Surveillance of Infections

Infection Prevention Conference
Bismarck, North Dakota

August 17-18, 2011
Surveillance of Infections

- Surveillance is an essential component of an effective infection prevention and control program.
  - Sound epidemiological and statistical principles
  - Use surveillance data to improve the quality of healthcare
- Challenges
  - Changing healthcare delivery system
  - Emerging and reemerging infectious diseases
  - Mandatory reporting requirements
Components of a Strong Surveillance Program

- Should be based on sound epidemiological and statistical principles
- Designed in accordance with current recommended practices
- Needs to be able to identify risk factors for infection
  - Adverse events
  - Implement risk-reduction measures
  - Monitor the effectiveness of intervention
- Identify
  - Outbreaks
  - Emerging infectious diseases
  - Antibiotic-resistant organisms
  - Bioterrorist events
Components of a Strong Surveillance Program

• Include
  – Infection prevention
  – Performance improvement
  – Patient safety
  – Public health activities
• Mandatory and public reporting requirements
• Surveillance data
  – Reduce the occurrence of infections by using risk factors and implementation of risk-reduction measures and monitoring effectiveness of interventions.
Surveillance Definition

• “Ongoing collection, collation, and analysis of data and the ongoing dissemination of information to those who need to know so that action can be taken.”


• Surveillance is an essential component of an effective infection prevention program.
  – First recommended for hospitals by the American Hospital Association in 1958
    • Staphylococcus aureus
  – 1960 CDC
  – 1976 Joint Commission
1985 Study on the Efficacy of Nosocomial Infection Control
  - Scientific evidence
    - that hospitals with
      - strong surveillance programs
      - strong prevention and control programs
    » improved patient outcomes by reducing HAI

Since 1985 healthcare delivery systems has shifted outside of the acute care hospital
  - Publication of surveillance recommendations for outpatient settings
    • Hospitals, LTC, rehab, ASC, dialysis, home care, hospice, mental health, and correctional facilities
Factors Affecting Surveillance Programs

- Shorter hospital stays
- Aging of the population
- Increased use of invasive procedures and devices
- More acutely ill patients and residents
- Healthcare worker shortage
- Emerging and reemerging infectious diseases
- Threat of bioterrorism
- Mandatory and public reporting
- New diseases emerging
- Antimicrobial resistance
- Mandatory reporting requirements increase
- New surveillance methods are needed to meet the changing environment
Purpose of Surveillance

- Determine baseline and endemic rates of occurrence of a disease or event
- Detect and investigate clusters or outbreaks
- Assess the effectiveness of prevention and control measures
- Monitor the occurrence of adverse outcomes to identify potential risk factors
- Provide information that can be used by an organization to target performance improvement activities
- Measure the efficacy of interventional and performance improvement efforts
- Observe practices, such as hand hygiene and sterilizer performance monitoring, to promote compliance with recommendations and standards
- Detect and report notifiable diseases to the health department
- Identify organisms and diseases of epidemiological importance, such as AROs and tuberculosis, to prevent their spread
- Ensure compliance with requirements of federal regulators, such as the Occupational Safety and Health Administration and the Centers for Medicare and Medicaid Services
Purpose of Surveillance

- Ensure compliance with state regulations and state mandatory reporting requirement
- Meet requirements of accrediting agencies, such as the Joint Commission and the Commission on Accreditation of Rehabilitation Facilities (CARF)
- Provide information for the education of healthcare personnel
- Monitor injuries and identify risk factors for injuries in personnel
- Detect a bioterrorist event or an emerging infectious disease
- Provide data to conduct a facility risk assessment for diseases, such as legionellosis or tuberculosis
Types of Surveillance

