



Infectious Disease Management Among Leading Health Systems

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Matt Devino, MPH, Senior Analyst, Research & Advisory
Melissa Stahl, Senior Manager, Research & Advisory
Anita Wang, MS, Data Analyst, Research & Advisory
Casey Skapek, Health Services Fellow
Sanjula Jain, PhD, Executive Director, Research & Advisory

Introduction

Over the last three decades, there has been a concerning increase in the incidence of infections caused by multidrug-resistant organisms (MDROs). According to the Centers for Disease Control and Prevention (CDC), more than 2 million people in the United States are infected with antibiotic-resistant bacteria annually, and at least 23,000 of these individuals die due to their infection. Invasive methicillin-resistant *Staphylococcus aureus*, or MRSA, alone accounts for over 80,000 infections and 11,285 deaths per year.¹ Sepsis, a life-threatening condition often caused by this type of bacteria, has become the leading cause of hospital readmissions and associated costs, accounting for 12.2% of 30-day readmissions and an average cost of over \$10,000 per readmission.²

In order to reduce the burden of MDROs in healthcare settings, the CDC recommends a multifaceted strategy that focuses on the prevention of infections, accurate and prompt diagnosis and treatment, and prudent utilization of antimicrobials. The advancement of rapid diagnostic testing (RDT) has allowed clinicians to more quickly identify and appropriately treat infections. To further enact this strategy, many organizations have implemented antimicrobial stewardship programs and treatment guidelines aimed at improving patient outcomes and preventing the proliferation of MDROs.

One report estimates the total economic cost of lives and productivity lost as a result of infections with MDROs will total \$100 trillion globally by 2050.³ At the same time, the increase in value-based payment models and financial risk assumed by health systems creates an impetus to minimize readmissions and decrease healthcare-associated infections (HAIs), which negatively impact reimbursement. As costs associated with infectious diseases continue to rise and hospital operating margins continue to shrink, health systems are under increasing financial pressure to more effectively treat and manage their infectious disease patient population.

1. National Strategy for Combating Antibiotic-resistant bacteria (2014) https://www.cdc.gov/drugresistance/pdf/carb_national_strategy.pdf

2. Mayr FB, Talisa VB, Balakumar V, Chang CH, Fine M, Yende S. [Proportion and cost of unplanned 30-day readmissions after sepsis compared with other medical conditions](#) [published online January 22, 2017]. *JAMA*. doi:10.1001/jama.2016.20468

3. O'Neill J. Tackling Drug-Resistant Infections Globally: Final Report And Recommendations. Review On Antimicrobial Resistance 2016.

Methodology & Respondent Profile

The Health Management Academy (The Academy) has set out to identify key trends in health system approaches to infectious disease management, including the use of technology, rapid diagnostic testing, and treatment guidelines. From December 2018 through January 2019, The Academy conducted an online survey of senior clinical executives at Leading Health Systems (LHS) regarding their infectious disease management strategy. The responses collected represent the perspectives of 20 unique health systems.

Profile of Participating Health Systems

- Median Net Patient Revenue (NPR): \$3.4 billion
 - Large (>\$6B): 25%
 - Medium (\$3-6B): 40%
 - Small: (<\$3B): 35%
- Hospitals: 286
- Beds: 65,000
- Inpatient admissions: 3.2 million/year

Respondent Roles

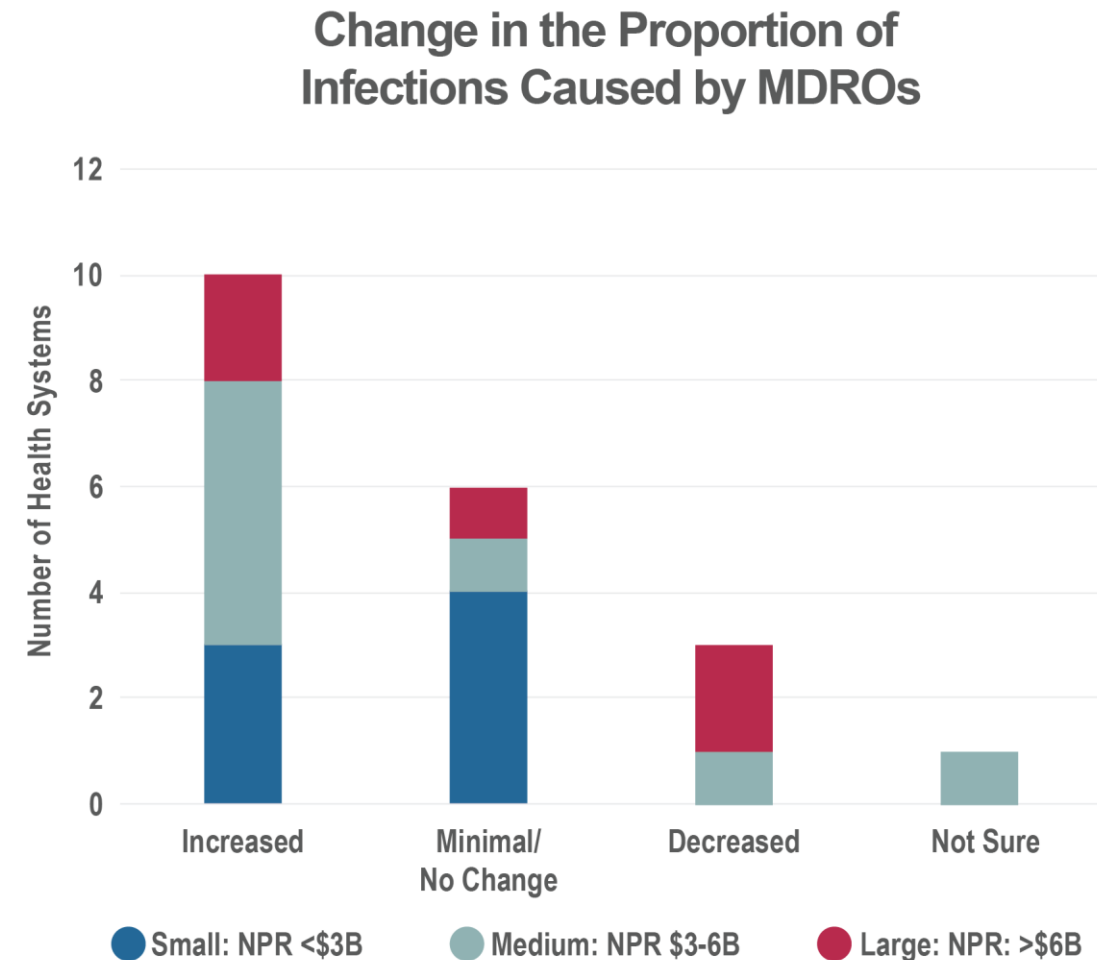
Chief Medical Officer;
Chief Nursing Officer;
Chief Quality & Patient Safety Officer;
VP, Quality & Patient Safety;
VP, Infection Prevention;
VP, Medical Affairs;
VP, Care Transformation;
Pharmacy Director;
Executive Director, Clinical Operations;
System Director, Infection Prevention;
Service Line Leader, Acute Medicine;
Infectious Disease Specialist.

