Case Study: An Active Surveillance Program

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Objectives

• Discuss the guidelines for an Active Surveillance program
• Discuss the expectations for an Active Surveillance program
• Develop a framework for evaluating success and the effectiveness of the program
Personal Impact of MRSA

- Hospital stays from MRSA Infection:
  - 368,600 hospitalizations in 2005 were due to MRSA infection
  - 30% increase from 2004
  - 16-fold increase since 1995
- 4.7% hospital mortality for patients with MRSA in 2004 vs. 2.1% for patients without MRSA
- Hospitalized patients with MRSA infection in 2004:
  - 10 day length of stay vs. 4.6 days for all other stays
  - $14,000 cost of hospital stay on average vs. average of $7,600 for all other stays


Personal Impact of MRSA

Estimates based on calendar year 2005 US data:
- 94,000 cases of invasive MRSA infections among patients
- 19,000 (approx) patients died (18%) during initial hospitalization
- 86% of invasive MRSA disease had exposures to hospitals or health care settings
- 14% of patients had no recent hospitalization or other risk factors
- Majority of cases overall had infection manifest or discovered when the person was out of the hospital:
  - 58% were community-onset HA-MRSA infections (e.g., persons recently discharged from a hospital or recently had surgery)
  - 27% were hospital-onset HA-MRSA infections (i.e., the typical nosocomial MRSA infections)
  - 14% were community associated CA-MRSA infections


Rates of invasive MRSA, 2007

Total invasive infections = 34,210,000 population

- Community-associated: 5.93/100,000 (17%)
- Hospital-onset: 8.43/100,000 (25%)
- Healthcare-associated community-onset: 19.85/100,000 (58%)

Financial Impact of MRSA

<table>
<thead>
<tr>
<th>Excess LOS</th>
<th>Direct Cost</th>
<th>Total Cost</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSSA 4</td>
<td>$4,989</td>
<td>$9,961</td>
<td>0.043</td>
</tr>
<tr>
<td>MRSA 12</td>
<td>$14,783</td>
<td>$27,083</td>
<td>0.043</td>
</tr>
<tr>
<td>Days 8</td>
<td>$9,794</td>
<td>$17,422</td>
<td></td>
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P values:
- 0.043
- 0.023

Abramson ICHE1999; Engelman ICAAC2001; Kaye ICAAC, 2002; Cosgrove ICAAC 2001
Financial Impact of MRSA

- Annual cost to treat MRSA patients in the U.S. between $3.2 billion and $4.2 billion
- Extra cost associated: a bloodstream infection $17,422 (MSSA $9,661)
- A surgical site infection $36,133 (MSSA $4,989)

Source: Abramson, ICHE 1999;20:408  Engelman et al. 2001;ICAAC 2001; Kaye et al. ICAAC 2002  International Society of Pharmacoeconomics Outcome Research 5/05

Clinical Impact of MRSA

- Colonized patients are 30-60% likely to become infected with MRSA
- Patients are twice as likely to die from a MRSA bloodstream infection
- MRSA colonization is the tip of the iceberg


Frequency and Sites of MRSA Colonization

- Forehead 51%
- Nose 54% - 93%
- Neck 35%
- Axilla 13% - 28%
- Hands 40%
- Groin 30% - 39%

68% of positive patients were colonized at more than one extranasal site
95% of nasal carriers had MRSA at extranasal sites


Figure 1. Hospital stays with methicillin-resistant Staphylococcus aureus (MRSA) infections, 1993-2005

Total number of discharges

Source: APIC, Center for Delivery, Organization, and Networks Healthcare Cost and Utilization Project, Health-e Network, 1993-2005
Contaminated Environmental Surfaces and Equipment

- Items frequently contaminated near patients include:
  - Bed rails
  - Bed linen
  - Overbed tables
  - Blood pressure cuffs
  - Intravenous pumps
  - Nurse call buttons
  - Urinary collection bags

Survival of MRSA/VRE in the environment

Duration of survival of MRSA in dry conditions:
- Plastic charts = 11 days
- Laminated tabletop = 12 days
- Cloth curtains = 9 days

Activities Leading to Hand Contamination Among Healthcare Workers

- Resistant bacteria on the skin or in the gastrointestinal tract of patients often contaminate items in the immediate vicinity of the patient
- Healthcare workers can contaminate their hands by touching environmental surfaces near affected patients

Patient Risk Factors for MRSA

- Hospitalization or recent healthcare contact
- Admission to a nursing home or LTC
- Antibiotic use
- HIV infection
- IVDU
- MRSA colonization
- Hemodialysis
Greenwich Hospital
Methicillin-resistant Staphylococcus
(MRSA)
Reduction Initiative

The Problem
• A >50% increase in the number of HA-MRSA infections between 2000-2003 despite conventional infection control practices
• Upon thorough investigation source of the increased incidence could not be determined

Background
• 173 Bed community hospital located in Connecticut
• Part of Multi-hospital Yale New Haven Health System
• Acute care medical facility (MSICU, NICU, Medical-surgical, Oncology, Surgery)
• Several Outpatient clinics
• Several nursing homes in the community

Infection Control Practices
In Place at time of Increased MRSA Infections
• “Flagging” MRSA patients in the computer
• Contact Precautions (gown, gloves, mask)
• Terminal cleaning of isolation rooms
• Surveillance cultures of staff on units with a high rate of MRSA
• Environmental sampling to determine effectiveness of cleaning
• Hand hygiene
• Staff and physician education
Hand Hygiene

Culture of patient safety in our organization

- “Protect Our Patients”
- “Partners in Care”