• Total or Whole House Surveillance
  – Monitors all HAI in the entire facility
  – Overall facility infection rate should not be calculated
    • Rates should be calculated for specific AHIs in a defined population
      – Example:
        » Central line-associated bloodstream infections in an ICU
        » Surgical site infection for a particular surgery such as hips, knee, CABGs
    • Overall facility rates are not sensitive enough to identify potential problems
    • Are not adjusted for specific infection or injury risks so they are not appropriate for:
      – measuring trends over time
      – Comparisons between groups
      – Benchmarking
    • Although ideal, most facilities do not have the technical and personnel resources to do house-wide surveillance
    • Target surveillance is generally conducted
Types of Surveillance

• Target surveillance
  – 1990 CDC shifted from total house surveillance to target surveillance (NNIS system)
  – Focuses on:
    • particular care units (e.g., ICU, nurseries etc)
    • Infections related to devices (e.g., intravascular and urinary catheters)
    • Invasive procedures (e.g., surgery)
    • Organisms (e.g., resistant organisms such as MRSA, VRE, ESBL, etc)
  – Focuses on high-risk, high-volume procedures and adverse outcomes that are potentially preventable
Infection Definitions – Acute Care

CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting

Teresa C. Horan, MPH, Mary Andrus, RN, BA, CIC, and Margaret A. Dudeck, MPH

Infection Definitions for LTC

SHEA/APIC Guideline:
Infection prevention and control in the long-term care facility

Philip W. Smith, MD, Gail Bennett, RN, MSN, CIC, Suzanne Bradley, MD, Paul Drinka, MD, Ebbing Lautenbach, MD, James Marx, RN, MS, CIC, Lona Mody, MD, Lindsay Nicolle, MD, and Kurt Stevenson, MD

July 2008

Definitions of Infection for Surveillance in Long-term Care Facilities

Allison McGeer, Beverly Campbell, T. Grace Emori, Walter J. Hierholzer, Marguerite M. Jackson, Lindsay E. Nicolle, Carla Peppler, Amersolo Rivera, Debra G. Schollenberger, Andrew E. Simor, Philip W. Smith, and Elaine E-L. Wang

In the last decade, increasing attention has focused on the practice of infection control in long-term care facilities. It has become clear that Co-operative Infection Control Committee\(^1\) and on detailed reviews of these definitions written by a sample of 59 infectious disease physicians.
• There is a CDC/SHEA project to revise infection surveillance definitions for LTC in progress. The plan is for these definitions to be available by early Fall.

• NHSN is releasing a newly designed LTCF component in October 2011 which will enable SNF/NHs to enroll in the system and perform reporting on UTI events, MDRO/CDI lab-ID events, and prevention process measures (hand hygiene/gown and glove use). These will be the only reporting options available when it is released.
Home Care and Hospice Infection Definitions

APIC - HICPAC Surveillance Definitions for Home Health Care and Home Hospice Infections

February 2008

Original Authors
APIC Home Care Membership Section 2000
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http://www.apic.org/AM/Template.cfm?Section=Definitions_and_Surveillance&Template=/CM/ContentDisplay.cfm&ContentFileID=9898
Other Infection Definitions

- Behavioral Health, Correctional Facilities, Drug Treatment Facilities, Rehab, LTACs
  - No national definitions yet.
  - Take other definitions and fit them to these settings
  - LTACs may consider using acute care definition
  - Behavioral Health definitions are currently being developed
Numerator/Denominator

• Numerator: the upper portion of a fraction used to calculate a rate or ratio. In surveillance, it is usually the number of cases of a disease or event being studied.

• Denominator: the lower portion of a fraction used to calculate a rate or ratio.

Example: 5 UTIs/135 Catheter Days = rate

5 is the Numerator 135 is the Denominator

Denominator can be: census (rarely used), patient or resident days, device days, number of visits, number of surgical site cases (by type of surgery)
Infection Rate Calculation

Example of rate calculation:

In June, there were three catheter-associated primary bloodstream infections (CABSIs) and 491 central line days in an ICU. The number of BSIs in ICU patients in June/number of central line days in ICU patients in June X 1000

\[
\frac{3}{491} \times 1000 = 6.1
\]

This rate is interpreted as 6.1 CABSIs per 1000 central line-days in the ICU in June.
Infection Rate Calculation

Example:

In August there were two resident wound infections in a LTC unit that had 275 residents days. The calculation for the wound infection rate would be the number of wounds in the LTC unit in August/number of resident days in the LTC unit in August x 1000.

\[
\frac{2}{275} \times 1000 = 7.3
\]

The rate is expressed as 7.3 wounds per 1000 resident days in the LTC unit in August.
Surgical Site Infections

http://www.cdc.gov/nhsn/psc_pa.html
Surgical Site Infection (SSI) Event

Introduction: In 2002, in the United States, an estimated 14 million NHSN operative procedures were performed (CDC unpublished data). SSIs were the second most common healthcare-associated infection, accounting for 17% of all HAIs among hospitalized patients. A similar rate was obtained from NHSN hospitals reporting data in 2006-2008 (15,862 SSI following 830,748 operative procedures) (CDC, unpublished data) with an overall rate of nearly 2%.

While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis, SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. In one study, among nearly 100,000 HAIs reported in one year, deaths were associated with SSIs in more than 8,000 cases.

Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk. Surveillance with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk. A successful surveillance program includes the use of epidemiologically-sound infection definitions and effective surveillance methods.
Data Collection

• Data to collect depends on the event being monitored
• Data collection for infectious events:
  – Demographics:
    • name, sex, age, unique identifier (MD #, acct. # unit, MD, date of admission, date of onset of infection, type of infection, date of discharge, transfer, or death
  – Information needed to determine whether the case definition is met:
    • lab results, diagnostic tests, dates performed, sites and dates cultured and organisms isolated, antibiotic susceptibility, clinical signs and symptoms specific for the infection being monitored.
  – Risk factors for the infection being monitored:
    • underlying conditions and diseases, surgical procedure and date performed, including surgeon, ASA score, wound classification, use of IV catheters including date of insertion and duration of use etc.
## Data Collection Tools

![Excel Spreadsheet](image)

**Copy of Surgical Surveillance 2008 2-09 [Compatibility Mode] - Microsoft Excel**

<table>
<thead>
<tr>
<th>Type of Surgery</th>
<th>NNIS Rate</th>
<th>Cas</th>
<th>Infect</th>
<th>Cas</th>
<th>Infect</th>
<th>Cas</th>
<th>Infect</th>
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<th>Infect</th>
<th>Cas</th>
<th>Infect</th>
<th>Cas</th>
<th>Infect</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARCIC CATH</td>
<td>1.56</td>
<td>279</td>
<td>8</td>
<td>279</td>
<td>2.87%</td>
<td>21</td>
<td>1</td>
<td>273</td>
<td>0</td>
<td>25</td>
<td>1.95%</td>
<td>26</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>26</td>
<td>1.95%</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>CABG</td>
<td>1.56</td>
<td>279</td>
<td>8</td>
<td>279</td>
<td>2.87%</td>
<td>21</td>
<td>1</td>
<td>273</td>
<td>0</td>
<td>25</td>
<td>1.95%</td>
<td>26</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>26</td>
<td>1.95%</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>CABG with Valve</td>
<td>1.56</td>
<td>279</td>
<td>8</td>
<td>279</td>
<td>2.87%</td>
<td>21</td>
<td>1</td>
<td>273</td>
<td>0</td>
<td>25</td>
<td>1.95%</td>
<td>26</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>26</td>
<td>1.95%</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>VALVE ONLY</td>
<td>1.56</td>
<td>279</td>
<td>8</td>
<td>279</td>
<td>2.87%</td>
<td>21</td>
<td>1</td>
<td>273</td>
<td>0</td>
<td>25</td>
<td>1.95%</td>
<td>26</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>26</td>
<td>1.95%</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>

**Surgical Surveillance - 2008**

- **YEAR TO DATE 2007**
- **Jan-08**
- **Feb-08**
- **Mar-08**
- **Apr-08**
- **May-08**
- **Jun-08**
- **Jul-08**
- **Aug-08**
- **Sep-08**
- **Oct-08**
- **Nov-08**
- **Dec-08**

