Effectiveness of Rapid Methicillin-Resistant Staphylococcus Aureus (MRSA) Screening in Reducing Hospital Acquired Infections

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Learning Objectives

• Discuss how leveraging new testing technologies can aid in the management of Hospital Acquired Infections (HAIs)
• Describe how screening/testing programs can contribute to performance driven healthcare
• Articulate the Laboratory’s role in the identification of HAIs using new technologies

John T. Mather Memorial Hospital

Our Mission is to be the best community hospital in New York State
U.S. News & World Report’s Best Hospital Rankings
Magnet Status

• 248 Bed Community Hospital established in 1929
• Located North Shore on Long Island in Suffolk County
• Continually changing to meet the needs of the community
Bringing Molecular Testing into the Clinical Lab: The Basics and Beyond for Planning and Achieving Successful Results

Lab Information

Adding Value with Lab Tests

• Goal is to improve patient outcomes while reducing the cost per episode of care.
• Lab can spend a bit more money, but contribute to millions in cost savings.

Scope of the Problem
Hospital Acquired Infections

Hospital infections cost $9.8 billion a year

Source: JAMA Internal Medicine September 2013

Hospital Acquired Infections

- In the US, hospital acquired infections (HAIs) afflict nearly 2 million patients and kill approximately 99,000 people annually.

- Every year an estimated 1.7 million Americans develop a new infection while hospitalized.

Reference: CDC

The Challenges

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MRSA Colonization
The Silent Killer

Who is the MRSA carrier?

Definitions
Infection vs. Colonization

- **Infection:**
  The entry and multiplication of micro-organisms in the tissues of the host leading to signs and local or systemic symptoms

- **Colonization:**
  Presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or damage

Implementation of a MRSA Surveillance Program

**Key Questions**

- **Which screening test do you use?**
  - Routine culture media
  - Rapid test (MDx)

- **Who to test?**
  - High risk
  - Universal screening

- **When to isolate the patient?**
  - Pre-emptive (when test obtained)
  - Reactive (after result is known)

- **Best way to utilize isolation rooms**
  - Rapid test
  - Routine culture for entry or removal

Guilty until proven innocent or innocent until proven guilty
Where Do We Begin?

Screening programs can be effective for various groups of patients

- High-risk Admissions
  - ER
  - Hospital transfer
  - Nursing home

- Frequent Hospital Visits
  - Dialysis
  - HIV

- All Hospital Admissions

- High-risk or Infected Patients
  - ICU
  - CCU
  - Surgical

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Mather Experience

Rapid Active Surveillance
J.T. Mather Objectives

- Improve the diagnosis and identification of MRSA infections
- Identify patients that are colonized or infected
- Place colonized/infected patients into contact isolation
- Reduce patient-to-patient transmission
- Reduce HAIs and associated morbidity and mortality
- Improve patient safety and outcomes
- Comply with regulatory requirements
Mather's Surveillance Program

Our Campaign:
The BUG Stops Here!

Rapid Surveillance is the Foundation for Effectively Eliminating HAI’S

Teams Round Daily AM

Appropriate Contact Barrier

Hand Hygiene

Appropriate Antibiotic Selection

RAPID ACTIVE SURVEILLANCE

Immediate Real Time Alert by Phone and Fax to Preventionists from Laboratory

Leads to Quick Identification of Patients Requiring Contacts

Improved Resource Utilizations and Reduce Costs

Immediate patient Counseling to Reduce Transmission to Family and Community

Getting to ZERO INFECTIONS

Teamwork

Surveillance Program should include:

- Senior Hospital Leadership
- Infectious Disease Professionals
- Clinical Laboratory
- Pharmacists
- Nursing Management/Staff
- Physicians
- Environmental Services
Rapid MRSA Screening

Molecular Diagnostics Detection and Screening Technology

Culture – The Gold Standard

- Traditional microbiology 48 hr broth enrichment
- Sensitive
- Low cost
- Report final results in 96 hours (4 days)
- After many patients are discharged but not before they have had an opportunity to transmit their MRSA to others

Molecular Diagnostics

- Direct method of infectious agent detection
- Identification of infectious organisms through the detection of DNA/RNA sequences
- Dramatically reduce (TAT)
Cepheid GeneXpert®

- Automates and integrates sample purification, nucleic acid amplification, and detection of the target sequence in samples
- Uses real-time PCR and RT-PCR
- Uses primers and probes to detect a proprietary sequence for the presence of a cassette inserted into the MRSA/C. diff chromosome in a single test cartridge
- Delivers test results in less than an hour
- Available on-demand in real time, around the clock, allowing for fast interventions by clinicians and infection control preventionists when HAI is detected.

