MetroHealth Case Study: *Acinetobacter*/MDROs

**Executive Summary**

*Acinetobacter* is a rare, virulent and typically multi-drug resistant organism that can cause significant morbidity and mortality. In the summer/early fall of 2010, the MetroHealth System (MHS) experienced an outbreak of *Acinetobacter* in our hospital. As part of the multidisciplinary rapid and ongoing response to this outbreak, four different EHR tools were developed and implemented for clinicians. A set of three additional EHR tools were developed and implemented for infection control staff. These seven EHR tools, in combination with other non-EHR interventions, stemmed the *Acinetobacter* outbreak and have led to a steady, now over 30% reduction in overall *Acinetobacter* cases throughout the MHS, eliminating over 200 infections that otherwise would have been expected to occur, saving several million dollars in healthcare costs and probably preventing several deaths. Since implementation five years ago, the MHS has never had a month with as high a number of new *Acinetobacter* cases as it did the month before these tools were implemented.

**Local Problem**

In the summer/early fall of 2010, the MHS infection control staff identified a case of *Acinetobacter* in a patient in the MHS burn unit who expired. Associated with this was a two-fold increase in hospitalized patients with new *Acinetobacter* infections. Because of the virulence of this organism, the rapid increase in its prevalence and its presence in a patient that died, a healthcare system-wide, multi-disciplinary task force chaired by the Chief Medical Officer and Chair of Infection Control was assembled. The task force included the Chief Information Officer and the Chief Medical Informatics Officer. The goal of the task force was to develop any and all tools, processes and approaches that would stem the tide of the increase in new *Acinetobacter* cases, allow for efficient and effective care of patients with *Acinetobacter*, decrease the overall baseline number of *Acinetobacter* cases and hopefully not allow new *Acinetobacter* cases to reach levels they had in the past.

**Design and Implementation**

From the overall MHS *Acinetobacter* task force, an Information Services sub-task force was developed that included information services and informatics staff. The goal of this group was to design, build, test and implement EHR based tools and processes in support of the overall *Acinetobacter* task force goals. The sub-task force focused on tools for clinicians that would help to more easily and effectively identify patients with *Acinetobacter*, allow for better handoffs between staff caring for patients with *Acinetobacter* and allow staff to easily screen patients for possible *Acinetobacter* infections. The sub-task force also developed a suite of tools for infection control staff to more efficiently and more completely identify and track patients with *Acinetobacter*. 
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The final set of EHR tools implemented by the sub-task force included:

- **Tools for Clinicians (all MDROs)**
  - MDRO Header and Patient Name
  - MDRO Best Practice Alert
  - MDRO Handoff Communications
  - MDRO Screening Culture

- **Tools for Infection Control Staff (*Acinetobacter*)**
  - Reporting Workbench Reports
  - Daily emails
  - Paging for positive cultures/admissions

**How Health IT Was Utilized**

**Tools for Clinical Staff**

Tools for clinical staff were developed to more easily identify patients with any multi-drug resistant organism (MDRO), which included *Acinetobacter*, and isolation procedures that were in place for those patients. Patients with an MDRO where identified with a special “mdro!” status in their patient name field (Figure 1). Any isolation status that the patient may have because of their MDRO was also clearly added to the patient’s EHR header (Figure 1). The special name MDRO nomenclature also included a hyperlink that showed all relevant cultures related to a patient’s MDRO status (Figure 2). The isolation status also included a hyperlink to clearly describe the details of all isolations status for improved compliance with the isolation status (Figure 3). Best practice clinical decision alerts were also developed for patients with MDROs if they did not appear to have appropriate isolation orders (Figure 4).

![Figure 1 – Electronic health record screen shot showing special MDRO hyperlinked patient name (upper left-hand red box) and patients isolation status (upper right-hand red box)](image1)

![Figure 2 – Electronic health record screen shot showing hyperlink MDRO culture details (red boxes)](image2)
To help ensure that a patient’s MDRO status and necessary isolation precautions were known and maintained at transitions of care throughout the healthcare system, tools were developed so that staff could easily identify and pro-actively prepare for patients with MDROs. The transition of care nursing handoff SBAR report was modified to include a section for isolation precautions (Figure 5). Schedules were modified to include a column to identify a patient’s MDRO status (Figure 6).

Figure 3 – Electronic health record screen shot showing MDRO isolation order clinical decision support

Figure 4 – Electronic health record screen shot showing isolation hyperlink details

Figure 5 – Electronic health record screen shot showing patient isolation order in SBAR report

Figure 6 – Electronic health record screen shot showing MDRO schedule column
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Another important aspect of the generalized MDRO EHR interventions developed with the support of the *Acinetobacter* task force, was the ability to screen patients (and objects) to check their MDROs. This required development of a special order in the EHR so that the specimens could be specially processed and billed (Figure 7).