**Columns:**
- **Type of Surgery**
- **NNIS Rate**
- **Cases**
- **Infect**
- **%**

**Rows:**
- **CARDIAC CATH**
- **PTCA**
- **ERCClose/StarClose**
- **Angioss**
- **Stent**
- **IABP Starting 2007**
- **AICD**
- **EP Lab**
- **OR**
- **PACEMAKER**
- **EP Lab**
- **OR**
- **OPEN HEART**
- **CABG**
- **CABG with Valve**
- **VALVE ONLY**
- **ORTHO**

**Cells:**
- **Cut Time**
- **Year to Date**
- **Jan-08**
- **Feb-08**
- **Mar-08**
- **Apr-08**
- **May-08**
- **Jun-08**
- **Jul-08**
- **Aug-08**
- **Sep-08**
- **Oct-08**
- **Nov-08**
- **Dec-08**

**Note:** The above table and spreadsheet contain data related to surgical surveillance with various entries for different procedures and infection rates.
### OTHER SSIs

<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Type of Inf.</th>
<th>Acct #</th>
<th>MR #</th>
<th>Age</th>
<th>WT</th>
<th>ASA</th>
<th>CLASS</th>
<th>Physician</th>
<th>OR Room</th>
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</tbody>
</table>

*Note: This table is a screenshot from Microsoft Excel.*
### OTHER SSIs

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Procedure Date</th>
<th>Procedure Start Time</th>
<th>Procedure End Time</th>
<th>ABX</th>
<th>ABX Given</th>
<th>ABX Redose Time</th>
<th>ABX Redose</th>
<th>ABX Redose Time</th>
<th>Prep</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>2/16/2010</td>
<td>8:37</td>
<td>16:33</td>
<td>Ancef</td>
<td>8:15</td>
<td>1215</td>
<td>Ancef</td>
<td>16:20</td>
<td>Alcohol/Duraprep</td>
</tr>
<tr>
<td>CABG x4</td>
<td>2/24/2010</td>
<td>9:27</td>
<td>14:14</td>
<td>Zinacef 1.5 gm</td>
<td>9:05</td>
<td>13:05</td>
<td>NA</td>
<td>NA</td>
<td>Alcohol/Duraprep /CHG</td>
</tr>
<tr>
<td>ACDF CS-7 Evolve</td>
<td>3/30/2010</td>
<td>11:32</td>
<td>13:48</td>
<td>Vanco 1 GM</td>
<td>948</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
## OTHER SSIs

<table>
<thead>
<tr>
<th>Post Op Drsg</th>
<th>Infection Date</th>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L leg vein harvest site cellulitis superficial infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Alcohol/Duraprep</td>
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</tr>
<tr>
<td>Alcohol/Duraprep/CHG</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Cellulitis Abd.</td>
<td></td>
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</tr>
</tbody>
</table>

**Post Op Drsg**: Preparation, Alcohol/Duraprep/CHG.
**Line Listing Data Collection**

### OTHER SSIs

<table>
<thead>
<tr>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
<th>Cultures Date</th>
<th>Site Cultured</th>
<th>Culture Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L. leg vein</td>
<td>harvest site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>Infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Infection Surveillance – Respiratory Tract Infection

**Resident Name:**

**Home/Resident:**

**Date:**

**Date Infection Was Noted:**

**Suspected Date:**

### Respiratory Tract Infection (Check Boxes Only After Criteria Have Been Met)

<table>
<thead>
<tr>
<th>Infection/Site</th>
<th>Criteria</th>
<th>Conditions &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Cold Syndrome</td>
<td>MUST have at least 2 of the following: runny nose, sneezing, stuffy nose (nasal congestion), sore throat or hoarseness, difficulty swallowing, dry cough, irritation or tender glands in neck (tender lymph nodes).</td>
<td>Headache or irritability may or may not be present. Symptoms must be acute and not caused by allergy (seasonal or medication).</td>
</tr>
<tr>
<td>Influenza-like Illness</td>
<td>Must have fever &gt;100°F at any site.</td>
<td>This diagnosis can be made only during influenza season (November to April). During this season, if criteria for influenza-like illness and laboratory or clinical evidence of respiratory tract infection are met at the same time, only the diagnosis of influenza-like illness should be recorded.</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Chest x-ray not.</td>
<td>Non-infectious causes of symptoms must be ruled out. In particular, congestive heart failure is a common cause of symptoms and signs similar to those of respiratory infection. Not: This diagnosis can be made only if chest x-ray was done.</td>
</tr>
</tbody>
</table>