I. Clinical Care and Antimicrobial Stewardship

Overview of the landscape of infectious disease management: quantification of infections and readmissions caused by infectious diseases, investment in technology, and feedback on antibiotic prescribing

The proportion of infections caused by MDROs has increased for half of health systems

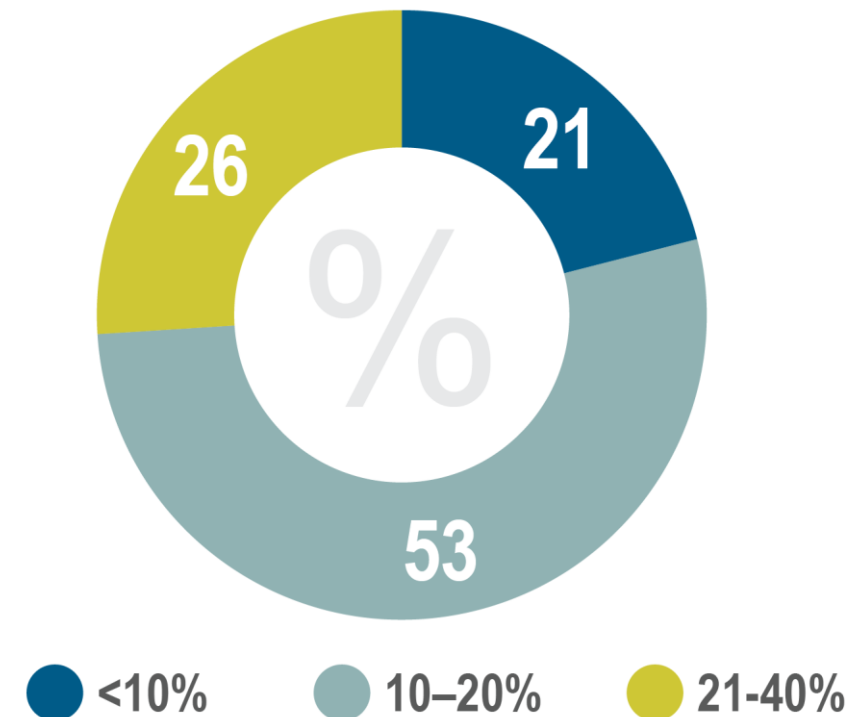
- Among 50% of health systems, the proportion of infections caused by MDROs has increased over the past 5 years.
- Despite health systems' focus on quality improvement and becoming high reliability organizations, only 15% saw a decrease in the proportion of these infections and 30% indicate there has been either a minimal change or no change in this proportion.
- Medium health systems are more likely to report an increase compared to small and large systems.
- Large health systems are more likely to report a decrease compared to small and medium systems.



Most health systems attribute 10-20% of their readmissions to patients with an infectious disease

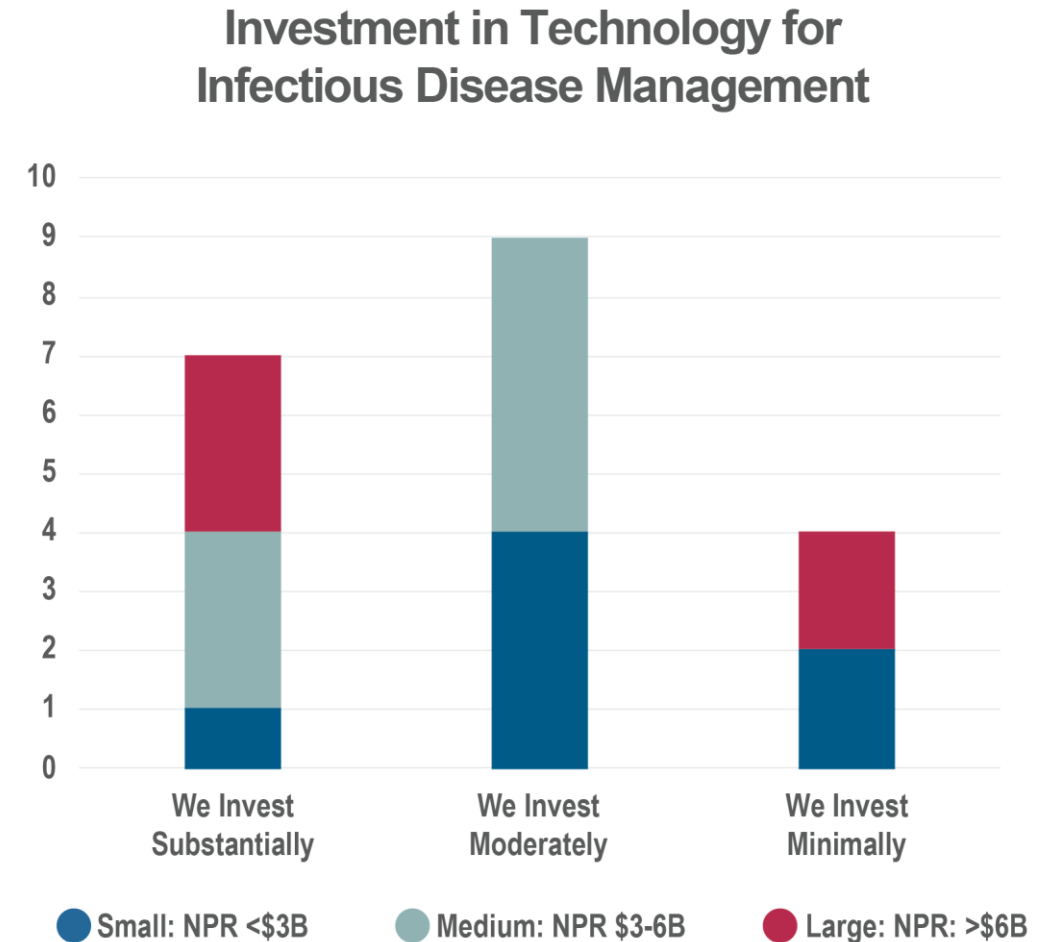
- 53% of health systems estimate that 10-20% of their readmissions can be attributed to patients with an infectious disease.
 - Notably, three-quarters of health systems that reported an infectious disease-related readmission rate of less than 10% were large health systems, with NPR >\$6 billion.
- For 90% of health systems, the care of patients with infectious diseases (e.g., sepsis, *C. difficile*, pneumonia) often exceeds the DRG reimbursement rate.

