Economic analysis of VA initiative to prevent methicillin-resistant *Staphylococcus aureus* infections

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Collaborators

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• Martin E. Evans, MD

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Iowa City VA
• Marin L. Schweizer, PhD
• Eli L. Perencevich, MD
Poll Question

• How familiar are you with health econometrics or cost-effectiveness analysis?
  – I have conducted cost or cost-effectiveness analyses
  – I have read papers that describe cost or cost-effectiveness analyses
  – I have lived my life up to this point by avoiding the dismal science altogether and have been happier for it
HAI and MRSA

• Healthcare-associated infections (HAI)
  – Infections that result from encounters with healthcare system
  – About 1 in 20 hospitalized patients in US

• Methicillin-resistant *Staphylococcus aureus* (MRSA)
  – Bacteria resistant to many antibiotics
  – One of the leading causes of invasive infections in healthcare settings
    • Bloodstream, pneumonia, and surgical site infections
VA MRSA Prevention Initiative

• Implemented in October 2007
• Bundle with 4 components
  1. Universal nasal surveillance for MRSA,
  2. Contact precautions for patients whose nasal test for MRSA was positive,
  3. Improved hand hygiene efforts, and
  4. Increased emphasis on infection control being the responsibility of all healthcare workers
Veterans Affairs Initiative to Prevent Methicillin-Resistant Staphylococcus aureus Infections
• Attributable cost of MRSA HAIs
  – Pre-discharge
  – Post-discharge
• Economic evaluation of VA initiative to prevent MRSA HAIs
### Conceptual model

<table>
<thead>
<tr>
<th>Admission date</th>
<th>HAI date</th>
<th>Discharge date</th>
</tr>
</thead>
</table>
| Healthcare services attributable to HAI | • More inpatient days  
• More services on each day | • Number of outpatient visits  
• Number of prescriptions  
• Risk of readmission  
• More inpatient days on readmission |
| Healthcare costs attributable to HAI | • Cost per inpatient day | • Cost of outpatient visit  
• Cost per prescription  
• Cost of readmission |

#### Index hospitalization

- **Pre-discharge**
- **Post-discharge**
Components of accurate cost of HAIs

1. Pre-discharge costs
   – Incorrect methods (overestimation)

2. Post-discharge costs
   – Often neglected in cost of HAI estimates (underestimation)
Which Costs Can be Avoided?

- Staff
- Buildings
- Equipment

Cost of HAI

- Antibiotics
- Catheters
- Other consumables
Estimating cost of MRSA HAI in VA

• Need way of identifying healthcare costs
  – VA Managerial Cost Accounting (MCA) data
    • Activity-based accounting system in VA
    • Extracts information from general ledger and VA payroll system
    • Specific job categories, supplies or equipment
    • Costs are allocated to cost centers
      – Primary care clinics
      – Intensive care units
      – Administration
      – Environmental services
  • Costs are allocated based on employee activities
Estimating cost of MRSA HAI in VA

• Need way of identifying MRSA infections
  – ICD-9 code (V09) is not good for MRSA HAIs
    • V09 = infection with drug-resistant microorganisms
  – Microbiology data
    • Unstructured

Schweizer et al ICHE 2011
Identification of methicillin-resistant
*Staphylococcus aureus* within the Nation’s
Veterans Affairs Medical Centers using natural
language processing

Makoto Jones¹², Scott L DuVal¹², Joshua Spuhl¹, Matthew H Samore¹², Christopher Nielson³⁴ and
Michael Rubin¹²
Impact of HAI on Pre-Discharge Costs
Aside: Impact of HAI on Excess LOS

- Important because each extra bed-day taken up by a patient with HAI represents opportunity cost for hospital
- Many studies compare total LOS between patients with HAI and those without

<table>
<thead>
<tr>
<th>Patient 1</th>
<th>HAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission</td>
<td>Discharge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission</td>
</tr>
</tbody>
</table>

- But not all of the days are attributable to the HAI
- This leads to “time-dependent bias”