Figure 7 – Electronic health record screen shot showing specially developed MDRO screening order

**Tools for infection Control Staff**

Tools were developed for infection control staff to promote better real time notification of newly diagnosed and newly presenting patients with MDROs. This notification allowed infection control staff to intervene in real time to control the infection in the patient and to reduce the potential spread of infection to other patients as quickly as possible. The primary tool developed for this was integration between the laboratory information systems, the EHR, the admission, discharge, and transfer system and the paging system. Tools were implemented so that any time a patient with *Acinetobacter* presented to our emergency department or inpatient area the ADT system sent out a page to the infection control staff on call to immediately alert staff in the area to ensure that appropriate infection control measures were being taken.

Additionally, daily reports were developed (that could be re-run and updated manually at any time) (Figure 8). These reports were available in the EHR and also automatically emailed to interested parties daily.

Figure 8 – Electronic health record screen shot representative *Acinetobacter/MDRO* population report
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**Value Derived**

The *Acinetobacter* task force continued from the fall of 2010 through the fall of 2011 at which time it was recognized that the increase in *Acinetobacter* had been addressed and that systems were in place to continue addressing *Acinetobacter* (and other MDROs). The task force was disbanded with continued monitoring for new *Acinetobacter*. Figure 9 shows the incidence of new *Acinetobacter* infections per month “pre-task force” (1/09-7/10) and “post-task force” (8/10-5/15).

Prior to the Task Force creation, the average rate of new *Acinetobacter* infections was an average of 12 per month over the preceding 18 months, with several spikes of over 20 per month. The creation of the Task Force quickly (within 1 month) eliminated the upward trend in new *Acinetobacter* infections. Over the subsequent almost 4 years, even after the Task Force stopped meeting there has been a generally steady decrease in new *Acinetobacter* infections such that the average number of new *Acinetobacter* infection over the last 46 months has been 9 per month and only one month where there has ever been over 15 new cases. Given the significant increase in prevalence in the first half of 2010, these interventions probably stopped upwards of 50 new *Acinetobacter* infections in 2010. Establishing a new baseline over time (2011 to present) stopped another 162 new *Acinetobacter* infections from occurring. This EHR enabled improvements effort was recognized by the Association of Medical Directors of Information Service in 2011. Figure 10 shows the rate of attributed hospital acquired MDRO *Acinetobacter* infections (the most serious *Acinetobacter* infections we were trying to reduce) from 2009 to 2014. Figure 12 shows the hand hygiene compliance rate from 12/2010 to 12/2014 which was a non-IT enabled strategy also employed to stem *Acinetobacter*. MDRO infections.

![Figure 9](image-url)
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Lessons Learned

The MHS’s *Acinetobacter* outbreak had nothing to do with the EHR/HIT, but it demonstrates the cultural shift that had occurred within the MHS since the EHR was first installed starting in 1999. When any important clinical or operational issue arises in the MHS, the EHR specifically and HIT generally are seen as tools to bring to bear as part of a solution(s). Leaders and representatives from information services and informatics are seen a critical members to address these issues even if EHR/HIT is not a direct cause and it may initially seem like the EHR/HIT may not be able to contribute to a solution(s).

As with other complex change management and quality improvement efforts related to the EHR, several specific key lessons learned include:

1. Inter-disciplinary team is critical (in this case – infection control, clinical, quality improvement, information services and clinical informatics)
2. Typically, for complex issues no single intervention will provide a “magic bullet;” rather a series of interventions (technical and non-technical) can provide significant and long-term impact, but will still not provide perfection for any process that still involves people
3. Developing initial and ongoing outcomes (in this case monthly new *Acinetobacter* infection) is needed so that initial and ongoing success can be evaluated
4. When issues arise, evaluate if there are larger opportunities associated with the issue (here the initial issue was *Acinetobacter*, but in designing and implementing solutions we took into account all MDROs)

Financial Considerations

All of the tools implemented as part of this effort relied on existing functionality of the EHR/HIT infrastructure already in place in the MHS. The cost to implement these features was only the MHS staff time need to design, build, test and implement, estimated at several hundred hours.

With the significant rise in *Acinetobacter* infections, these interventions (along with non-technical interventions not described, like increased focus on hand hygiene and changes in room cleaning methods) are estimated to have reduced new *Acinetobacter* infections by 52 in 2010, and from 2011 through mid-2015 by another 162 infections. Using a representative cost per new *Acinetobacter* infection of at least $25,000 (estimated typical cost hospital acquired infections), this initiative has saved at least $4.3 million dollars to date in healthcare expenses and is anticipated to save at least $1 million annually on an ongoing
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References