Percent of Readmissions Attributed to Patients with an Infectious Disease
(n=19)



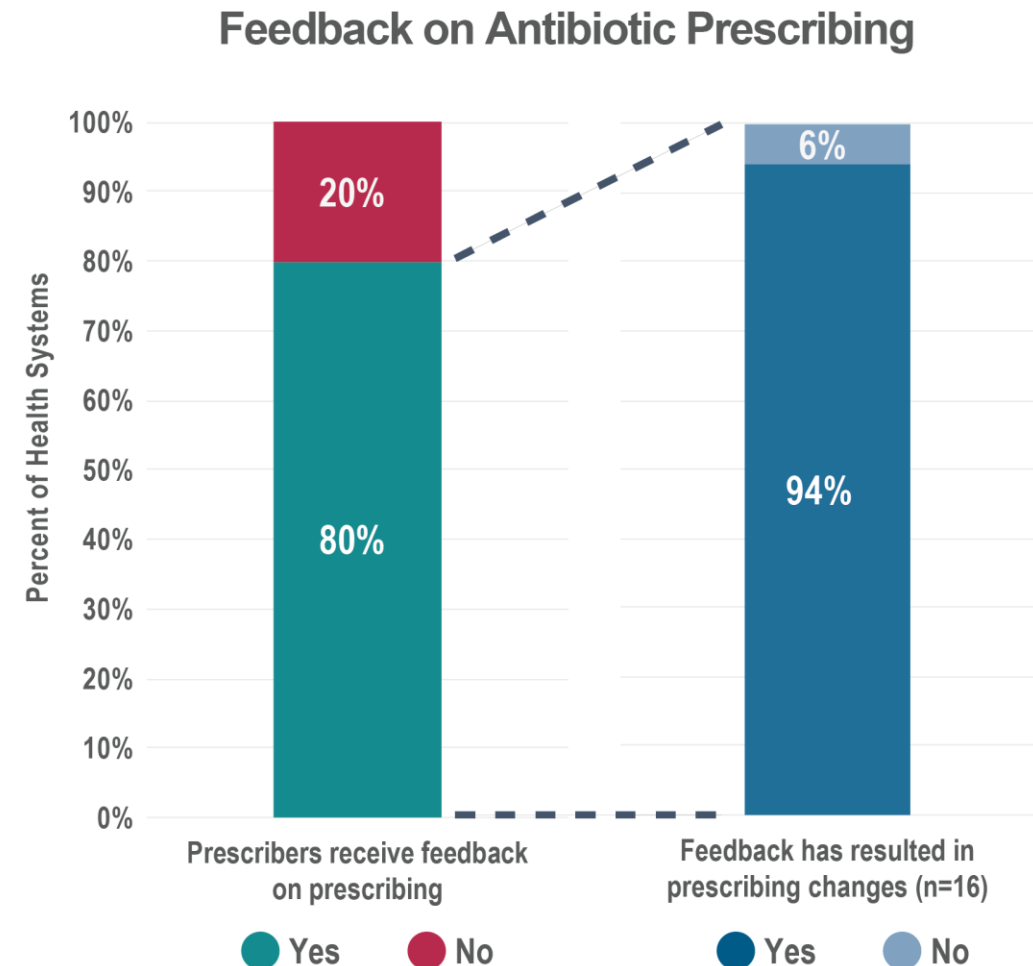
All health systems invest in technology for infectious disease management

- Reflective of the impact of MDROs, all health systems, regardless of size, invest resources in technology to assist in managing the patient population affected by infectious diseases.
 - 35% of health systems invest substantially, 45% invest moderately, and 20% invest minimally in support technologies.
- Large and medium health systems are more likely to invest substantially in technology than small systems.
- Health systems that report an increase in the proportion of infections caused by MDROs are more likely to invest substantially, potentially indicating a higher commitment to this issue.



Prescribers at most health systems receive personalized feedback on antibiotic prescribing

- Prescribers receive direct, personalized communication about how they can improve their antibiotic prescribing at 80% of health systems.
- There is variation across health systems in the role of the individual or body responsible for providing this feedback:
 - Chief Medical Officer, Chief Clinical Officer, Chief Quality Officer;
 - Chief of Service Physician, Infectious Disease (ID) Physician;
 - Chief Pharmacy Officer, ID Pharmacist, Pharmacy Lead;
 - Pharmacy & Therapeutics Committee Chair, Medical Executive Committee;
 - Director of Antimicrobial Stewardship, Antimicrobial Stewardship Pharmacist, Antibiotic Stewardship Council.
- 94% of health systems feel that the provision of such feedback has led to prescribing changes.