Barnett AJE (2009)
Barnett Value in Health (2011)
The Magnitude of Time-Dependent Bias in the Estimation of Excess Length of Stay Attributable to Healthcare-Associated Infections

Richard E. Nelson, PhD;1,2 Scott D. Nelson, PharmD;1,3 Karim Khader, PhD;1,2 Eli L. Perencevich, MD, MS;4,5 Marin L. Schweizer, PhD;4,5 Michael A. Rubin, MD, PhD;1,2 Nicholas Graves, PhD;6 Stephan Harbarth, MD, MS;7 Vanessa W. Stevens, PhD;1,3 Matthew H. Samore, MD1,2
Estimates of the Magnitude of Time-Dependent Bias

### Table 1. Published Estimates of the Magnitude of Time-Dependent Bias: Conventional Methods vs Multistate Models

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Infection Type</th>
<th>Excess LOS, d (95% CI)</th>
<th>Conventional Methods</th>
<th>Multistate Model</th>
<th>Absolute Difference, d</th>
<th>Relative Difference, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schulgen (2000) Study I&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Germany</td>
<td>Postoperative wound</td>
<td>16.9 (12.9–20.9)</td>
<td>9.8 (5.7–13.8)</td>
<td>7.1</td>
<td>72.5</td>
<td></td>
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<tr>
<td>Schulgen (2000) Study II&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Germany</td>
<td>Pneumonia</td>
<td>12.3 (9.7–14.9)</td>
<td>3.4 (0.8–6.0)</td>
<td>8.9</td>
<td>261.7</td>
<td></td>
</tr>
<tr>
<td>Roberts (2010)&lt;sup&gt;14&lt;/sup&gt;</td>
<td>US</td>
<td>Mixed</td>
<td>8.1</td>
<td>5.9</td>
<td>2.2</td>
<td>37.3</td>
<td></td>
</tr>
<tr>
<td>Barnett (2011)&lt;sup&gt;15&lt;/sup&gt;</td>
<td>Argentina</td>
<td>CLABSI, CAUTI, VAP</td>
<td>11.2 (10.1–12.4)</td>
<td>1.4 (0.8–1.9)</td>
<td>9.9</td>
<td>731.9</td>
<td></td>
</tr>
<tr>
<td>De Angelis (2011)&lt;sup&gt;16&lt;/sup&gt;</td>
<td>Switzerland</td>
<td>Mixed</td>
<td>24.5 (14.5–34.5)</td>
<td>6.0 (0–11.9)</td>
<td>18.6</td>
<td>312.3</td>
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<tr>
<td>Macedo-Vinas (2011)&lt;sup&gt;17&lt;/sup&gt;</td>
<td>Switzerland</td>
<td>Mixed</td>
<td>15.3</td>
<td>11.5 (7.9–15.0)</td>
<td>3.8</td>
<td>33.0</td>
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<tr>
<td>Schumacher (2013)&lt;sup&gt;18&lt;/sup&gt;</td>
<td>Germany</td>
<td>Pneumonia</td>
<td>21.9 (17.6–26.2)</td>
<td>6.2 (1.3–9.1)</td>
<td>15.7</td>
<td>253.2</td>
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<tr>
<td><strong>Mean</strong></td>
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<td><strong>238.0</strong></td>
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### Table 2. Published Estimates of the Magnitude of Time-Dependent Bias: Conventional Methods vs Matching on Timing of Infection

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Infection Type</th>
<th>Excess LOS, d (95% CI)</th>
<th>Conventional Methods</th>
<th>Matching on Timing of Infection</th>
<th>Absolute Difference, d</th>
<th>Relative Difference, %</th>
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<tr>
<td>Schulgen (2000) Study I&lt;sup&gt;13&lt;/sup&gt;</td>
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<td>Postoperative wound</td>
<td>16.9 (12.9–20.9)</td>
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<td>Germany</td>
<td>Pneumonia</td>
<td>12.3 (9.7–14.9)</td>
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<td>Vrijens (2010)&lt;sup&gt;19&lt;/sup&gt;</td>
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<td>Vrijens (2012)&lt;sup&gt;20&lt;/sup&gt;</td>
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<td>UTI, BSI, SSI, LRI, GI</td>
<td>38.3 (34.1–42.5)</td>
<td>10.0 (7.3–12.6)</td>
<td>28.3</td>
<td>283.0</td>
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<tr>
<td>Schumacher (2013)&lt;sup&gt;18&lt;/sup&gt;</td>
<td>Germany</td>
<td>Pneumonia</td>
<td>21.9 (17.6–26.2)</td>
<td>11.3 (6.8–15.7)</td>
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<tr>
<td><strong>Mean</strong></td>
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<td><strong>12.6</strong></td>
<td></td>
<td><strong>139.3</strong></td>
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Impact of HAI on Pre-Discharge Costs

