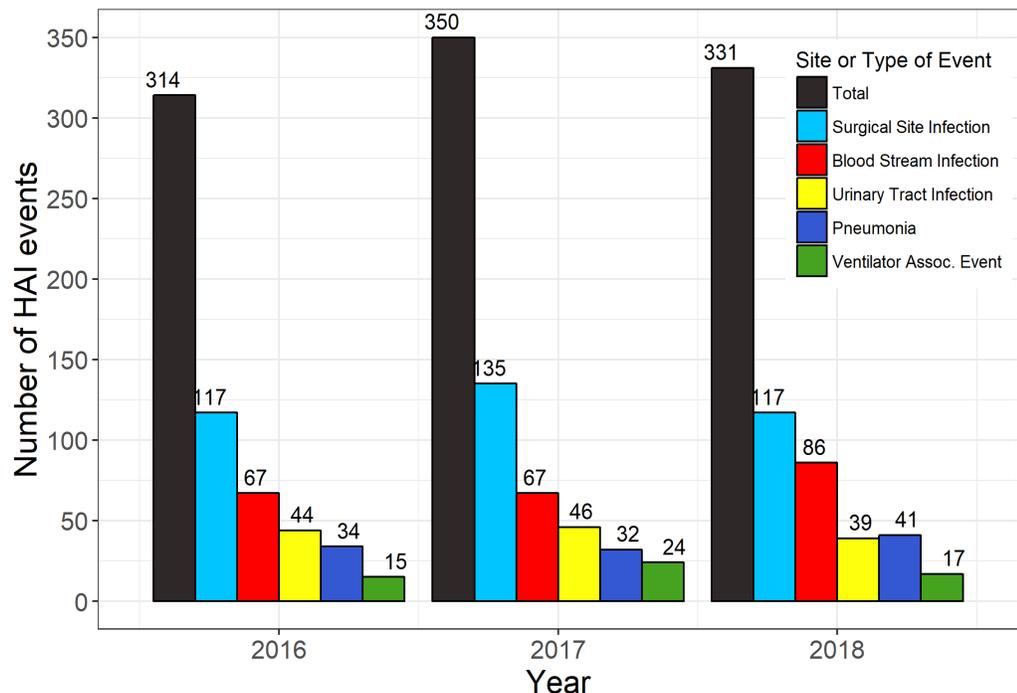
To register for or join this series of webinars, please click this URL:

<https://zoom.us/webinar/register/fec4461bdf6892d78c34be5db4a05ad8>

After registering, you will receive a confirmation email containing information on joining the webinar.

**PA Surveillance Data** In the last three years *Serratia marcescens* has been reported as a pathogen in about 1,000 healthcare associated infections in Pennsylvania. Most of these HAIs were surgical site infections followed by bloodstream infections and urinary tract infections.

**Number of *Serratia marcescens* HAI Events Reported to NHSN by Source Site: Pennsylvania 2016-2018**



**Footnote:** Other types of events not shown include bone and joint, gastrointestinal, eye, ear, nose and throat, central nervous system, lower respiratory infection, and skin and soft tissue.

## Improving the Effectiveness of Your Antibiotic Stewardship Program

Contributed by: Christine Mulgrew, PhD, MPH & Jane M. Gould, MD, FAAP

### **Antibiotic Stewardship Strategic Plan**

To assist healthcare facilities in creating an antibiotic stewardship *strategic plan*, the Pennsylvania Department of Health (DOH) requests that each facility take a critical look at their Antibiotic Stewardship Program (ASP) and assess how each of the CDC core ASP elements are implemented. To support you in this assessment, examples of basic, intermediate and advanced implementation plans from the [National Quality Partners Playbook: Antibiotic Stewardship in Acute Care](#) are provided below. Review these examples to identify opportunities to expand your facility's implementation of each core element and to develop long-term strategies to advance your ASP.