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Performance Metrics

Active Surveillance For MRSA Cost-Benefit Molecular Testing (PCR)

<table>
<thead>
<tr>
<th>Costs</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screened high risk patients</td>
<td>246 bed hospital</td>
</tr>
<tr>
<td>2006: 98/mo = 1,050/yr</td>
<td>8,373 patient days/91% occupancy</td>
</tr>
<tr>
<td>2009: 139/mo = 1,663/yr</td>
<td>0.90/1,000 = 74.0 infections (2007)</td>
</tr>
<tr>
<td>2010: 176/mo = 2,107/yr</td>
<td>0.59/1,000 = 48.5 infections (2008)</td>
</tr>
<tr>
<td>2011: 182/mo = 2,181/yr</td>
<td>0.29/1,000 = 23.5 infections (2009)</td>
</tr>
<tr>
<td>2012: 164/mo = 1,967/yr</td>
<td>0.25/1,000 = 19.0 infections (2010)</td>
</tr>
<tr>
<td>2013: 164/mo = 1,952/yr</td>
<td>0.17/1,000 = 13.0 infections (2011)</td>
</tr>
<tr>
<td>PCR Assay = $50 per test</td>
<td>0.23/1,000 = 18.0 infections (2012)</td>
</tr>
<tr>
<td>Total Screening Cost $546,000</td>
<td>0.19/1,000 = 12.0 infections (2013)</td>
</tr>
<tr>
<td>NO ADDITIONAL FTE’S</td>
<td>(2007 vs 2013)</td>
</tr>
<tr>
<td>MRSA testing performed 24/7</td>
<td>Difference = 62.0 fewer infections @ $35,000</td>
</tr>
</tbody>
</table>

- Increase in 2008 hospital costs = $935,000
- Decrease in 2009 hospital costs = -$875,000
- Decrease in 2010 hospital costs = $140,000
- Decrease in 2011 hospital costs = $210,000
- Increase in 2012 hospital costs = $170,000
- Decrease in 2013 hospital costs = $210,000
- $2,170,000 cost avoidance
- Net Savings Due to Prevention $1,624,000

(2007 vs 2013)
Clinical Impact and Financial Metrics

- Implementation of an Active MRSA High Risk Screening Program
- Improved services by bringing Molecular testing in-house
- Increased Awareness of HAI's

Achieved Best Practices in:

- Decreased Infection Rate
- Cost Reduction

Cost Reduction

- 84%

Total Cost Avoidance/Reduction of MRSA Testing/Screening is $1,624,000

Financial Impact of Rapid Screening for HAIs

Creating Value

"One of the Hospital's top priorities is to eliminate HAIs, reduce patients' length of stay and enhance patient safety. By delivering critical actionable information quickly, the Laboratory can help us achieve these goals. Our HAIs rapid screening program is one great example".

Dr. Joan Faro
Chief Medical Officer
Length of Stay

- Implementation of an Active MRSA Screening Program
- Improved services by bringing Molecular testing in-house
- Increased Awareness of HAIs

Length of Stay in ICU and CCU

YEAR

Days

Reflects an annual cost savings of $491,000

Outcomes of a GREAT Rapid HAIs Surveillance Program

Organizational Performance

Achieved Best Practices in:

- HAIs
- Operational Efficiency
- Patient Safety
Laboratory Performance

Achieved Best Practices in:

- Turnaround Time (TAT)
- Delays
- Quality

Patient Health Outcome

Achieved Best Practices in:

- Complications
- HAIs
- Patient Safety

Measurable Outcomes of Rapid HAIs Surveillance Programs

- Rapid and effective management for reduction of Hospital Acquired Infections (HAI)
- Making evidence-based, data driven decisions
- Defining comprehensive outcome measures
- The impact of value added measures on patient outcomes, cost, cost effectiveness, rapid turnaround time, technology selection, reduced infection rates and enhanced patient safety and satisfaction
- Laboratory can play a major role in reduction of HAIs
Lessons Learned

• Start screening with a pilot population
• Continuous assessment of the program
• Keep communication open
• Collaboration among all stakeholders is paramount for success
• Education

Executive Summary

• The Laboratory directly contributes to patient care by implementing advanced technology to support an active surveillance program.
• Active MRSA surveillance can reduce HAIs
• Second generation molecular MRSA testing makes it possible to dramatically reduce TAT, while delivering accurate test results in real time.
• Laboratorian/clinician communication forums and collaborations enable initiatives, like MRSA, to be successfully implemented to reduce costs and enhance patient safety.

J.T. Mather Laboratory Team

THANK YOU!
Wrap up

Questions????

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