II. Rapid Diagnostic Testing

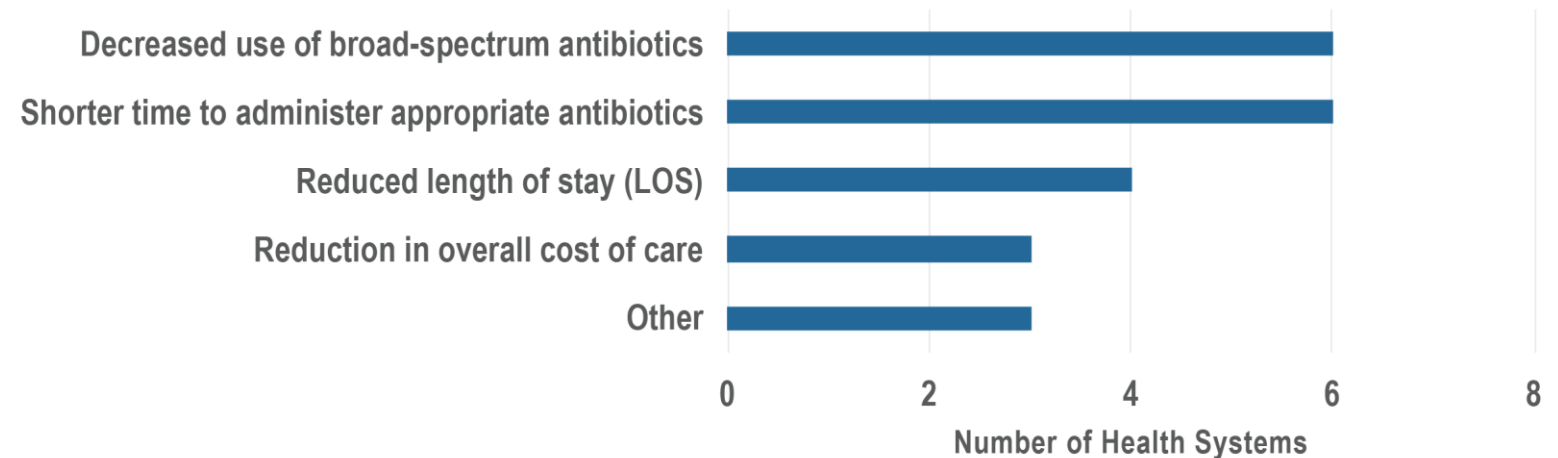
Use of rapid diagnostic testing (RDT) as a clinical tool for ID management: measurement of clinical and financial benefits, communication of RDT results, and confidence in physicians to leverage RDT results for clinical decisions

Less than half of health systems that use RDT have measured the clinical and financial benefits

- Rapid diagnostic testing (RDT) enables clinicians to quickly and accurately identify infectious microorganisms and their susceptibility to antibiotics using molecular markers.
- Among the 90% of health systems that use RDT, only 39% measure and track associated clinical and financial metrics.
 - Measuring clinical and financial metrics is more common among large and medium health systems (50% for both) compared to small health systems (17%).
- The most common clinical and financial benefits realized with RDT are a decreased use of broad-spectrum antibiotics and a shorter time to administer appropriate antibiotics.
- Respondents selecting “other” indicated improvements in isolation costs and the appropriate use of transmission-based precautions; one system indicated it is too early to evaluate such benefits despite collecting the necessary metrics.

Clinical & Financial Benefits of Rapid Diagnostic Testing

(n=7)

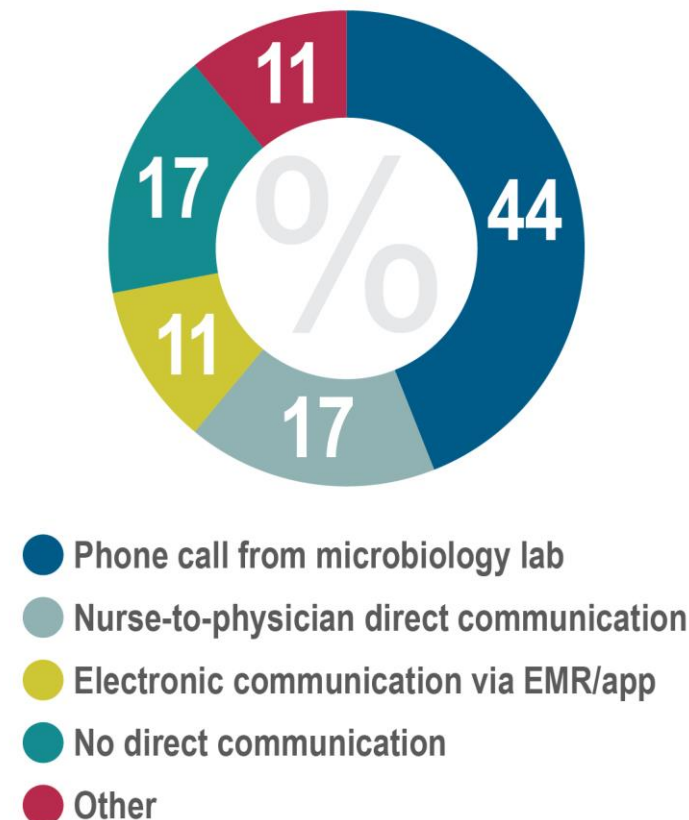


Physicians most commonly receive RDT results via phone from the microbiology lab

- Among health systems that use RDT, 44% receive the results via a phone call from the microbiology lab.
- While several systems receive results electronically, they report that the communication comes through their EMR, not necessarily via an app.
- Respondents selecting “other” indicated that this communication is variable by hospital or that there is some combination of phone, electronic, and nurse-to-physician communication.
- However, for nearly one-fifth of responding health systems, there is no direct communication of RDT results.
- Notably, all health systems with no direct communication or nurse-to-physician direct communication do not track clinical/financial metrics.
 - 50% that receive RDT results via phone calls track clinical and financial metrics.
 - Additionally, both systems that receive results directly in the EMR track clinical and financial metrics.

Mode of Communication for RDT Results

(n=18)

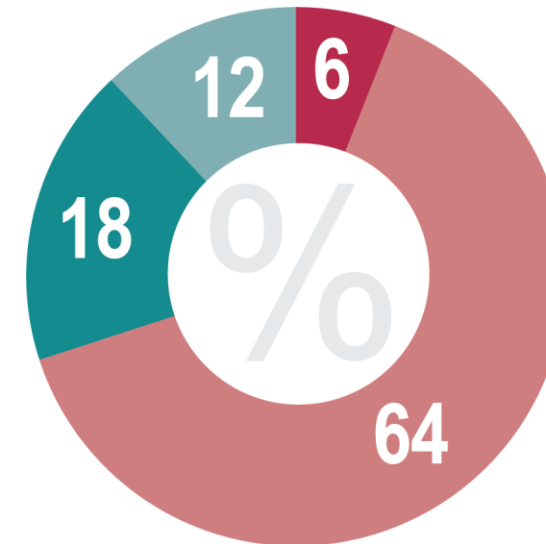


Most health systems are somewhat confident in their clinicians' ability to leverage RDT results

- 64% of health systems are only somewhat confident in the ability of their clinicians to leverage rapid diagnostic results to make clinical decisions.
 - Among this group, only 27% have observed clinical and financial benefits of RDT.
- By comparison, 60% of health systems that are either confident or very confident in their clinicians have observed clinical and financial benefits of RDT.
- This trend highlights the importance of clinician education and support in leveraging RDT results for clinical decision-making in order to maximize the benefits of this diagnostic tool.