**ONLINE CONTINUING  
EDUCATION WEBINARS  
AVAILABLE ON TRAIN PA**

· Public Health Response to Invasive Group A Streptococcus (ID 1079034)

· Infection Prevention in Outpatient Settings That Reprocess Medical Equipment (ID 1077111)

· Infection Prevention in Outpatient Settings: Safe Care and Antimicrobial Stewardship (ID 1077114)

· Infection Prevention in the Long-Term Care Setting: Safe Care and Antimicrobial Stewardship (ID 1077115)

· Environmental Cleaning & Disinfection in Long-term Care Facilities (ID 1081685)

· PA-QA In-service: Root Cause Analysis (ID 1070908)

· Carbapenem-resistant Enterobacteriaceae (CRE) Investigations Webinar Series Part 1 (ID 1083460)

**Leadership commitment**

**Leadership commitment** is a core element in every successful ASP. In most facilities, leaders within the C-Suite allocate human, financial and information technology resources. They use the resources to support and prioritize competing needs and goals. It is important that



your facility leadership commits to supporting your ASP. Without their full commitment, it will be more difficult to fully implement the ASP core elements to ensure appropriate use of antibiotics, reduce development of multi-drug resistant organisms (MDRO) and reduce MDRO healthcare associated infections.

**Examples of leadership commitment categorized into basic, intermediate, and advance levels of support** from [National Quality Partners Playbook: Antibiotic Stewardship in Acute Care](#):

**Basic evidence for leadership support:**

1. Formal board-approved statement of support for the ASP
2. Newsletter column written by the facility's leader highlighting their support for ASP
3. Dedicated salary support and specific time commitments for the ASP leaders
4. Support for expert stewardship consultation (e.g., infectious diseases physicians and/or pharmacists) through remote or telemedicine platforms
5. Ongoing communication from leaders that demonstrate ASP support and stress how ASPs can improve patient outcomes

**Intermediate evidence for leadership support:**

1. Designation of a facility executive to serve as an ASP "champion"
2. Demonstration of ASP outcome measures in the facility's strategic dashboard and regular updates of leadership on meeting those goals
3. Integration of ASP activities into quality improvement for the facility and/or patient safety initiatives
4. Inclusion of antimicrobial stewardship education in ongoing prescriber education, and annual assessment of prescriber competencies

**Advanced evidence for leadership support:**

1. ASP leaders received adequate training to measure and improve antimicrobial use
2. Funding information technology to support ASP activities
3. Availability of microbiology laboratory resources and data
4. Implementation of a stewardship strategic plan that begins at the executive leadership level and flows through individual department policies to include all leaders and prescribers

## Are You Receiving Health Alerts from the PA Department of Health?

Stay informed and join the PA Health Alert Network (PA HAN). This system serves as a communication network among state and local public health agencies, health care providers, hospitals and emergency management officials. The information provided is based upon recommendations from the Centers for Disease Control and Prevention and other health organizations. If you are a healthcare professional, please **register** for the PA HAN today!

## Important Notices

**Web Posting on Stem Cell Products:** CDC is investigating bacterial infections in patients who have received stem cell products from the ReGen Series® (distributed by Liveyon, LLC). Most of these patients developed symptoms such as pain, swelling, or chills within a few days of receiving the stem cell products. Liveyon, LLC, recalled these products on Friday, September 28<sup>th</sup>, 2018. For more information please visit <https://www.cdc.gov/hai/outbreaks/stem-cell-products.html>.

5. Financial incentives for units and departments to improve antimicrobial use
6. Hold prescribers accountable for improving antimicrobial use
7. Engagement of patients and/or their advocates to improve antimicrobial use

### **How can you get more Leadership Support?**

You can inspire your leaders to find value in ASP programs! Review the suggestions below and the numerous free articles listed in the Resources section to increase your hospitals leadership commitment.

### **Barriers and solutions**

1. Low support by leaders
  - a. Provide evidence for ASP from groups such as American Hospital Association or other recognized agencies
  - b. Provide a business case for your ASP to facility leadership that demonstrates improvement in patient outcomes and experience, reduction in adverse events and financial savings
  - c. Provide data to facility leadership on rates of healthcare associated infections secondary to multidrug resistant organisms, fungus and *C. difficile*
2. Low awareness by facility leaders
  - a. Provide leaders with data and evidence on the benefits of ASPs (ex. reductions in *C. difficile* rates and reductions in antimicrobial resistance)
  - b. Recruit patients and their advocates to share stories about the impact that *C. difficile* and antimicrobial resistant infections have had on their lives
3. Competing priorities by facility leaders
  - a. Educate leaders about regulatory and accreditation requirements (ex. Joint Commission, proposed CMS infection control worksheet)
  - b. Discuss potential impact on facility "brand" if ASP is not prioritized
  - c. Incorporate stewardship efforts in other quality improvement efforts to improve efficiency (ex. sepsis initiatives, *C. difficile* prevention)

