Surveillance of Healthcare-Associated Infections in Acute Care Settings
Teresa C. Horan, Emory University, Atlanta
A Webber Training Teleclass

Objective:
- Define surveillance and why we do it
- Describe 7 essential elements of surveillance
- Identify the recommended method for HAI surveillance
- Describe the national HAI surveillance system of the United States: National Healthcare Safety Network (NHSN)

Surveillance

“The ongoing, systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know.”

CDC Definition

Purpose of Surveillance (1)
- Improve patient outcomes
- Obtain “baseline” data
- Identify problems
- Evaluate control interventions

Purpose of Surveillance (2)
- Monitor quality of infection control practices
- Educate healthcare providers
- Determine research / study needs
- Satisfy regulatory / accreditation requirements

Which Infections to Survey? Epidemic vs. Endemic
- Fewer than 10% of all HAs occur in recognized outbreaks
- Ongoing surveillance measures the endemic rates of various infections so that we can recognize problems as they surface
- High endemic rates usually require addressing multiple problems


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7 Essential Elements of Surveillance

1. Assess the population
2. Select the event or process to survey
3. Choose the surveillance method(s) keeping in mind the need for risk-adjustment of data
4. Monitor for the event or process


5. Apply surveillance definitions during monitoring
6. Analyze and report the data
7. Use the data to drive prevention efforts


Healthcare Settings

- Inpatient
  - Hospitals
  - Long term acute care facilities
  - Rehabilitation facilities
  - Long term care facilities
- Outpatient
  - Ambulatory clinics, including surgical and dialysis centers
  - Community health centers
  - Home care services

Element 1: Assess the Population

Sources of data

- Medical records
- Quality / utilization management
- Surgical databases
- Administrative / management reports
- Public health reports
- Community agencies
- Occupational Health reports

Prioritize “at-risk” patients

- What types of patients do you serve?
- What are the most common diagnoses?
- What are the most frequently performed procedures?
- Which services are utilized most often?
- Which patients increase organization’s cost or liability?
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Vulnerable Patient Populations
- Elderly
- Immunosuppressed
- Organ or bone marrow transplant
- HIV / AIDS
- Pregnant women
- Infants and children
- Diabetics
- Alcohol/substance users
- Chronic obstructive pulmonary disease
- Congestive heart failure
- Other chronic illnesses
- Dialysis

Element 2: Select Event or Process to Survey
- Relative frequency of the event / process
- Cost or impact of a specific negative event / outcome
- Preventability
- Customer needs / satisfaction
- Organizational mission / strategic goals
- Available resources

Element 2: Select Event or Process to Survey
- Include key stakeholders in selection process
- Consider the time frame for each surveillance initiative
- Allocate resources according to surveillance priorities
- Get administrative support / commitment
- Develop a written surveillance plan

Surveillance Plan
- List surveillance initiatives that make up your plan
- Clearly describe each initiative
  - Purpose
  - Eligible patient population
  - Duration and frequency of monitoring
  - Data sources
  - Definitions of numerator and denominator (if any)
  - Analysis, including calculations
  - Dissemination plan (who, how often)

Survveillance Plan at General Hospital
EXAMPLE
Surveillance initiatives:
- Reduce incidence of central line-associated bloodstream infections (CLABSI)
- Increase adherence with central line insertion practices
- Reduce incidence of surgical site infections after open heart operations
- Improve surgical antimicrobial prophylaxis
- Increase uptake of influenza vaccination of healthcare workers

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**EXAMPLE**

CLABSI Surveillance Plan (1)

- **Purpose:** To reduce the CLABSI rate by x% 
- **Eligible patient population:** All adult and pediatric patients in intensive care units (ICU) and the neonatal ICU (NICU) 
- **Duration and frequency of monitoring:** Monthly during 2013; daily review of data sources; weekly visits to ICUs/NICU 
- **Data sources:** Patient charts, blood culture reports, radiographic and other diagnostic test reports (to rule out primary site of infection) 

**EXAMPLE**

CLABSI Surveillance Plan (2)

- **Numerator:** Number of CLABSI in ICU/NICU in the month 
- **Denominator:** Number of central line days (CLD) per month per ICU/NICU 
- **Analysis:** Quarterly rates (No. CLABSI / 1000 CLD) 
- **Dissemination plan:** Quarterly report of CLABSI rates and distribution of pathogens to the Infection Prevention Committee and ICUs/NICU within 2 weeks of end of quarter 

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**Element 3: Choose the Method**

**Active vs. Passive**

- Active: Trained personnel use various data sources to identify events 
  - In USA, infection prevention specialists collect HAI data 
  - Other staff can be trained to collect denominator and process measure data 
- Passive: Non-trained personnel identify and report events to you 