Level of Confidence in Clinicians' Ability to Leverage RDT Results

(n=17)



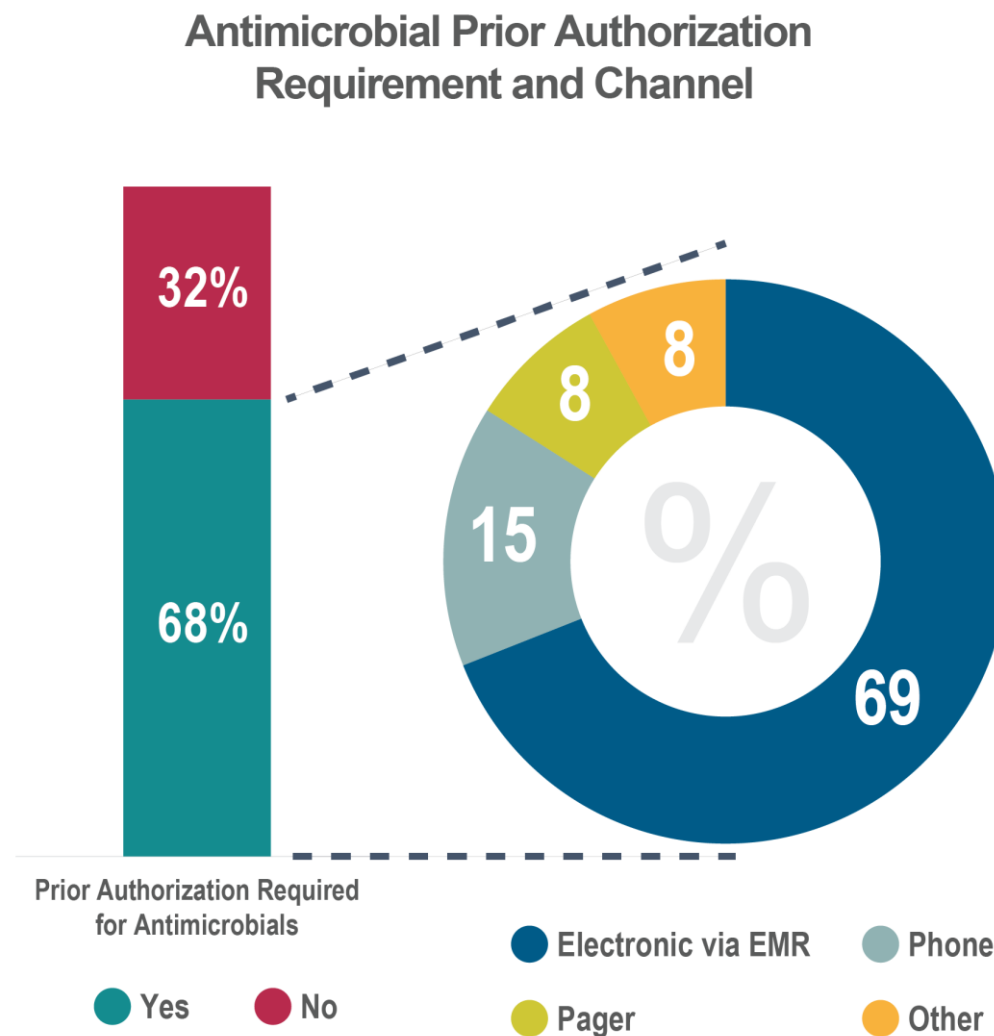
- Not at all confident
- Somewhat confident
- Confident
- Very Confident

III. Prior Authorization & Treatment Guidelines

Processes and platforms for placing prior authorization requests for antimicrobials and accessing facility-specific treatment guidelines for antibiotic selection

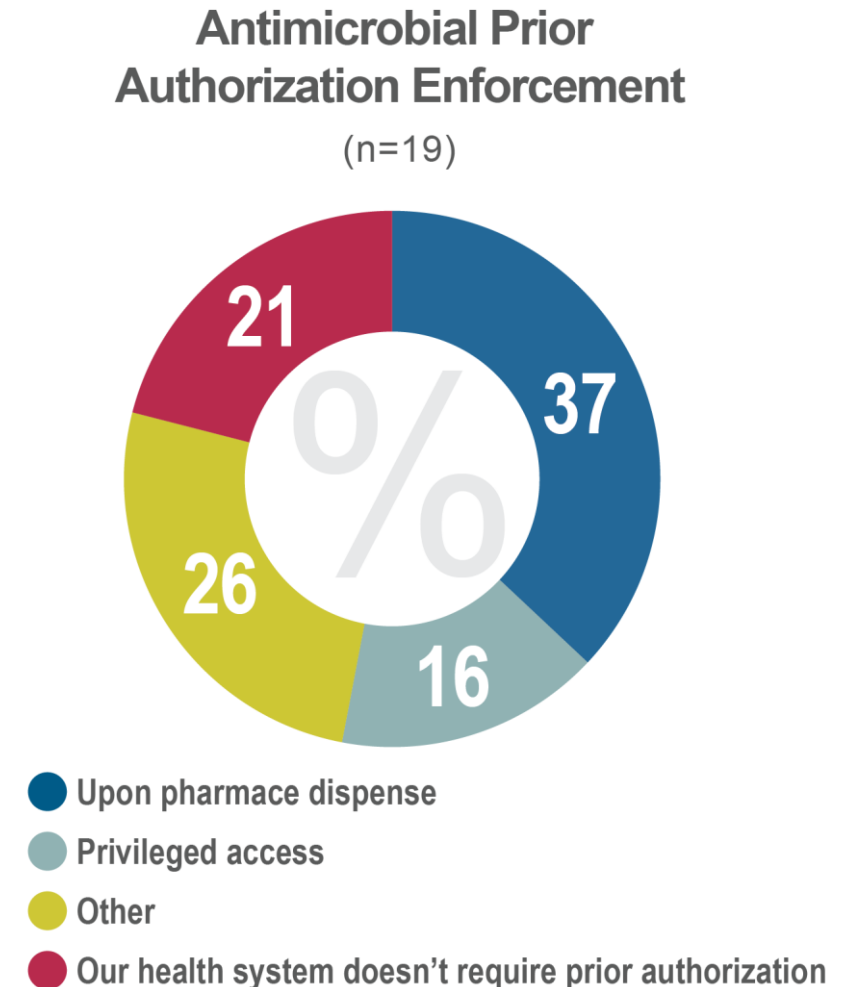
Most health systems place prior authorization requests for antimicrobials through their EMR

- 68% of health systems *require* prior authorization for antimicrobials or other agents (e.g., factor products, IVIG, rasburicase, etc.)
 - Of these systems (n=13) 69% allow clinicians to place prior authorization requests through the EMR.
 - Less often, these requests are placed via phone or pager.
 - For one system, the prior authorization channel is variable depending on the specific antimicrobial/agent.
- While the remaining 32% of systems do not require prior authorization for all antimicrobials, a few organizations indicate that nonformulary items require explicit approval by the CMO, Pharmacy Director, or Medical Director.
- Notably, no health systems report placing prior authorization requests through a smartphone app.