## The FDA Provides Interim Results of Duodenoscope Reprocessing Studies Conducted in Real-World Settings: FDA Safety Communication:

Highlights of FDA statement:

A safety communication was issued on December 10, 2018 reporting on preliminary findings of duodenoscope reprocessing studies. Higher than expected contamination rates occurred. FDA makes more recommendations to reinforce best practices. The FDA previously issued a safety communication in 2015 to fight the spread of infections by recommending additional reprocessing steps to increase the safety of these medical devices.

## Contact Us

Bureau of  
Epidemiology/Healthcare  
-Associated Infection  
Prevention &  
Antimicrobial  
Stewardship

Pennsylvania  
Department of Health

Room 993, Health &  
Welfare Building

625 Forester Street

Harrisburg, PA 17120

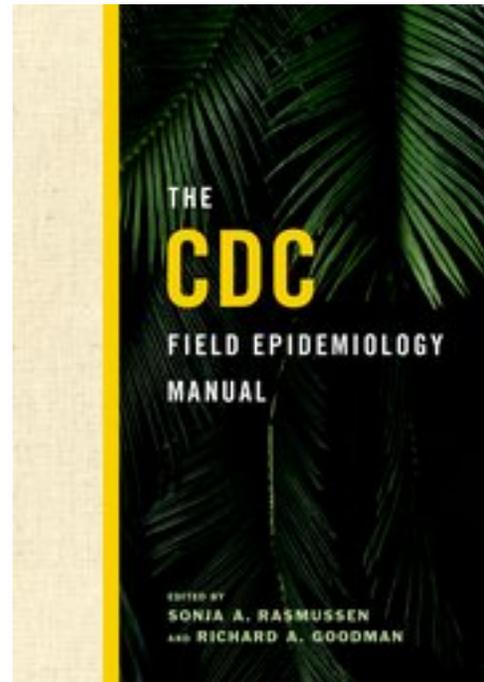
717-787-3350

RA-DHHAI@pa.gov

## News You Can Use

**The CDC Field Epidemiology Manual** is a definitive guide used to investigate acute public health events on the ground and in real time. Assembled and written by experts from CDC, with written contributions from other national experts, it offers current and field-tested guidance for every stage of an outbreak investigation. **Chapter 18** focuses primarily on the healthcare setting and describes the essential processes to detect and manage outbreaks in diverse healthcare settings. It starts with verifying the diagnosis, moves to identifying cases and finishes with notifying patients, if applicable. This was updated in December 2018.

Hardcover, paperback, and E-book available from [Oxford University Press](#) and major online booksellers, such as [Amazon](#) and [Barnes & Noble](#).



## References

- American Hospital Association. (2012). *Appropriate Use of Medical Resources Antimicrobial Stewardship Toolkit*. Retrieved from <http://www.ahaphysicianforum.org/resources/appropriate-use/antimicrobial/ASP-Toolkit-v4.pdf>
- Barlam, T., Cosgrove, S., Abbo, L., MacDougall, C., Schuetz, A., & Septimus, E. et al. (2016). Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clinical Infectious Diseases*, 62(10), e51-e77. doi: 10.1093/cid/ciw118. Retrieved on February 27, 2019 from <https://academic.oup.com/cid/article/62/10/e51/2462846>
- Bush, K., Pannell, M., Lock, J., Queenan, A., Jorgensen, J., & Lee, R. et al. (2013). Detection systems for carbapenemase gene identification should include the SME serine carbapenemase. *International Journal Of Antimicrobial Agents*, 41(1), 1-4. doi: 10.1016/j.ijantimicag.2012.08.008SME-3, a novel member of the Serratia marcescens SME family of carbapenem-hydrolyzing  $\beta$ -lactamases, *Antimicrob Agents Chemother*. 2006; 50(10):3485-3487
- Centers for Medicare & Medicaid Services Hospital Infection Control Worksheet. Retrieved from <https://www.cms.gov/medicare/provider-enrollment-and-certification/surveycertificationgeninfo/downloads/survey-and-cert-letter-15-12-attachment-1.pdf>
- Durvalva, R., Kelly, J., Schleyer, A., Anawalt, B., Somani, S., & Dellit, T. (2018). Standardized Review and Approval Process for High-Cost Medication Use Promotes Value-Based Care in a Large Academic Medical System. *American Health Drug Benefits*, 11(2), 65-73.
- Esteve-Palau, E., Grau, S., Herrera, S., Montero, M., Segura, C., Durán, X., & Horcajada, J.P. (2018). Impact of an antimicrobial stewardship program on urinary tract infections caused by extended-spectrum  $\beta$ -lactamase-producing Escherichia coli. *Rev Esp Quimioter*, 31(2), 110-117. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6159366/pdf/revesquimioter-31-110.pdf>
- Hopkins, K., Findlay, J., Meunier, D., Cummins, M., Curtis, S., & Kustos, I. et al. (2017). Serratia marcescens-producing SME carbapenemases: an emerging resistance problem in the UK?. *Journal Of Antimicrobial Chemotherapy*, dkw567. doi: 10.1093/jac/dkw567