• All previous studies compare total inpatient costs between patients with HAI and those without

• But not all of the costs are attributable to the HAI
• This leads to “time-dependent bias”
Impact of HAI on Pre-Discharge Costs

- Can we differentiate between costs that occur before and after HAI with VA data?
Impact of HAI on Pre-Discharge Costs

- Can we differentiate between costs that occur before and after HAI with VA data?
  - Separate observations for each patient-treating specialty-calendar month

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<th>txspedt</th>
<th>txsp</th>
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<tr>
<td>2009-10-29</td>
<td>2009-11-04</td>
<td>2009-11-05</td>
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<td>2009-11-21</td>
<td>22</td>
<td>2010</td>
<td>2</td>
<td>$28,833.26</td>
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</table>

5 treating specialties
6 observations
Reducing Time-dependent Bias in Estimates of the Attributable Cost of Health Care–associated Methicillin-resistant Staphylococcus aureus Infections
A Comparison of Three Estimation Strategies

Richard E. Nelson, PhD,* † Matthew H. Samore, MD,* † Makoto Jones, MD,* † Tom Greene, PhD, † Vanessa W. Stevens, PhD,* † Chuan-Fen Liu, PhD,§ † Nicholas Graves, PhD,¶
Martin F. Evans, MD,## ** and Michael A. Rubin, MD, PhD* †

(Med Care 2015;53: 827–834)
Impact of HAI on Pre-Discharge Costs

• Conventional analysis
  – Compare cost over entire LOS for patients with and without MRSA HAI

• Post-HAI analysis
  – Utilize the quirk of the MCA TRT file to identify costs occurring after MRSA HAI
Time window for capturing costs in conventional analysis

Time window for capturing costs in post-HAI analysis

Patient 1
HAI in 1st day of month

Patient 2
HAI in 1st month

Patient 3
HAI in 2nd month

Patient 4
No HAI

Patient 5
HAI, 1 month

Patient 6
No HAI, 1 month

= HAI

Admit

Discharge

Month 1 costs

Month 2 costs

Month 1 costs

Month 2 costs

Month 1 costs
Time window for capturing costs in conventional analysis

Patient 1
HAI on 1st day of month

Patient 2
HAI in 1st month

Patient 3
HAI in 2nd month

Patient 4
No HAI

Patient 5
HAI, 1 month

Patient 6
No HAI, 1 month

Time window for capturing costs in post-HAI analysis

Calendar month 1
Admit
Month 1 costs
HAI
Discharge
Month 2 costs

Calendar month 2
Admit
Month 1 costs
HAI
Discharge
Month 2 costs
Time window for capturing costs in conventional analysis

<table>
<thead>
<tr>
<th>Patient</th>
<th>Post-HAI analysis designation</th>
<th>Conventional analysis designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>HAI</td>
<td>HAI</td>
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<tr>
<td>Patient 2</td>
<td>Exclude</td>
<td>HAI</td>
</tr>
<tr>
<td>Patient 3</td>
<td>No HAI</td>
<td>HAI</td>
</tr>
<tr>
<td>Patient 4</td>
<td>No HAI</td>
<td>No HAI</td>
</tr>
<tr>
<td>Patient 5</td>
<td>Exclude</td>
<td>HAI</td>
</tr>
<tr>
<td>Patient 6</td>
<td>Exclude</td>
<td>No HAI</td>
</tr>
</tbody>
</table>

