Infection Prevention in Real Time - Automating Your Surveillance System

Georgia P. Dash, RN, MS, CIC
Corporate Director, Infection Prevention Department
Cape Cod Health Care
Hyannis, MA

Objectives:
1. Make the business case for purchase of automated surveillance software
2. Share examples of the benefits to infection prevention programs that an automated surveillance system provides
3. Provide a list of resources for evaluating surveillance needs and the surveillance systems currently on the market

State of the Industry 2010 Survey
Infection Control Today Supplement June 2010

- 50% of IP wear multiple hats
- 51% of IP experienced staffing or resource cuts
- 62% are NOT currently using automated surveillance technologies
How Infection Preventionists Spend Their Time

<table>
<thead>
<tr>
<th>Activity</th>
<th>Median (hr)</th>
<th>Mean (hr)</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting, analyzing, and interpreting data on the occurrence of infections</td>
<td>40.0</td>
<td>45.5</td>
<td>14.3</td>
<td>7</td>
<td>80</td>
</tr>
<tr>
<td>Policy development and meetings</td>
<td>14.5</td>
<td>15.0</td>
<td>8.6</td>
<td>0</td>
<td>85</td>
</tr>
<tr>
<td>Data validation issues</td>
<td>10.0</td>
<td>10.9</td>
<td>9.0</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Teaching infection prevention and control policies and procedures</td>
<td>10.0</td>
<td>13.0</td>
<td>6.2</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>Other (eg, product evaluation, employee health, and emergency preparedness)</td>
<td>5.0</td>
<td>8.9</td>
<td>8.2</td>
<td>0</td>
<td>80</td>
</tr>
<tr>
<td>Activities related to outbreaks</td>
<td>5.0</td>
<td>6.1</td>
<td>4.6</td>
<td>0</td>
<td>40</td>
</tr>
</tbody>
</table>


Translating the Survey Data.....

1 FTE= 2080 hrs

44.5% of time spent in data management

925.6 hrs per year

3.6 hr / day spent in data management
Shoe Leather Epidemiology = Antiquated Workflow to Collect and Analyze Yesterday’s Data

**Traditional Surveillance Work Process:**
- Printed micro results
- Patient chart for demographics
- Admission and transfers
- Medications
- Vital signs
- Laboratory results
- Diagnosis
- Radiology results
- Surgical procedures

Wastes time and resources gathering data from multiple locations
Manual entry into Infection Control databases
Manual reporting to multiple entities

---

Can Automated Surveillance Technology Make a Difference in Prevention of HAI??

- APIC New Orleans 2010
  “CA Hospitals using automated surveillance to identify HAIs were more likely than those using manual methods to reduce MRSA infections (85% vs. 66%); VAP (96% vs. 88%) SSI (91% vs. 82%).”
  “AST resulted in improved practices, cost avoidance and reduction in rates of CAUTI.”
- California Hospital Medical Center since institution of ATS with feedback to staff: “68% reduction in C. difficile nosocomial infection markers (NIMS).”
- Automated readmission alerts of pts with MRSA increased recognition and isolation from 13% to 40%4

---

Five Steps for Making the Business Case for Automated Surveillance Technology.... Positioning Yourself to Compete for Scarce Capital Dollars

---
Making the Business Case for Automated Surveillance Technology

Step One:
Understand the operating costs and revenue declines in your facility

Rationale:
1. To show the direct attributable costs of HAIs and the benefits of prevention to the bottom line
2. To position IP to compete for scarce capital dollars

![Graph: Hospital Operating Costs vs Declining Revenues]

Understanding Hospital Operating Costs:
Present Picture in MA Hospitals

- Annual Operating Costs Increase 2004 - 2008
  - Labor - 50%
  - Fringe Benefits -42%
  - Purchased Services - 55%
  - Supplies / Equipment / Drugs - 35%

Hospital Costs in Context: A Transparent View of the Cost of Care. Massachusetts Hospital Association, April 2010

Present Picture in MA Hospitals...
Revenue Declines or the Cost of Doing Business with the Government...