**Prospective vs. Retrospective**

- Prospective: Monitoring patients while still in the institution; includes post-discharge period for SSI 
  - Visibility of ICP on wards 
  - Timely analysis and feedback 
  - Labor intensive; costly 
- Retrospective: Case-finding based solely on chart review after patient discharged 

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Incidence vs. Prevalence
- Incidence: Measure new events occurring during some defined time period
- Prevalence: Measure all events occurring at either a point in time or during some defined time period
  - Useful to get a sense of the magnitude of the event

Priority-directed vs. Comprehensive
- Priority-directed: Objectives for surveillance are defined and focused on specific events and/or patients
  - Usually less resource intensive / costly
- Comprehensive: Continuous monitoring of all patients for all events
  - Hospital-wide
  - Usually more resource intensive / costly

What’s Recommended for HAI Surveillance?
- Active
- Prospective
- Patient-based
- Incidence metrics
- Mix of priority directed and comprehensive

Data elements to consider
- Demographics (patient ID #, name, age or DOB)
- Clinical and laboratory information to support case definition (including onset dates)
- Risk factors for infection being surveyed

http://www.cdc.gov/nhsn/dataCollectForms.html
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Element 4: Monitor for the Event or Process
- Employ a team approach; negotiate for assistance
  - Provide standardized training
- Maintain consistent surveillance intensity over time and across data collectors

Element 5: Apply Surveillance Definitions
- Use standardized definitions
  - Enhance the accuracy of data
  - Modifications have implications if you wish to compare your data to an external data source
- Clearly define all data elements for surveillance (i.e., criteria for risk factors and denominators)

Healthcare-associated Infection (HAI) Definition
- A localized or systemic condition that resulted from adverse reaction to the presence of an infectious agent or its toxin
- Not present on admission to the facility
- Occurs on or after hospital day 3 (where day 1 is day of admission)

HAI Surveillance Definitions

| Imaging test findings |
| Signs and symptoms |
| Laboratory findings |

Laboratory & Clinical Criteria vs. Either Alone
- For most infection sites, both required
- Laboratory criteria alone could falsely include colonized patients as infected
- Clinical criteria alone may overestimate true incidence of infection

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Clinical vs. Surveillance Definitions

- Clinical
  - Individualized; used for making therapeutic decisions
- Surveillance
  - Population-based
  - Must be applied uniformly and consistently

Element 6: Analyze and Report the Data

- Express data in numerical terms (i.e., ratios, proportions, rates)
- Display graphically; dashboards
- Determine whether observed differences in rates and ratios are meaningful; interpret findings for your audience
- Report the data in a timely manner

Element 7: Use the Data to Drive Prevention Efforts

- Present surveillance information in a manner to stimulate ideas for process improvement
- Perform follow-up surveillance to determine whether change has occurred

Surveillance without action should be abandoned

60-bed suburban U. S. hospital

- Services provided: Medical, Surgical, Obstetric, Pediatric, Emergency
- 2,900 surgeries and 250 infant deliveries per year
- 6-bed ICU
- Minimal computerization of medical records
- 1 infection preventionist (IP) who is also responsible for the employee health program
- Population served includes migrant workers
- Mandatory reporting of CLABSI, CAUTI, SSI, and notifiable diseases to the State Health Department
- Participates in CMS' Inpatient Quality Reporting program for CLABSI and CAUTI in ICU; SSI after colon and abdominal hysterectomy procedures; influenza vaccination of HCWs

Tools for this Hospital's IP

- Annual facility risk analysis
- Emergency Department records
- Hospital admission and discharge records
- Daily laboratory reports
- Close working relationship with staff from Admissions, Quality Improvement, Risk Management, Nursing Administration; Hospitalists
- Infection Prevention Committee meetings 6 times per year
  - Infectious Disease physician chairman
- Joined NHSN in 2010

Hospital's Surveillance Plan (1)

- Monitor CLABSI and CAUTI in ICU per state and CMS requirements
  - Train a clinician as an adjunct IP
  - Gather line and catheter days during daily rounds
- Monitor SSI following COLO and HYST per state and CMS requirements
- Use NHSN protocols* and app to enter, analyze, and report the data

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**Hospital’s Surveillance Plan (2)**
- Use automated system provided by state for notifiable disease reporting
- Conduct influenza vaccination campaign as soon as vaccine is available for 2013-14 season and monitor compliance using NHSN protocol* and app to enter, analyze, and report the data
  - Request clerical support
  - Conduct monthly “Safety Rounds” (to “keep finger on the pulse”)