HAI on 1st day of month

HAI in 1st month

HAI in 2nd month

No HAI

HAI, 1 month

No HAI, 1 month

Admit

Discharge

Calendar month 1

Calendar month 2

Month 1 costs

Month 2 costs

X = HAI
Time window for capturing costs in conventional analysis

- Calendar month 1
  - Admit
  - Month 1 costs
  - Discharge

- Calendar month 2
  - Admit
  - Month 2 costs
  - Discharge

HAI = HAI

Patient 1
- Post-HAI analysis designation: HAI
- Conventional analysis designation: HAI
- HAI on 1st day of month

Patient 2
- Post-HAI analysis designation: Exclude
- Conventional analysis designation: HAI
- HAI in 1st month

Patient 3
- Post-HAI analysis designation: No HAI
- Conventional analysis designation: HAI
- HAI in 2nd month

Patient 4
- Post-HAI analysis designation: No HAI
- Conventional analysis designation: No HAI
- No HAI

Patient 5
- Post-HAI analysis designation: Exclude
- Conventional analysis designation: HAI
- HAI, 1 month

Patient 6
- Post-HAI analysis designation: Exclude
- Conventional analysis designation: No HAI
- No HAI, 1 month
Time window for capturing costs in conventional analysis

Calendar month 1

- Admit
- Month 1 costs

Calendar month 2

- Admit
- Month 2 costs

HAI

Patient 1

- HAI
- HAI on 1st day of month

Patient 2

- Exclude
- HAI in 1st month

Patient 3

- No HAI
- HAI in 2nd month

Patient 4

- No HAI
- No HAI

Patient 5

- Exclude
- HAI, 1 month

Patient 6

- Exclude
- No HAI, 1 month

X = HAI
Time window for capturing costs in post-HAI analysis

<table>
<thead>
<tr>
<th>Patient</th>
<th>Post-HAI analysis designation</th>
<th>Conventional analysis designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
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<td>HAI</td>
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<tr>
<td>Patient 2</td>
<td>Exclude</td>
<td>HAI</td>
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<tr>
<td>Patient 3</td>
<td>No HAI</td>
<td>HAI</td>
</tr>
<tr>
<td>Patient 4</td>
<td>No HAI</td>
<td>No HAI</td>
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<tr>
<td>Patient 5</td>
<td>Exclude</td>
<td>HAI</td>
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<td>Patient 6</td>
<td>Exclude</td>
<td>No HAI</td>
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</table>

HAI on 1st day of month
HAI in 1st month
HAI in 2nd month
No HAI
HAI, 1 month
No HAI, 1 month

X = HAI
Impact of HAI on Pre-Discharge Costs

• Approximation of improved method on data more widely available
  – “Matched” method
  – If have date of HAI but not cost data that separates cost by calendar month
  – Propensity score match 4 non-MRSA HAI patients for every MRSA HAI patient
    • For each MRSA HAI patient, the potential matches were those still at risk for MRSA HAI on the day that the infected patient was infected
    • Did separate PS matching for HAIs occurring on days 3-40
Impact of HAI on Pre-Discharge Costs

• Methods
  – Dependent variables
    • Total cost
    • Variable cost
    • LOS
  – Generalized linear model (GLM)
    • Gamma distribution for costs
    • Poisson distribution for LOS
## Impact of HAI on Pre-Discharge Costs
### Results: Multivariable Cost Regressions

- Model = GLM, gamma/Poisson distribution, log link
- Dependent variable = inpatient cost, LOS
- Key independent variable = MRSA HAI

### Table: Cost and LOS Effects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Post-HAI analysis* N=121,520</th>
<th>Matched analysis* N=12,992</th>
<th>Conventional analysis** N=386,794</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$12,559 (5,903 - 19,216)</td>
<td>$14,393 (12,103 - 16,684)</td>
<td>$16,786 (15,999 - 17,572)</td>
</tr>
<tr>
<td>LOS</td>
<td>11.43 (10.44 - 12.43)</td>
<td>13.97 (10.49 - 17.44)</td>
<td>17.64 (17.58 - 17.71)</td>
</tr>
</tbody>
</table>