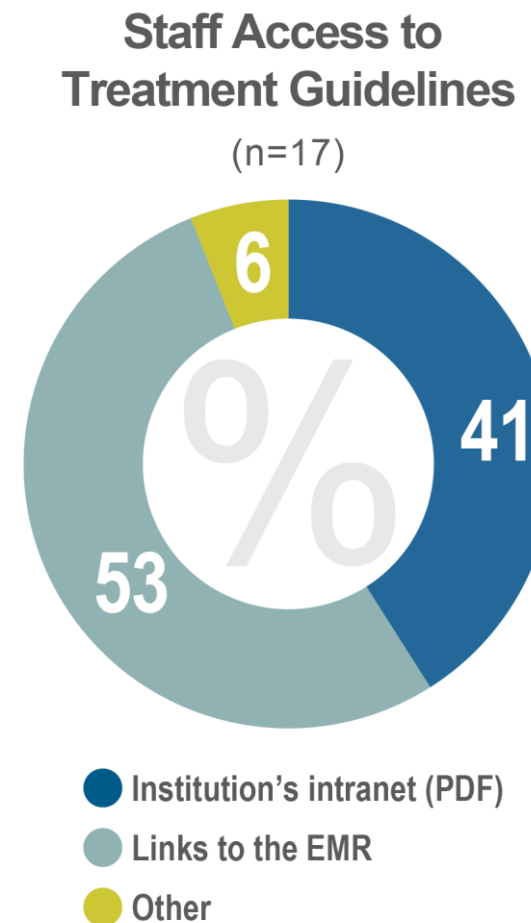
The enforcement of prior authorization policies is highly variable among health systems

- 37% of health systems enforce prior authorization policies upon dispensation from the pharmacy.
 - 16% regulate these policies using privileged access.
- The large proportion of respondents selecting “other” (26%) emphasizes significant variation around prior authorization processes among health systems.
 - Many of these health system have a formulary for antimicrobials and other agents, and for several prior authorization is only necessary for nonformulary antimicrobials.
 - Additionally, some health systems use a combination of different methods to regulate prior authorizations, including hard stops in the computerized physician order entry (CPOE) system, upon pharmacy dispense, and limits on authorized providers.



Almost all health systems utilize facility-specific treatment guidelines for antibiotic selection

- 89% of health systems use facility-specific treatment recommendations, based on national guidelines and local susceptibility, to assist with antibiotic selection for common clinical conditions.
- Among these health systems, 82% have internal guidelines that take patient data or local resistance patterns into account.
- Medical staff predominantly access these treatment guidelines in two ways: through the EMR (53%) and through a PDF on the institution's intranet (41%).
 - One health system uses a combination of both PDF documents and links in the EMR.
- Notably, no health system leverages smartphone apps to access these guidelines.



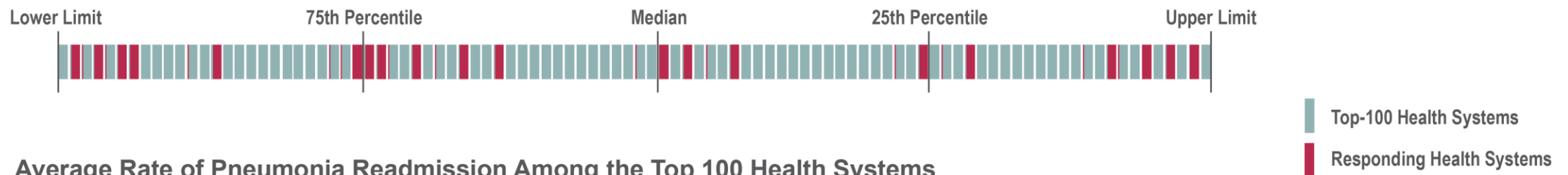
IV. Benchmarking Performance

Benchmarking the sample of responding health systems by performance in two infectious disease management metrics

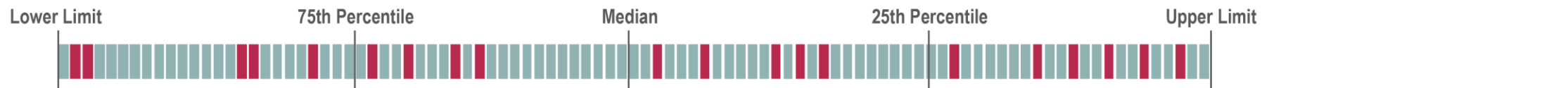
Benchmarking Performance

- To benchmark the sample of responding health systems against the overall landscape of the top 100 health systems (ranked by NPR) in terms of infectious disease management, the rate of postoperative sepsis and the rate of readmission for pneumonia patients was calculated for each health system using hospital data from the Centers for Medicare & Medicaid Services (CMS).
- These metrics were selected as indicators of overall performance because of the growing financial impact (and subsequent prioritization by LHS) of sepsis treatment and readmissions caused by infectious diseases.
- Lower rates of sepsis and readmission are more desirable; since lower rates indicate better performance, systems with lower rates for these metrics were placed in higher percentiles, shown below.
- The distribution of the sample for both metrics is broad and therefore representative of the overall population of LHS.
- Only three health systems placed in the top quartile for both measures and three systems placed in the bottom quartile for both measures, indicating significant variation in performance between the two measures for most health systems.

