Spotlight On: Expanding the Utility of HIE Care Coordination Tools to Suppress Superbugs in Indiana

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The Challenge
To identify patients with previous MRSA exposure upon admission to hospitals and initiate appropriate therapy and control measures to prevent the potential spread of the avoidable infection.

The Approach
Following a two-pronged approach, Indiana created an electronic notification system to prospectively track all known patients with exposure to MRSA.

Indiana’s Key Takeaways
- Harnessing technology isn’t enough; hospitals also need to change their policies and engage staff and patients.
- Creating opportunities for sharing promising practices and lessons learned enhances results.
- Tracking common data elements across hospitals helps uniformly identify where there is opportunity and progress.

In 2007, the Agency for Healthcare Research and Quality (AHRQ) awarded Indiana University and the Regenstrief Institute with funding to implement a program to reduce and prevent the incidence of methicillin-resistant Staphylococcus aureus (MRSA). Using a two-pronged approach, the program partners created a citywide electronic notification system to identify and track patients infected by MRSA and then applied the data to enable and share consistent, effective MRSA-reduction practices. We highlight these Indiana stakeholders because of the success they have had using health information exchange (HIE) to enable care coordination and the strong collaboration they have demonstrated to reduce MRSA rates in Indianapolis hospitals.

The Nosocomial Nightmare
MRSA is a type of staph infection that is resistant to many common antibiotics. First reported in 1961, MRSA is now regarded as a major hospital acquired pathogen worldwide, mainly transmitted from patient to patient through surface contamination and the contaminated hands of health care workers. In 2005, about 94,000 persons developed their first invasive (or serious) MRSA infection, of which approximately 19,000 died. Of these infections, about 86 percent are healthcare-associated. Indeed, of the different types of hospital-associated infections (HAIs), MRSA is a common complication of hospital care. However, many studies suggest that implementing infection control and prevention practices can reduce HAIs like MRSA by up to 70 percent, not only improving patient care but also saving between $25.0 billion to $31.5 billion in medical costs.

Indianapolis hospitals, like other US hospitals, are no strangers to the struggles of suppressing the MRSA bug; experiencing a steady increase in MRSA infection rates between 2004 and 2006 (see Figure 2). In 2007, a research team led by Dr. Brad Doebbling, MD, MSc, Indiana University, whom we interviewed for this brief, committed to expand surveillance and to identify and implement effective prevention programs. Their mission was to reduce the incidence of this avoidable infection, with the support of the Regenstrief Institute, Plexus Institute, AHRQ and Centers for Disease Control and Prevention (CDC).

Finding Solutions
To achieve the goal of reducing MRSA infections in five Indianapolis area hospitals, Dr. Doebbling and the research team are following a two-pronged approach — enable effective information sharing and promote organizational system change. The following sections provide an overview of each approach.
Effective Information Sharing

Indianapolis has a history of health care stakeholders working together to improve the cost and quality of health care. In 1994, the Regenstrief Institute helped Indianapolis’ five hospital systems launch a citywide clinical informatics network called the Indiana Network for Patient Care (INPC). The INPC, capturing info from over 90 percent of care provided at hospitals in Indianapolis, now has statewide reach and is run by the Indiana Health Information Exchange (IHIE).\(^\text{v}\) INPC contains 3 billion pieces of clinical data to support care for over 10 million patients. In addition to serving as an enormous repository of data, INPC also includes electronic notification functionality. When patients are admitted to participating hospitals or emergency departments, the hospital EHR system triggers an ADT (Admission, Discharge and Transfer) message to the INPC, which deposits information about the patient’s hospital encounter in the INPC and queries for information that may be relevant to the treatment of the patient.

It was an easy decision for Indiana University and Regenstrief to leverage the existing INPC infrastructure to help combat MRSA: the established technical connections with hospitals and wealth of compiled data were a great launching pad for identifying patients previously colonized or infected with the bacteria and then sharing that information at the point of care. Their hope was that this real-time information sharing would allow hospital infection preventionists to implement controls earlier and more often. And because patients often receive care at multiple sites, the team recognized that the cross-hospital exchange that INPC could help provide was crucial to achieving results.

Though the existing INPC gave the team a tremendous start, they had to take a few additional steps to launch the MRSA information sharing component. The team understood that infection preventionists were collecting information within individual hospitals regarding patients’ exposure to MRSA, but not all information was being shared through INPC. So, an informatics alert team, led by Dr. Abel Kho, MD, a Regenstrief Affiliated Scientist at Northwestern University, built a registry of patients with a history of MRSA colonization or infection. In addition to using electronic data from INPC, the team collected data from regional and commercial microbiology labs to populate the registry.\(^\text{vi}\) To supplement the electronic data received from the labs, the team reached out directly to local infection preventionists to gather additional data, which had frequently been captured by hand. The result of the collaboration was a comprehensive MRSA registry containing pertinent data elements\(^\text{vii}\), outlined in Figure 1.