2008 Medicare / Medicaid / Commonwealth Care and MA Health Safety Net represented 51% of Total Hospital Revenues

- Medicare:
  - 2008 7.3% < cost of care,
  - Payment deficit of $317 million
- MassHealth (MA Medicaid):
  - 2008 paid 14.2% < cost of care
  - 2009 paid 25% < cost of care
  - Payment deficit for 2010 = $400 million

Hospital Costs in Context: A Transparent View of the Cost of Care. Massachusetts Hospital Association, April 2010
Making the Business Case for Automated Surveillance Technology

Step Two:
Obtain your hospitals inpatient payer mix. Calculate the percentage of hospital associated infections in a given year by payer category
Rationale:
To show that the majority of HAIs occur in patients for which the hospital receives the least reimbursement

CCHC Average Payer Mix vs. CCHC Payer Mix for Patients with HAI

<table>
<thead>
<tr>
<th>Payer</th>
<th>CCHC Average Inpt. Payer Mix</th>
<th>CCHC Payer Mix for Pts with HAI 2006*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicare</td>
<td>64%</td>
<td>69% (66/96)</td>
</tr>
<tr>
<td>Commercial</td>
<td>25%</td>
<td>18% (17/96)</td>
</tr>
<tr>
<td>Medicaid/ MA Health</td>
<td>5%</td>
<td>13.5%</td>
</tr>
</tbody>
</table>

HAI Targeted Surveillance: CLABSI in ICUs; VAP in ICUs; SSI in Selected Surgeries

Making the Business Case for Automated Surveillance Technology

Step Three
– Calculate the annual cost of HAIs in your hospital using the CDC data
– Calculate the % of HAIs that could be prevented and the costs avoided using the CDC data on Direct Medical Costs of Healthcare Associated Infections
Rationale:
To show the benefit to the bottom line in costs avoided
Health Care-Associated Infections (1.7 Million) and Deaths (98,000) in US Hospitals 2002

Percent of All HAI  
- UTI - 36%  
- SSI - 20%  
- BSI - 11%  
- Pneumonia - 11%

Percent Procedure or Device Related  
- CAUTI - 80%  
- SSI - 20%  
- CLABSI - 37%  
- VAP - 21%

51% of all US HAI (884,373/1,737,125) can be attributed to these four procedure/device associated HAI


US Average Attributable Per Patient Costs of HAI by Selected Site of Infection


<table>
<thead>
<tr>
<th>Infection Site</th>
<th>Estimate Adjusted to 2007 $ for Inpatient Hospital Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSI</td>
<td>$11,874 - $34,670</td>
</tr>
<tr>
<td>CLABSI</td>
<td>$7,288 - $29,156</td>
</tr>
<tr>
<td>VAP</td>
<td>$19,633 - $28,508</td>
</tr>
<tr>
<td>CAUTI</td>
<td>$862 - $1,007</td>
</tr>
</tbody>
</table>

What percentage of HAI are preventable?

- SENIC Study 1970s estimated 32% of HAI were preventable if an effective Hospital Infection Prevention Program was in place:
  - Dedicated IP and physician
  - Robust surveillance program
  - Feedback of outcomes to staff

- 2003 review of literature: between 20% and 70% of HAI are preventable depending upon type, study design and interventions

- CDC 2009 Study estimated the benefits of prevention of 20%, 50% and 70% of HAI in Direct Medical Costs in 2007 dollars

Step Three: CCHC Direct Attributable Costs of HAI and Benefits of Prevention 2006

<table>
<thead>
<tr>
<th>HAI</th>
<th># HAI</th>
<th>Cost/HAI</th>
<th>Cost/Yr</th>
<th>Cost/20% HAI-Cost Avoided</th>
<th>Cost/50% HAI-Cost Avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI - All Units</td>
<td>7</td>
<td>$29,156</td>
<td>$204,092</td>
<td>$40,819</td>
<td>$102,046</td>
</tr>
<tr>
<td>VAP - ICU</td>
<td>18</td>
<td>$513,144</td>
<td></td>
<td></td>
<td>$102,628</td>
</tr>
<tr>
<td>SSI (THA, THP, LAM, Sp Fx, Abs Fx, All Other Case Surg): mobs</td>
<td>71</td>
<td>$2,461,570</td>
<td></td>
<td>$492,314</td>
<td>$1,230,785</td>
</tr>
<tr>
<td>Total Direct Attributable Costs of HAI</td>
<td>96</td>
<td>$3,178,806</td>
<td>$635,761</td>
<td>$1,589,403</td>
<td></td>
</tr>
</tbody>
</table>


Making the Business Case for Automated Surveillance Technology

Making the Business Case for Automated Surveillance Technology

Step Four
- Determine the average length of stay for patient
- Calculate the additional # of days stayed by patients with HAI or utilize published LOS data for pts with HAI

Rationale:
To show the benefits of HAI prevention on patient turnover and increased revenues

- **CCHC 2006**
  - Average LOS - 4 days
  - Additional days for 96 patients with HAI:
    - CLABSI*: 168 days
    - VAP**: 162 days
    - SSI***: 710 days
  - Total Excess Days = 1040
  - Direct effect on bed turnover and patient throughput!