Average Rate of Postoperative Sepsis Among the Top 100 Health Systems



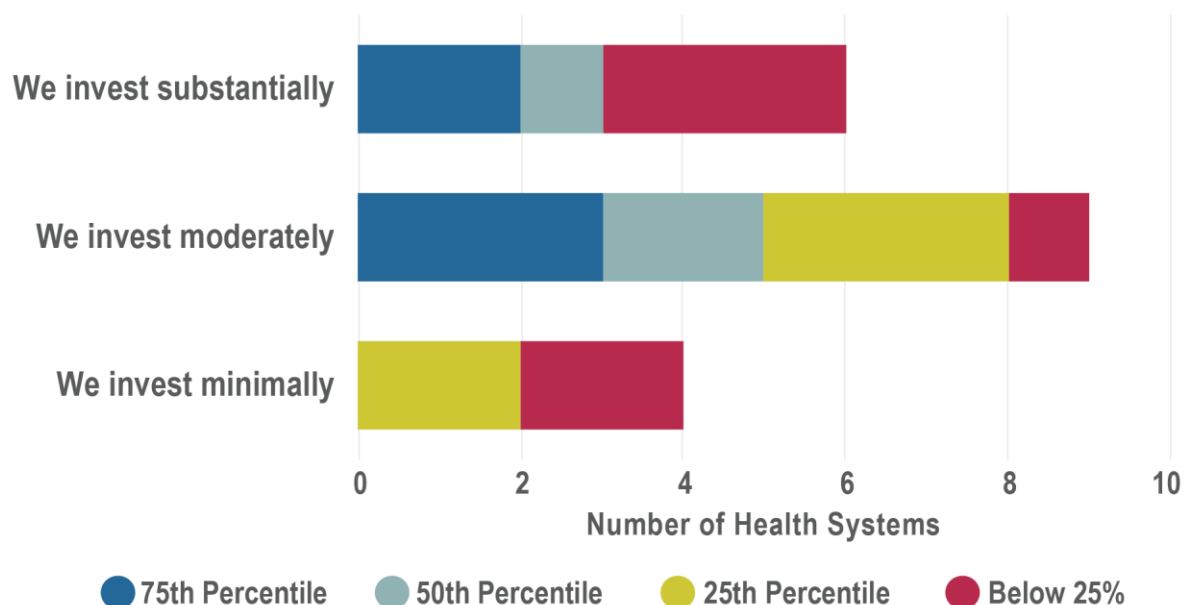
Average Rate of Pneumonia Readmission Among the Top 100 Health Systems



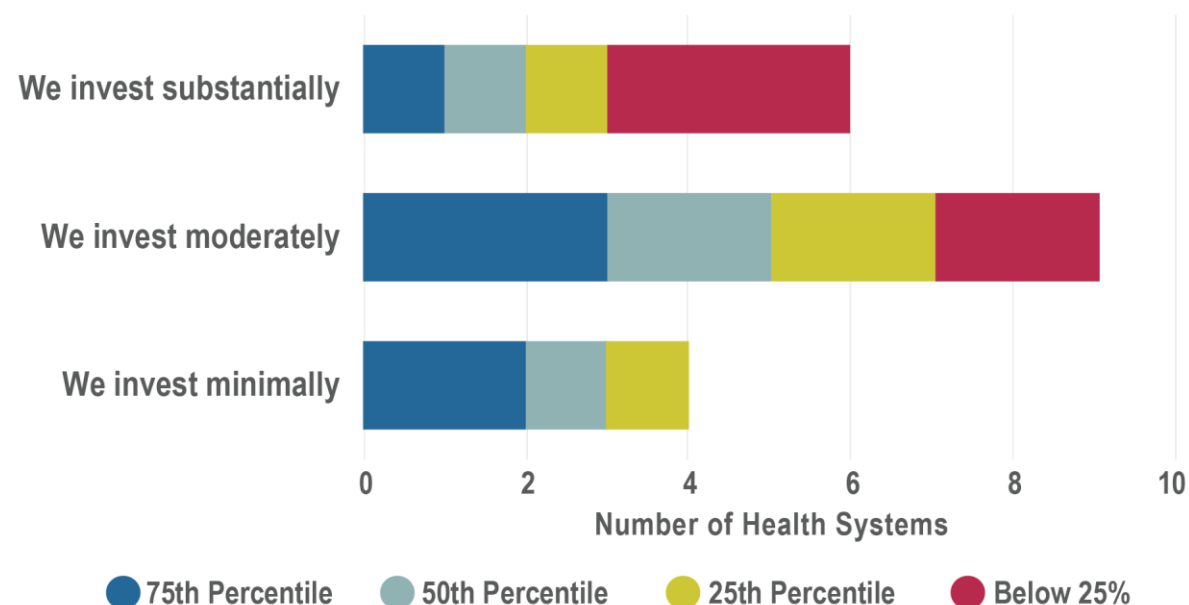
Investment in Technology for Infectious Disease Management by Benchmarking Metrics

- While health systems with low pneumonia readmission rates seem to invest more substantially than weaker performers, the opposite trend is seen for the sepsis metric. This variability suggests that there is no association between a health system's performance for these two measures and their investment in technology.

Investment in Technology by Rate of Readmission for Pneumonia Patients



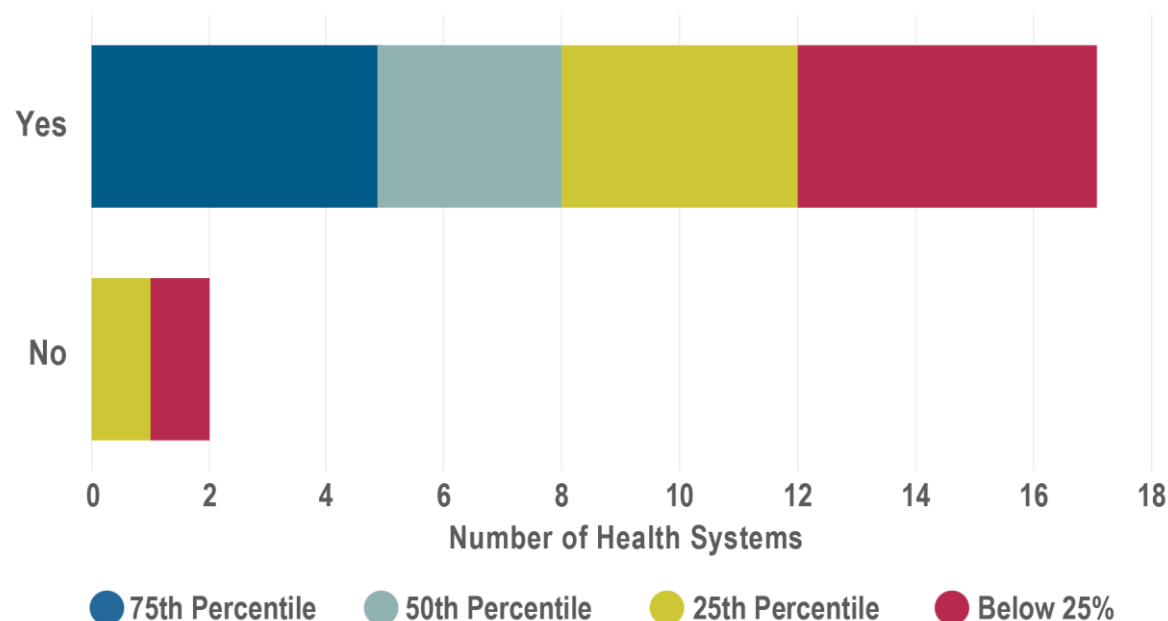
Investment in Technology by Rate of Postoperative Sepsis