**Additional Information:**

**Antibiotics Ordered:**

**Signature of Person Preparing This Form:**

---

**Note:**

- This form should be used to report suspected cases of respiratory tract infections. It is important to follow the criteria listed to accurately identify the infection. Please consult with medical professionals for further guidance.
Surveillance Data Collection Form LTC

INFECTION SURVEILLANCE – URINARY TRACT INFECTION

ORGANISM FOUND ON CULTURE:

☐ Lift in patient/resident WITHOUT Collector

☐ Lift in patient/resident WITH Collector

MUST HAVE at least 2 of the following:

☐ Fever >100°F on chart.

☐ Burning pain or irritation on urination, frequency or urgency.

☐ Blood or suppurative pain or tenderness.

☐ Change in character of urine.

☐ Worsening of mental or functional status (may be new or increased confusion/instability).

☐ Urine culture with >100,000 colonies/ml of single uropathogen in patient/resident on appropriate antimicrobial therapy.

NOTE: If any other organism is found in the urine specimen it is NOT a UTI.

CATEGORIES INCLUDE:

- URTI: Urinary Tract Infection
- UTI: Urinary Tract Infection
- Cys: Cystitis
- CK: Cystitis with pyelonephritis
- Pro: Prostatitis
- NIVT: Not Investigated
- VLBW: Very Low Birth Weight
- DDD: Dying Day by Day
- F: Fever
- P: Pain
- P: Plastic
- M: Malignant
- I: Incontinent
- A: Active
- C: Comatose

FUNCTIONAL STATUS:

☐ Independent

☐ Need assistance

☐ Total assistance

☐ Dying Day by Day

☐ Bedbound

☐ Courant

☐ Any other

CC: Comorbid Conditions

Antibiotics Ordered:

☐ Yes

☐ No

List Antibiotics Ordered:

Signature of person preparing this form:
Written Surveillance Plan

- Describe
  - Type of healthcare setting
  - Services provided and populations served
  - The surveillance program purpose, goals, and objectives
  - The indicators (what are you monitoring)
  - The methodology used for case definition
  - Data collection
  - Analysis
  - Types of reports generated and to whom they are provided
  - Process used to evaluate the surveillance program
Evaluation of Surveillance Program

• Evaluate:
  – The usefulness and ability to meet the organization’s objectives
  – Revisions should be made as needed
  – Compare program structure and activities to current practices and published recommendations for surveillance
  – The program resources
    • Adequate number of trained personnel
    • Appropriate computer hardware and software
    • Access to email and the internet
    • Need for secretarial, computer, or lab support
Benchmarking and Comparing Data

- Benchmarks are measures against which outcomes and processes can be compared.

- There are currently few external benchmarks that can be used for interfacility comparisons of HAIs and other adverse events.

- The NHSN program for HAI surveillance in acute care hospitals is the most widely used.

Summary

• Surveillance practices evolve in response to changes in healthcare delivery. The use of surveillance data has shifted from measuring clinical outcomes, such as infections, to guiding performance improvement activities and demonstrating improvements in clinical outcomes and healthcare practices. With the increase of antimicrobial resistance and outbreaks caused by emerging and reemerging infectious diseases and intentionally released pathogens highlights the need for local, regional, national, and global surveillance systems.

• ICPs responsible for managing surveillance programs must ensure that their programs are based on sound epidemiological and statistical principles and designed and evaluated in accordance with current recommendation and practices and have the resources needed to promote quality healthcare.