- Fukunaga, B., Sumida, W., Taira, D., Davis, J., & Seto, T. (2016). Hospital-Acquired Methicillin-resistant Staphylococcus aureus Bacteremia Related to Medicare Antibiotic Prescriptions: A State-Level Analysis. *Hawaii Journal Of Medicine & Public Health*, 75(10), 303-309. Retrieved from [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5056633/pdf/hjmph7510\\_0303.pdf](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5056633/pdf/hjmph7510_0303.pdf)
- Hopkins, K., Findlay, J., Meunier, D., Cummins, M., Curtis, S., & Kustos, I. et al. (2017). Serratia marcescens-producing SME carbapenemases: an emerging resistance problem in the UK?. *Journal Of Antimicrobial Chemotherapy*, dkw567. doi: 10.1093/jac/dkw567
- Joint Commission. (2017) *Medication Management Antibiotic Stewardship Standard*. Retrieved on February 27, 2019 from [https://www.jointcommission.org/assets/1/6/New\\_Antimicrobial\\_Stewardship\\_Standard.pdf](https://www.jointcommission.org/assets/1/6/New_Antimicrobial_Stewardship_Standard.pdf)
- Michaelidis, C., Fine, M., Lin, C., Linder, J., Nowalk, M., & Shields, R. et al. (2016). The hidden societal cost of antibiotic resistance per antibiotic prescribed in the United States: an exploratory analysis. *BMC Infectious Diseases*, 16(1). doi: 10.1186/s12879-016-1990-4
- National Quality Partners Playbook. (2016). Retrieved February 28, 2019 from <https://www.qualityforum.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=82501>
- Roberts, R., Hota, B., Ahmad, I., Scott II, R., Foster, S., & Abbasi, F. et al. (2009). Hospital and Societal Costs of Antimicrobial-Resistant Infections in a Chicago Teaching Hospital: Implications for Antibiotic Stewardship. *Clinical Infectious Diseases*, 49(8), 1175-1184. doi: 10.1086/605630
- Sick, A., Lehmann, C., Tamma, P., Lee, C., & Agwu, A. (2013). Sustained Savings from a Longitudinal Cost Analysis of an Internet-Based Preapproval Antimicrobial Stewardship Program. *Infection Control & Hospital Epidemiology*, 34(06), 573-580. doi: 10.1086/670625
- Standiford, H., Chan, S., Tripoli, M., Weekes, E., & Forrest, G. (2012). Antimicrobial Stewardship at a Large Tertiary Care Academic Medical Center: Cost Analysis Before, During, and After a 7-Year Program. *Infection Control & Hospital Epidemiology*, 33(04), 338-345. doi: 10.1086/664909
- US. Department of Health and Human Services. National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination Phase Four: Coordination among Federal Partners to Leverage HAI Prevention and Antibiotic Stewardship. (2018). Retrieved February 5, 2019 from [https://health.gov/hcq/pdfs/National\\_Action\\_Plan\\_to\\_Prevent\\_HAIs\\_Phase\\_IV\\_2018.pdf](https://health.gov/hcq/pdfs/National_Action_Plan_to_Prevent_HAIs_Phase_IV_2018.pdf)