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

SURVEILLANCE OF HEALTHCARE-ASSOCIATED INFECTIONS (HAI) IN ACUTE CARE SETTINGS

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Hosted by
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Namibia

Objectives

- 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

CDC Definition

"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."

Purposes of Surveillance (1)

- Improve patient outcomes
- Obtain "baseline" data
- Identify problems
- Evaluate control interventions

Purposes 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 HAIs 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

Stamm W et al., Am J Med 1981;70:393-397.

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www.webbertraining.com

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

Lee TB et al. Recommended practices for surveillance. Am J Infect Control 2007;35(7):427-440.

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7 Essential Elements of Surveillance

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

Lee TB et al. Recommended practices for surveillance. Am J Infect Control 2007;35(7):427-440.

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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

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Element 1: Assess the Population

- Obtain data to describe and understand your patient population
- Conduct an assessment of your "at-risk" population to set surveillance priorities

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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

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Element 1: Assess the Population

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

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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

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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

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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)

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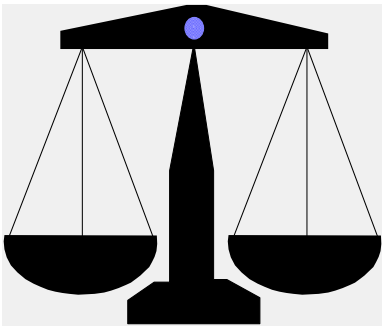
Balance



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Surveillance 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)

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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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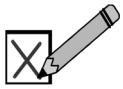
Element 3: Choose the Method



- Active vs. passive
- Prospective vs. retrospective
- Patient-based vs. laboratory-based
- Incidence vs. prevalence
- Priority directed vs. comprehensive

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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

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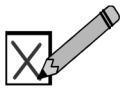
Element 3: Choose the Method



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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Element 3: Choose the Method

Patient-based vs. Laboratory-based

- Patient-based: Monitoring patients for events, risk factors, and procedures and practices related to patient care
  - Requires ward rounds
  - Includes discussions with caregivers
- Laboratory-based: Case-finding based solely on positive lab findings
  - Events may be missed
  - Colonization

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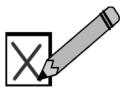
Element 3: Choose the Method



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

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Element 3: Choose the Method

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

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Element 3: Choose the Method

What's Recommended for HAI Surveillance?

- Active
- Prospective
- Patient-based
- Incidence metrics
- Mix of priority directed and comprehensive

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Element 4: Monitor for the Event or Process

- Develop data collection form for each surveillance initiative
  - Limit data collection to only what is needed for meeting the specific objective
  - Design forms considering flow of patient charts / data sources and ease of data recording / entry

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Element 4: Monitor for the Event or Process

- 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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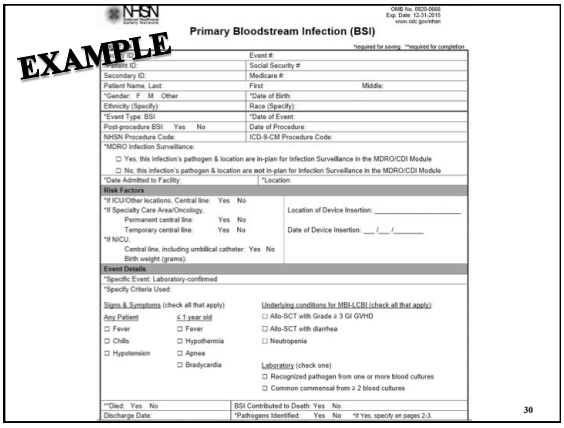

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Element 4: Monitor for the Event or Process

- Employ a team approach; negotiate for assistance
  - Provide standardized training
- Maintain consistent surveillance intensity over time and across data collectors

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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)

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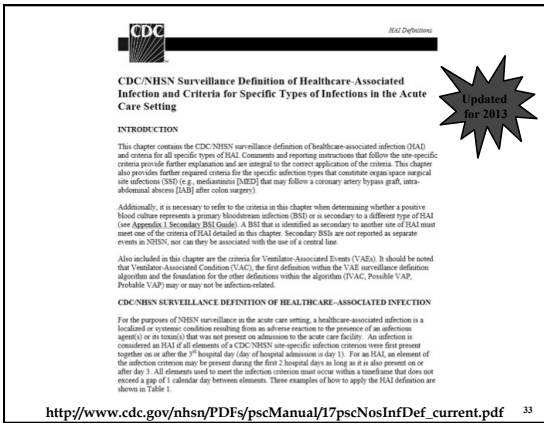

HAI Definitions

CDC/NHSN Surveillance Definition of Healthcare-Associated Infection and Criteria for Specific Types of Infections in the Acute Care Setting

INTRODUCTION

This chapter contains the CDC/NHSN surveillance definition of healthcare-associated infection (HAI) and criteria for all specific types of HAI. Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria. This chapter also provides further required criteria for the specific infection types that constitute organ/space surgical site infections (SSI) (e.g., mediastinitis [MED] that may follow a coronary artery bypass graft, intra-abdominal abscess [IAB] after colon surgery).