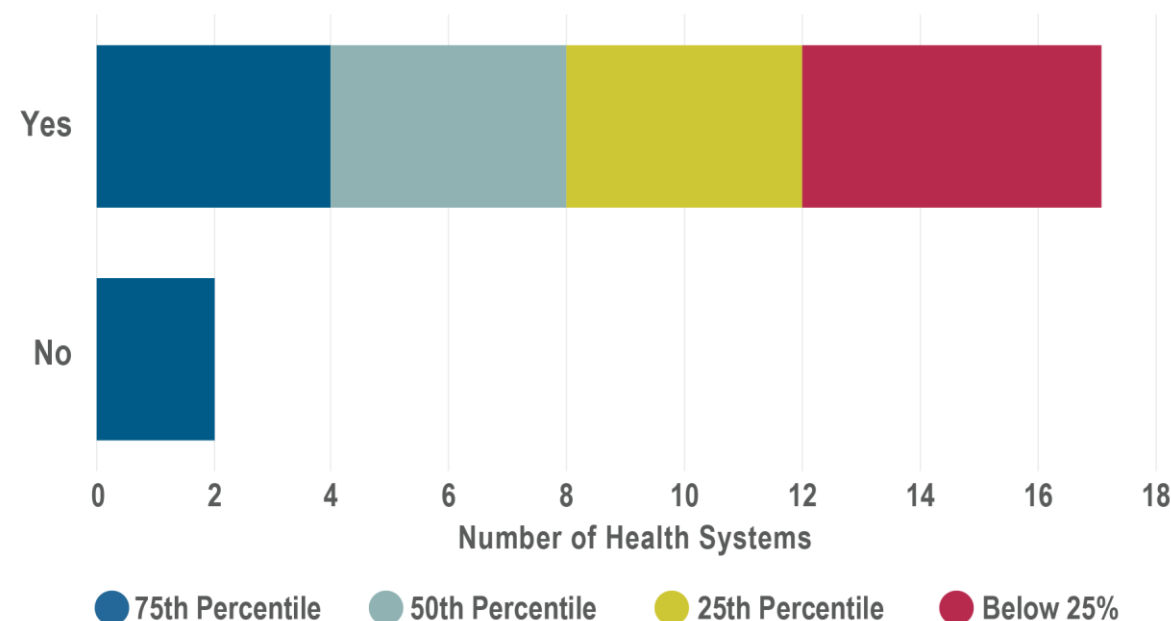
Use of RDT by Benchmarking Metrics

- Health system performance, as measured by the rate of pneumonia readmission and rate of postoperative sepsis, were not predictive of whether or not they use RDT. Relatively equal proportions of health systems in each performance quartile for both metrics use RDT.

Use of RDT by Rate of Readmission for Pneumonia Patients



Use of RDT by Rate of Postoperative Sepsis



V. Key Takeaways

Key Takeaways

1. Despite variation in the impact of infectious diseases on health systems and the processes they have created for managing these conditions, all health systems seek ways to better manage this patient population, given the agreement that there is insufficient reimbursement and an increasing cost of care for patients with infectious diseases.
2. There is an opportunity to increase the utilization of technology among health systems seeking to better quantify the clinical and financial benefits of RDT, improve the delivery of rapid diagnostic test results, and support clinicians in leveraging these results in a clinical setting.
3. While most health systems require prior authorization for antimicrobials and other agents, the methods health systems use to enforce these prior authorizations is highly variable. For this reason, there is a strong need for a tool to regulate and centralize prior authorization processes and facility-specific treatment guidelines.

Due to the significant variability identified in infectious disease management strategies and performance among LHS, additional insights are needed to establish key components of an effective health system strategy. Health systems can benefit from strategic guidance and support in managing, operationalizing, and reporting within their infectious disease programs.

About The Health Management Academy

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The Health Management Academy (The Academy) is a membership organization exclusively for executives from the country's Top-100 Health Systems and most innovative healthcare companies. The Academy's learning model identifies top priorities of health system leaders; develops rich content based on those priorities; and addresses them by convening members to exchange ideas, best practices, and information. The Academy is the definitive trusted source for peer-to-peer learning in healthcare delivery with a material record of research and policy analysis. Offerings include C-suite executive peer forums, issues-based collaboratives, leadership development programs, research, advisory, and media services. The Academy is an accredited CE provider. More information is available at www.academynet.com.

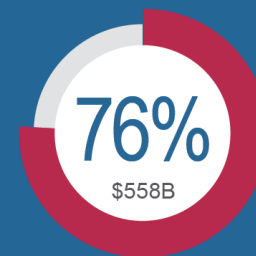
Our Network of Leading Health System Members

100 Health Systems

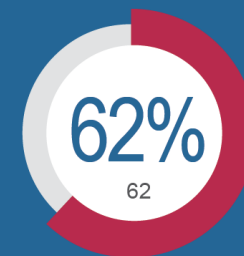
500+ C-suite Executives

2,000+ Health System Leaders

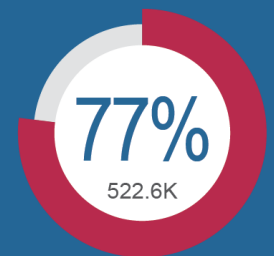
Representing



Top-100 Health
System Revenue



Top-100
Hospitals



Top-100
Physicians

About ILÚM

ILÚM Health Solutions is a provider of technology and services to support precision medicine using data science, microorganism genomics and machine learning to individualize therapy in infectious disease. ILÚM is part of Healthcare Services & Solutions, LLC, a wholly-owned subsidiary of Merck & Co., Inc. Its Insight solution and other portfolio products are commercially available and in use in major health systems.



Participating Health Systems

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AdvocateAuroraHealth