*Post-HAI analysis regressions controlled for the following variables: demographic characteristics, comorbid conditions, surgery during 1st 48 hours, primary ICD-9 code, length of stay during 1st calendar month, and facility

**Matched analysis regressions controlled for the following variables: demographic characteristics, comorbid conditions, surgery during 1st 48 hours, primary ICD-9 code, and facility

***Conventional method regressions controlled for the following variables: demographic characteristics, comorbid conditions, primary ICD-9 code, and facility
Impact of HAI on Pre-Discharge Costs

- Conventional analysis
  - Cost
    • 33.7% higher than post-HAI analysis
    • $16,786 vs. $12,559
  - LOS
    • 54.3% higher than post-HAI analysis
    • 17.64 vs. 11.43

- Matched analysis
  - Cost
    • 14.6% higher than post-HAI method
    • $14,393 vs. $12,559
  - LOS
    • 22.2% higher than post-HAI analysis
    • 13.97 vs. 11.43
Impact of HAI on post-discharge costs
The Impact of Healthcare-Associated Methicillin-Resistant *Staphylococcus Aureus* Infections on Post-Discharge Healthcare Costs and Utilization

Richard E. Nelson, PhD;² Makoto Jones, MD;¹,² Chuan-Fen Liu, PhD, MPH;³,⁴ Matthew H. Samore, MD;¹,² Martin E. Evans, MD;⁵,⁶,⁷ Nicholas Graves, PhD;⁸ Bruce Lee, MD;⁹ Michael A. Rubin, MD, PhD¹,²
Impact of HAI on post-discharge costs

• Post-discharge outcomes
  – Inpatient costs
    • Variable costs
    • Total costs
  – Outpatient costs
  – Pharmacy costs

Inpatient LOS 365 days post-discharge

Admission Discharge

Post-discharge outcomes time window
Results – Multivariable Cost Regressions

- Model = GLM, gamma distribution, log link
- Dependent variable = cost in 365 days post-discharge
- Key independent variable = MRSA HAI

<table>
<thead>
<tr>
<th></th>
<th>Full cohort (N=369,743)</th>
<th>Propensity score matched subgroup (N=7,184)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect</td>
<td>95% CI</td>
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<tr>
<td>Outpatient</td>
<td>-$487</td>
<td>-$1,042 - $67</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>$619</td>
<td>$29 - $1,209</td>
</tr>
<tr>
<td>Total inpatient</td>
<td>$7,844</td>
<td>$6,060 - $9,628</td>
</tr>
<tr>
<td>Variable inpatient</td>
<td>$4,083</td>
<td>$3,157 - $5,009</td>
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</tbody>
</table>

Note: Regression controlled for the following variables: demographic characteristics, comorbid conditions, LOS during index hospitalization, primary ICD-9 code for index hospitalization
Economic Analysis of Veterans Affairs Initiative to Prevent Methicillin-Resistant *Staphylococcus aureus* Infections

Richard E. Nelson, PhD,1,2 Vanessa W. Stevens, PhD,1,3 Karim Khader, PhD,1,2 Makoto Jones, MD,1,2 Matthew H. Samore, MD,1,2 Martin E. Evans, MD,4,5,6 R. Douglas Scott II, PhD,7 Rachel B. Slayton, PhD,7 Marin L. Schweizer, PhD,8,9 Eli L. Perencevich, MD,8,9 Michael A. Rubin, MD, PhD1,2

Objective

• The objective of this study was to conduct both a budget impact analysis and a cost-effectiveness analysis of the VA MRSA Prevention Initiative for FY2008-FY2010
  – In order to provide feedback to the VA
  – To give insight to other healthcare systems considering widespread adoption of similar infection control interventions
Background

• Cost-effectiveness analysis
  – Common analytic tool used to evaluate the economic costs and clinical benefits of two or more strategies
  – Examine the trade-off between costs and benefits a per-patient level

\[
\text{ICER} = \frac{\text{Cost}_A - \text{Cost}_B}{\text{Effectiveness}_A - \text{Effectiveness}_B}
\]