Making the Business Case for Automated Surveillance Technology

Step Five
- Obtain your Pharmacy’s budget for antimicrobials
- Perform an audit of antibiotic usage

Rationale:
To determine the actual budgeted dollars that could have been saved if automated surveillance technology was used to support the facility’s antimicrobial stewardship program
Step Five: Review of Antibiotic Usage at Cape Cod Hospital 8/23/07 - 8/30/07

- 38% (85/225) of pts at CCH were receiving abx. Random sample of medical records of 50 patients receiving abx

- Data extracted:
  - Date of adm and diagnosis
  - Date of all cultures and culture results.
  - If surgical procedure data / surgery and abx prophylaxis
  - Start and stop date, dosage and route of admin of all abx given
  - Cost of all abx given

- Findings:
  - 30% (15/50) opportunity to d/c abx
  - 4% (2/50) organism R to abx being given
  - Total abx costs that could have been avoided during one week study period was $2,428
  - Extrapolating these findings to all 85 pts on abx the weekly savings = $4,010, or $208,000/yr
  - Review, extraction, analysis of data from 50 med records took 12 hrs to identify 17 patients who could have benefited from intervention
  - Review, extraction and analysis of this same data using Premier Safety Surveillor took 15 minutes

Making the Business Case for Automated Surveillance Technology.... Benefits Outweigh Cost

<table>
<thead>
<tr>
<th>CCHC Total Direct Attributable Costs of CLABSI, VAP and SSI/yr</th>
<th>Costs Avoided @ 20% HAI Reduction</th>
<th>$635,761</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial Budget Dollars Saved @ 34% Intervention Level</td>
<td>$208,000</td>
<td></td>
</tr>
<tr>
<td>Excess Patient Days due to HAI Eliminated</td>
<td>1,040 pt days</td>
<td></td>
</tr>
</tbody>
</table>

ATS: $80,000
$250,000

Infection Prevention and Automated Surveillance Technology

- BD Protect (AICE)
- Cardinal Health CareFusion (MedMined)
- Cerner
- CKM Healthcare
- EpiQuest
- Hospira IC Assistant & Abx Assistant (TheraDoc)
- IC Net
- 3M ClinTrack
- Hidas
- Premier Safety Surveillor
- Siemens
- VecnaQC Pathfinder
- VigiLanz (Minneapolis, MN)
History of Laboratory Testing

<table>
<thead>
<tr>
<th>Specimen ID</th>
<th>Date/Time</th>
<th>Source</th>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>B05418051</td>
<td>07/19/2010, 11:49</td>
<td>sputum</td>
<td>Gram stain</td>
<td>Gram negative rod</td>
</tr>
<tr>
<td>B05418051</td>
<td>07/19/2010, 11:49</td>
<td>sputum</td>
<td>Gram stain</td>
<td>Gram positive cocci, in clusters</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/29/2010, 12:41</td>
<td>unknown</td>
<td>Sputum culture</td>
<td>Normal flora</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/29/2010, 12:41</td>
<td>unknown</td>
<td>Sputum culture</td>
<td>Staphylococcus aureus</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/27/2010, 18:41</td>
<td>sputum</td>
<td>Gram stain</td>
<td>Gram negative rod</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/27/2010, 18:41</td>
<td>sputum</td>
<td>Sputum culture</td>
<td>Normal flora, HAB not isolated, Staphylococcus aureus</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/21/2010, 12:41</td>
<td>blood</td>
<td>Blood culture</td>
<td>No growth</td>
</tr>
<tr>
<td>B05418051</td>
<td>08/21/2010, 12:41</td>
<td>blood</td>
<td>Blood culture</td>
<td>No growth</td>
</tr>
</tbody>
</table>