**Healthcare Settings Covered by NHSN**
- Hospitals
  - General, VA, military, pediatric
  - Specialty: rehabilitation, long term acute care, psychiatric, oncology, surgery, orthopedic
- Outpatient dialysis facilities
- Long term care facilities
  - Skilled nursing facilities initially
  - Ambulatory surgery centers

**NHSN members in all states and territories (n=11,676 as of 02/19/2013)**
Percent of AHA Facilities Enrolled in NHSN by State

**Characteristics of Hospitals Participating in NHSN, 02/19/2013 (n=5342)**

**Hospital Bed Size (n=5342)**
(21%)
(48%)
(20%)
Percentages in parentheses from cohort that comprised 2006 NHSN Report

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Percentages in parentheses from cohort that comprised 2006 NHSN Report

Patient Safety Component Modules

Device-associated Module
Procedure-associated Module
AUR* Module
MDRO & CDI* Module
Vaccination Module

Patient Safety Component Modules

Device-associated

CLABSI
Central line-associated bloodstream infection
CLIP
Central line insertion practices*
VAE/VAP
Ventilator-associated events / Ventilator-associated pneumonia
CAUTI
Catheter-associated urinary tract infection
DE
Dialysis event

*Process measure: Adherence to hand hygiene, protective sterile barriers, appropriate antiseptic skin prep, etc.

Patient Safety Component Modules

Procedure-associated

Surgical Site Infection (SSI)

Patient Safety Component Modules

MDRO and CDI

Infection Surveillance
LabID Event Reporting

additional options then become available

Prevention Process Measures:
• Adherence to Hand Hygiene
• Adherence to Gown and Glove Use
• Adherence to Active Surveillance Testing

Outcome Measures:
• AST Prevalence / Incidence

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**Patient Safety Component Modules**

- **Vaccination Module***
  - Summary Method
  - Patient-level Method

*Process measure: proportion of eligible patients getting vaccinated prior to discharge

**PS Module Protocols**

- Device-associated Module (excluding Dialysis Events)
  - Facility chooses the patient care areas (locations) and events to monitor
- Procedure-associated Module
  - Facility chooses the procedures and events to monitor
- AUR Module: Antimicrobial Use Option
  - Facility reports data for adult and pediatric ICU and wards, 1 SCA, and facility-wide
- MDRO & CDI Module
  - Facility chooses the organisms, events, and locations to monitor and any process measures
- Vaccination Module
  - Facility chooses either summary or patient-level method during influenza season

**Outpatient Dialysis Surveillance**

- Outpatient dialysis facility monitors dialysis events every month
  - Outpatient intravenous antimicrobial start
  - Vancomycin
  - Positive blood culture
  - Bloodstream infection (BSI)
  - Access-associated BSI
  - Local access infections (no +BC)

**NHSN LTCF Component**

- Annual survey
  - Captures information about facility size and services provided
- Urinary tract infections*
  - With and without catheters
- *C. difficile and MDRO LabID events*
- Hand hygiene and gown and gloves use adherence*
- Started in August 2012; 90 LTCFs enrolled as of 2/19/2013

*for entire resident population

**Healthcare Personnel Safety Component Modules**

- Blood and body fluid exposure with or without follow-up monitoring (laboratory, post-exposure prophylaxis, etc.)
- HCW Vaccination
  - Influenza vaccination: Summary method
  - Opened enrollment in August 2009
  - 2546 facilities as of 2/19/2013 due to new CMS requirement of HCW flu vaccine reporting (was 208 in 4/2012)

**NHSN Biovigilance Component**

- Hemovigilance Module
  - Monthly reporting of:
    - Transfusion-associated adverse reactions
    - Incidents associated with blood products
  - Opened enrollment in February 2010
  - 184 facilities as of 2/19/2013

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HAI Surveillance Resources

- National Healthcare Safety Network: www.cdc.gov/nhsn
- Protocols, definitions, forms, training
- Hospital Epidemiology and Infection Control, 4th ed., 2011, C. G. Mayhall, ed.
- APIC Text of Infection Control and Epidemiology, 3rd ed., 2009

May 16
WHAT’S NEW IN TECHNOLOGIC INNOVATIONS FOR THE PREVENTION OF INTRAVASCULAR CATHETER ASSOCIATED BLOODSTREAM INFECTION
Speaker: Prof Mark Rupp, University of Nebraska Medical Center

30 May
PREVENTING CATHETER-ASSOCIATED URINARY TRACT INFECTIONS IN ACUTE CARE SETTINGS
Speaker: Laurie J Conway, Columbia University School of Nursing

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Speaker: Sir Liam Donaldson, World Health Organization

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Speaker: Steven Bock, New York City Langone Medical Center
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