• Budget impact analysis
  – Complementary to but slightly different from CEAs
  – Designed to examine the expected expenditures a healthcare system might face after implementation of a new intervention
Methods

• Observed rate of MRSA HAIs
  – Jain (2011) *NEJM*

• Counterfactual rate of MRSA HAIs in absence of MRSA HAI initiative
  – Two different assumptions
National Burden of Invasive Methicillin-Resistant *Staphylococcus aureus* Infections, United States, 2011
Assumption 1 Straight line

MRSA HAIs

Non-ICU, Initiative
ICU, Initiative
Non-ICU, No Initiative
ICU, No Initiative
Assumption 2
Downward trend

- MRSA HAIs

<table>
<thead>
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<th>Non-ICU, Initiative</th>
<th>ICU, Initiative</th>
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</tbody>
</table>
Input parameters

• Costs
  – MRSA HAIs
    • Pre-discharge
    • Post-discharge
  – Intervention
    • Screening tests
    • Gloves and gowns
    • MRSA Prevention Coordinator
    • Laboratory technician
    • Educational materials

• Effectiveness
  – Attributable mortality due to MRSA HAIs
Results
### Results

#### Number of MRSA HAIs with and without Initiative

<table>
<thead>
<tr>
<th>Year</th>
<th>No MRSA Prevention Initiative</th>
<th>No MRSA Prevention Initiative Downward trend assumption</th>
<th>MRSA Prevention Initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2008</td>
<td>783</td>
<td>561</td>
<td>783</td>
</tr>
<tr>
<td>FY2009</td>
<td>783</td>
<td>313</td>
<td>686</td>
</tr>
<tr>
<td>FY2010</td>
<td>783</td>
<td>241</td>
<td>627</td>
</tr>
<tr>
<td>FY2008</td>
<td>1,172</td>
<td>1,125</td>
<td>1,172</td>
</tr>
<tr>
<td>FY2009</td>
<td>1,172</td>
<td>841</td>
<td>1,027</td>
</tr>
<tr>
<td>FY2010</td>
<td>1,172</td>
<td>938</td>
<td>573</td>
</tr>
</tbody>
</table>

**Graph**

- **ICU**
  - FY2008: No MRSA Prevention Initiative = 783, No MRSA Prevention Initiative Downward trend assumption = 561, MRSA Prevention Initiative = 783
  - FY2009: No MRSA Prevention Initiative = 783, No MRSA Prevention Initiative Downward trend assumption = 313, MRSA Prevention Initiative = 686
  - FY2010: No MRSA Prevention Initiative = 783, No MRSA Prevention Initiative Downward trend assumption = 241, MRSA Prevention Initiative = 627

- **Non-ICU**
  - FY2008: No MRSA Prevention Initiative = 1,172, No MRSA Prevention Initiative Downward trend assumption = 1,125, MRSA Prevention Initiative = 1,172
  - FY2009: No MRSA Prevention Initiative = 1,172, No MRSA Prevention Initiative Downward trend assumption = 841, MRSA Prevention Initiative = 1,027
  - FY2010: No MRSA Prevention Initiative = 1,172, No MRSA Prevention Initiative Downward trend assumption = 938, MRSA Prevention Initiative = 573

**Legend**
- No MRSA Prevention Initiative
- No MRSA Prevention Initiative Downward trend assumption
- MRSA Prevention Initiative
Cost savings due to MRSA HAIs prevented

### Straight Line Assumption
- **Total = $41.6 million**

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-discharge</th>
<th>Post-discharge inpatient</th>
<th>Post-discharge pharmacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2008</td>
<td>$149,824</td>
<td>$1,229,401</td>
<td>$2,947,939</td>
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<tr>
<td>FY2009</td>
<td>$10,055,045</td>
<td>$4,193,331</td>
<td>$10,055,045</td>
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<tr>
<td>FY2010</td>
<td>$5,975,669</td>
<td>$14,328,854</td>
<td>$14,328,854</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$14,328,854</strong></td>
<td><strong>$34,582,248</strong></td>
<td><strong>$41,600,828</strong></td>
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</tbody>
</table>