Laboratory Results Drill Down

<table>
<thead>
<tr>
<th>Text</th>
<th>Date/Time Resolved by Prior Data Center</th>
<th>Observation</th>
<th>Observation Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPITUM CULTURE</td>
<td>07/05/2010, 09:30</td>
<td>SECRETARI MAVEISENS</td>
<td>C</td>
</tr>
<tr>
<td>SPITUM CULTURE</td>
<td>07/05/2010, 09:30</td>
<td>QUANTITY SEEDY HEAVY</td>
<td>C</td>
</tr>
<tr>
<td>SPITUM CULTURE</td>
<td>07/05/2010, 09:30</td>
<td>F spots</td>
<td>F spots HEAVY</td>
</tr>
<tr>
<td>GRAM STAIN</td>
<td>07/05/2010, 09:30</td>
<td>HIGH GRAM POSITIVE COCO IN QUANTIT</td>
<td>C</td>
</tr>
<tr>
<td>GRAM STAIN</td>
<td>07/05/2010, 09:30</td>
<td>MILD GRAM NEGATIVE cocci in clusters</td>
<td>C</td>
</tr>
<tr>
<td>GRAM STAIN</td>
<td>07/05/2010, 09:30</td>
<td>FEW EPITHELIAL CELLS</td>
<td>C</td>
</tr>
<tr>
<td>GRAM STAIN</td>
<td>07/05/2010, 09:30</td>
<td>FEW NEUTROPHILS PEROX PHIL</td>
<td>C</td>
</tr>
<tr>
<td>SPITUM CULTURE</td>
<td>07/04/2010, 21:27</td>
<td>GRAM NEGATIVE cocci</td>
<td>P</td>
</tr>
<tr>
<td>SPITUM CULTURE</td>
<td>07/04/2010, 21:27</td>
<td>QUANTITY SEEDY HEAVY</td>
<td>P</td>
</tr>
</tbody>
</table>

Patient’s Radiology Data

<table>
<thead>
<tr>
<th>Procedure Name</th>
<th>Procedure Date</th>
<th>Impression</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTRACRANIAL ART BILATERAL</td>
<td>07/19/2010, 10:30</td>
<td>SEE DISCUSSION</td>
</tr>
<tr>
<td>HEAD WC-CONTRAST</td>
<td>08/20/2010, 10:30</td>
<td>SEE DISCUSSION</td>
</tr>
<tr>
<td>CHEST PORTABLE</td>
<td>09/02/2010, 14:30</td>
<td>SEE DISCUSSION</td>
</tr>
</tbody>
</table>
Generating Reports: Multitude of Combinations and Permutations

- Scheduled Reports
  - Patients with Significant Organisms
  - Healthcare Acquired MRSA in ICUs
  - Graph of Patients with C. difficile by Month and by Ward
  - MRSA isolates by month and Unique Patient
  - VRE isolates by month and Unique Patient

- Real Time Reports
  - Line Listing by Ward Group
  - Instant Antibiogram for any unit and any organism and date range
  - Find Specific Isolates by Organism, Lab Test, Unit, Date Range, Abb
  - Find Tagged Patients by Tag, Unit, Date Range
  - Reportable Communicable Diseases
  - Surgical Detailed Denominator and ICI reports

Scheduled Reports: Inpatients with Significant Pathogens Report

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Organism</th>
<th>Date of Admission</th>
<th>Date of Discharge</th>
<th>MRSA Status</th>
<th>Vancomycin</th>
<th>Line Listing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>MRSA</td>
<td>01/01/2023</td>
<td>05/10/2023</td>
<td>Positive</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Patient 2</td>
<td>MRSA</td>
<td>01/02/2023</td>
<td>05/11/2023</td>
<td>Positive</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Patient 3</td>
<td>MRSA</td>
<td>01/03/2023</td>
<td>05/12/2023</td>
<td>Positive</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Scheduled Reports: Healthcare Acquired MRSA in ICUs

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Admission Date</th>
<th>Tissue Type</th>
<th>Organism</th>
<th>Isolates</th>
<th>MRSA Status</th>
<th>Vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>01/01/2023</td>
<td>Blood</td>
<td>MRSA</td>
<td>Yes</td>
<td>Positive</td>
<td>Yes</td>
</tr>
<tr>
<td>002</td>
<td>01/02/2023</td>
<td>Blood</td>
<td>MRSA</td>
<td>Yes</td>
<td>Positive</td>
<td>Yes</td>
</tr>
<tr>
<td>003</td>
<td>01/03/2023</td>
<td>Blood</td>
<td>MRSA</td>
<td>Yes</td>
<td>Positive</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Real Time Reports: Find Tagged Patients

Surgical Reports: Detailed Denominator Data

Infection Prevention in Real Time - Automating Your Surveillance System

Objectives:
1. Make the business case for purchase of automated surveillance software
2. Share examples of the benefits to infection prevention programs that an automated surveillance system provides
3. Provide a list of resources for evaluating surveillance needs and the surveillance systems currently on the market
Thank You!