Following registry population, the team configured INPC’s established electronic notification system to automatically alert staff at four Indianapolis hospitals any time a patient with previous MRSA colonization or infection was admitted. More specifically, when any patient is admitted to the hospital or ED of a participating facility, an ADT message is sent to the INPC infrastructure.

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In addition to triggering the standard query of the INPC for general patient information, the message also triggers a query of the MRSA registry, using the common patient identifier, to determine if the patient had a
prior MRSA colonization or infection. If there is a positive result, INPC sends a secure email to the hospital registrar, as well as to the hospital’s infection preventionists, advising them to place the patient in a private room and test again for being a carrier. **Figure 2** below provides an overview of the notification system.

**Figure 2: MRSA Electronic Notification System Workflow**

1. **Patient admitted to hospital**
2. **ADT message automatically sent from hospital to INPC**
3. **ADT message queries INPC & MRSA registry for match against patient information contained in ADT**
4. **If match, registrar and infection preventionist receive a secure email with MRSA alert message**
5. **Patient moved into isolation and culture is taken to determine if patient is a carrier**
6. **If necessary, hospital personnel take precautions when entering room (e.g. wear gown)**

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Promoting Organizational System Change

The data sharing strategy was coupled with an organizational system change initiative that followed lean thinking\(^\text{viii}\) and a method for staff engagement called positive deviance\(^\text{ix}\). The team applied the strategy by seeking out successful practices used by front line staff members and learning how to replicate them. Working with the Plexus Institute, the team learned how to effectively harness data to help identify, adopt, and improve adherence to effective infection prevention techniques such as hand washing and putting patients in isolation. The approach has been well-received by the staff members. As one nurse described it, “this has changed the whole way we approach quality and safety problems in our system.”

The Plexus Institute supplied organizational change coaches to the participating hospitals and trained teams from each hospital on how to harness and use the data they were receiving. To evaluate their progress over time, area hospitals committed to capturing and sharing a baseline of common data elements about MRSA and overall hospital infection data, MRSA prevalence, screening protocols, and summary data about surveillance and infections identified. The team trained hospital personnel to capture and track the data, such as blood stream infections, and share the results through a data sharing program, as well as through blog postings, conference calls and in-person meetings. While there was structure and training given to the hospitals, the team left the implementation of new techniques to dedicated “MRSA reduction teams” within each hospital. For example, one hospital began tracking the supplies used to isolate a patient by unit in order to evaluate whether certain units were using isolation approaches more frequently than others. Similarly, another hospital worked closely with the housekeeping staff to identify opportunities for improving the decontamination of rooms. A third hospital engaged staff from multiple departments like transportation and occupational therapy to ensure all patient contact was reviewed and changed to support the measures.

By encouraging partnerships, information sharing and providing hospitals with helpful tools and resources, the research team empowered hospital personnel to be innovative in how they achieved success.
'Zero Tolerance for Avoidable Infections'

The results of their efforts are remarkable. During the first implementation period (2007-2008) of the program, the participating hospitals experienced an increase in recommended practices and reduction in MRSA infections. During the second implementation period (2009-2010), hospitals experienced an 85 percent reduction in the MRSA blood steam infection incidence rate compared to the baseline period. After the second implementation period was complete, reductions remained 32 percent lower than baseline.

**Figure 3** depicts an example of the reduction in blood stream cultures positive for MRSA that participating hospitals observed coinciding with the implementation of this hospital-based program.

**Figure 3: Counts of MRSA Blood Stream Infections in Indianapolis Hospitals from 2003-2010**

After the first AHRQ award in 2007, Indiana University and its partners received subsequent funding from AHRQ to expand the program for three additional years. In subsequent phases of the program, seven additional health care systems began participating in Indiana, as well as in other states/countries including Montana, Maine and Ontario, Canada. Since its initial inception, the program has delivered 16,000 notifications on over 10,000 patients across 17 different hospitals in Indiana. One fourth of these alerts were sent to hospitals where the patient had no prior history of MRSA; without the alert the patient’s prior history of MRSA infection would have been very difficult, if not impossible, to identify. Though the AHRQ-funded program has ended, the participating hospitals continue to leverage the INPC notification system and utilize the practices and policies developed through the program. The same program is now being applied to other hard-to-control bacteria often spread while patients are in the hospital. As the program marches forward, Dr. Bill Tierney, President and CEO, Regenstrief Institute, is committed to sharing their successes:

"We needed to step up and take ownership of the problem of avoidable infections. Managing information between hospitals and other health care venues is just one method. Hospitals deciding that it’s in their best interest to cooperate and share promising practices with one another would be a boon in other cities, too. Zero tolerance of avoidable infections!"

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1 Hospital systems in MT, ME, and Canada participating in organizational change components only.
References & Links

To learn more, contact Dr. Brad Doebbeling at bdoebbel@iu.edu.


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ii Centers for Disease Control and Prevention, “MRSA Surveillance.” Last modified April 8, 2011.