Number of HA-MRSA Infections, 2000 - 2003

An increase of 64%

Number of CA-MRSA Infections, 2000 - 2003
Guidelines and Recommendations to Prevent Transmission of MRSA (SHEA, APIC, CDC)

- System to identify MRSA patients
- Feedback to clinicians
- Education
- Hand hygiene
- Contact Precautions (single room, cohorting)
- Environmental decontamination
- Dedicated equipment
- Masks
- Antimicrobial stewardship
- Active surveillance testing
- Decolonization treatment

Review of Published Guidelines

Institute basic practices:
- Risk assessment
- Hand hygiene
- Contact precautions
- Disinfection of environment
- Education
- Monitoring

Monitor Rates of MRSA:
- Effective Control
  - Chlorhexidine bath of ICU patients
- Not effectively Controlled
  - Consider decolonization

Getting Started: MRSA Reduction Initiative

- Literature review
- Risk assessment
- Study of the problem
- Making the business case
- Team formation
- Program design
- Implementation

Risk Assessment

- Determined the HA-MRSA and CA-MRSA infection rates in the defined population.
- Reviewed micro lab results and tracked patients with infection as well as colonization
- Data obtained served as a baseline for comparison.
- Determined what group of patients was more likely to be colonized with MRSA.
Study of the Problem
Developed a plan to identify MRSA colonized patients by screening all patients admitted to the hospital over a 6 week period in 2004.
Data collected:
- demographics,
- hospitalizations,
- antibiotic use,
- LTC or nursing home
- IV drug use,
- indwelling devices,
- Co-morbidities (cancer, dialysis, liver disease)
- living with someone with MRSA.
- Open wounds

Making the Business Case
- Met with Administration regarding the impact of MRSA on the organization (cost of isolation, supplies, treatment, LOS).
- Outlined goals and objectives for the MRSA reduction initiative.
- Developed a comprehensive plan for implementation.

Strategy: Interdisciplinary collaboration

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<tr>
<th>Structure</th>
<th>Process</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Collaboration between Infection Control, Micro Laboratory, Nursing, IT, Env</td>
<td>Engage Educate Execute Evaluate</td>
<td>Reduced/eliminate MRSA infections</td>
</tr>
</tbody>
</table>

MRSA Reduction Initiative Implementation
- Cost estimates (supplies, lab staff)
- Training and education
- IT support (alerts, flagging)
- Lab support Microbiology support was critical!
- Implementation of screening (who, when, how often)
- Data collection & Statistical analysis
- Monitoring for compliance
- Results and feedback
Active Surveillance Screening

- Screened high risk patients for colonization.
- Developed a reliable method for identifying patients to be screened. (all patients from LTC and nursing homes within 24 months of admission)
- Assigned responsibility for screening the patient. Patients were screened in the Emergency Dept and on nursing units if direct admit
- Monitored to ensure that patients were screened.
- Flagged colonized patients medical record when discharged.
- Provided real-time notification of positive results

MRSA Reduction Initiative Implementation

- No treatment was offered to patients found positive on screening (non-clinical specimens).
- Screening was performed using chromogenic media (direct and enriched).
- The cost of screening was assumed by the hospital.
- Patients admitted to the hospital for less than 24 hrs were excluded from screening.

MRSA Reduction Initiative Implementation

- Provided feedback to staff on compliance with initiative (lab, environmental Services, nursing).
- Hold Staff accountable.
- Patients placed on modified “contact Precautions” (hand hygiene emphasized)
- Physician practices, LTC facilities and transferring hospitals were notified of patients colonization status.
- Patients and family members were educated on MRSA prevention.

Basic Infection Prevention Practices, Still Emphasized

Dedicated staff
Number of HA-MRSA and CA-MRSA Infections, 2000 – 2006, 2009

Cost of Testing versus Potential savings from avoided infections

Cost-Analysis of Active Surveillance

- Assumptions:
  - 34-bed general medical unit in Canada for a year
  - Total cost of surveillance:
    - culture-based = $5,517
    - PCR based = $38,325
  - Attributable cost of infection = $10,000–$16,000
  - Cost of colonization = $1,300

- Raboudet al., ICHE 2005;26:607-15

Measures of Effectiveness of Screening and Identification of Colonized Patients

- In the 12 months after implementation the HA-MRSA rate decreased by 52%.
- In the following year the rate decreased by 46% and continued to decrease.
- The challenge is the number of colonized patients who go on to develop MRSA infection. In our look back that number represented 70% of infected patients. The number of Non-infectected Patients increased.

Interventions That Resulted in Sustained Improvement

- Involvement of Leadership
- Staff Involvement - Clearly lay out the expectations.
- Formation of a core team of the “Key Players”
  The Microbiology Laboratory Involvement was critical
- Starting small and expanding gradually.
- Providing updates on progress, review data frequently
- Acknowledge and reward Compliance
Thank You For Washing

References:

- IHI Getting Started Kit: Reduce Methicillin-Resistant Staphylococcus aureus (MRSA) Infection How-to Guide
  - [Link](http://www.ihi.org/nr/rdonlyres/f4d9de7a-3952-4ae7-bbac-4e4222084a03/0/mrsahowtoguide.doc)
- CDC Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006
  - [Link](http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroguideline2006.pdf)
- CDC Guideline for Hand Hygiene in Health Care Settings
  - [Link](http://www.cdc.gov/HAI/pdf/guidelines/handhygiene2007.pdf)
- CDC Guideline for infection control in health care personnel, 1998
  - [Link](http://www.cdc.gov/hai/pdf/guidelines/hcp2007.pdf)
  - [Link](http://www.cdc.gov/nhsn/pdfs/pscManual/17_isolation.pdf)
- MRSA Elimination Guide, APIC [Link](http://www.apic.org)

The IP Collaboration Project

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