### Downward Trend Assumption
- **Total = $28.0 million**

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-discharge</th>
<th>Post-discharge inpatient</th>
<th>Post-discharge pharmacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2008</td>
<td>$110,623</td>
<td>$396,980</td>
<td>$728,240</td>
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<tr>
<td>FY2009</td>
<td>$907,730</td>
<td>$7,022,072</td>
<td>$9,431,026</td>
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<tr>
<td>FY2010</td>
<td>$1,956,777</td>
<td>$533,166</td>
<td>$9,431,026</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$2,956,777</strong></td>
<td><strong>$18,409,876</strong></td>
<td><strong>$28,000,000</strong></td>
</tr>
</tbody>
</table>

### Note
- Pre-discharge inpatient costs
- Post-discharge inpatient costs
- Post-discharge pharmacy costs
Results
VA MRSA Prevention Initiative expenses

- Laboratory technician salaries: $15,032,848
- MRSA prevention coordinator salaries: $41,162,716
- Time to don gloves and gowns: $40,301,560
- Educational materials: $1,354,645
- Screening on admission: $46,680,000
- Screening on transfer or discharge: $36,537,500
- Gowns: $23,279,349
- Gloves: $2,172,739

Total Cost = $206.5 million
## Results

### Budget Impact Analysis

<table>
<thead>
<tr>
<th></th>
<th>FY2008</th>
<th>FY2009</th>
<th>FY2010</th>
<th>Total</th>
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</table>

#### Downward Trend Assumption

<table>
<thead>
<tr>
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<th>FY2008</th>
<th>FY2009</th>
<th>FY2010</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2008</td>
<td>-$63,092,551</td>
<td>-$59,666,094</td>
<td>-$56,739,577</td>
<td>-$179,5 million</td>
</tr>
</tbody>
</table>

#### Straight Line Assumption

<table>
<thead>
<tr>
<th></th>
<th>FY2008</th>
<th>FY2009</th>
<th>FY2010</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2008</td>
<td>-$61,637,664</td>
<td>-$55,214,112</td>
<td>-$49,550,248</td>
<td>-$166.4 million</td>
</tr>
</tbody>
</table>

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**Total = -$166.4 million**

**Total = -$179.5 million**
## Results
### Cost-Effectiveness Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>Incremental Cost ($)</th>
<th>Incremental Effectiveness (LYs)</th>
<th>ICER ($/LY)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FY2008</strong></td>
<td>$61,637,664</td>
<td>504.8</td>
<td>$122,114</td>
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<td><strong>FY2009</strong></td>
<td>$55,214,112</td>
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<td><strong>FY2010</strong></td>
<td>$49,550,248</td>
<td>2,453.4</td>
<td>$20,196</td>
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<tr>
<td><strong>Total</strong></td>
<td>$166,402,204</td>
<td>4,679.8</td>
<td>$35,557</td>
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</table>

**Straight line assumption**

<table>
<thead>
<tr>
<th>Year</th>
<th>Incremental Cost ($)</th>
<th>Incremental Effectiveness (LYs)</th>
<th>ICER ($/LY)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FY2008</strong></td>
<td>$63,092,551</td>
<td>335.0</td>
<td>$188,310</td>
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<tr>
<td><strong>FY2009</strong></td>
<td>$59,666,094</td>
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<td>$49,625</td>
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<tr>
<td><strong>FY2010</strong></td>
<td>$56,739,577</td>
<td>1,614.8</td>
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<tr>
<td><strong>Total</strong></td>
<td>$179,498,223</td>
<td>3,152.2</td>
<td>$56,944</td>
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</table>

**Downward trend assumption**

*Note: ICER = Incremental cost-effectiveness ratio*
Conclusions

• VA data
  – Improved estimates of consequences of MRSA HAIs
• Rigorous economic evaluation of MRSA Prevention Initiative
• Useful information for decision makers
Questions/Comments?

Contact Information
Richard E. Nelson PhD
richard.nelson2@va.gov