Additionally, it is necessary to refer to the criteria in this chapter when determining whether a positive blood culture represents a primary bloodstream infection (BSI) or is secondary to a different type of HAI (see Appendix 1 Secondary BSI Guide). A BSI that is identified as secondary to another site of HAI must meet one of the criteria of HAI detailed in this chapter. Secondary BSIs are not reported as separate events in NHSN, nor can they be associated with the use of a central line.

Also included in this chapter are the criteria for Ventilator-Associated Events (VAEs). It should be noted that Ventilator-Associated Condition (VAC), the first definition within the VAE surveillance definition algorithm and the foundation for the other definitions within the algorithm (IVAC, Possible VAP, Probable VAP) may or may not be infection-related.

CDC/NHSN SURVEILLANCE DEFINITION OF HEALTHCARE-ASSOCIATED INFECTION

For the purposes of NHSN surveillance in the acute care setting, a healthcare-associated infection is a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility. An infection is considered an HAI if all elements of a CDC/NHSN site-specific infection criterion were first present together on or after the 3rd hospital day (day of hospital admission is day 1). For an HAI, an element of the infection criterion may be present during the first 2 hospital days as long as it is also present on or after day 3. All elements used to meet the infection criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between elements. Three examples of how to apply the HAI definition are shown in Table 1.

Updated for 2013

http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf

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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)

http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf

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HAI Surveillance Definitions

Imaging test findings

Signs and symptoms

Laboratory findings

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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

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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

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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

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60-bed suburban U. S. hospital

EXAMPLE

- Services provided: Medical, Surgical, Obstetric, Pediatric, Emergency
- 2900 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

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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

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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

*http://www.cdc.gov/nhsn/PDFs/pscManual/PSC-Manual-portfolio.pdf

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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")

*http://www.cdc.gov/nhsn/PDFs/HPS-manual/HPS_Manual-exp-plus-flu-portfolio.pdf

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NHSN National Healthcare Safety Network

U.S. National Surveillance System for Healthcare Settings

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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

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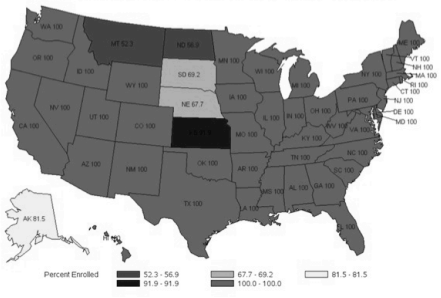
NHSN members in all states and territories (n=11,676 as of 02/19/2013)

Percent of AHA Facilities Enrolled in NHSN by State



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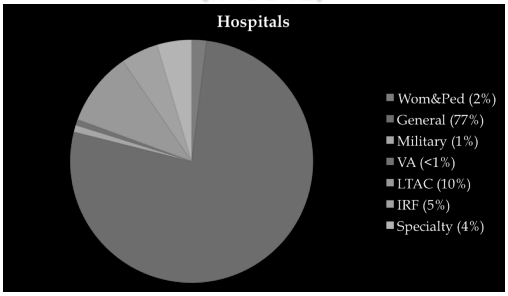
Characteristics of Hospitals Participating in NHSN, 02/19/2013 (n=5342)



VA, Veterans Affairs; LTAC, Long Term Acute Care; IRF, Inpatient Rehabilitation Facility

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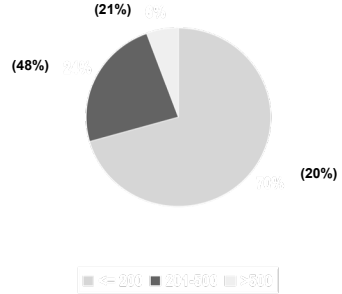
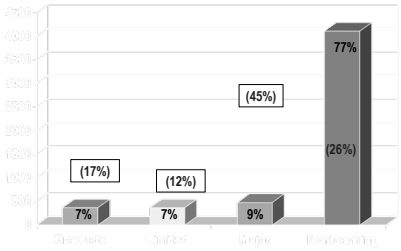
Hospital Bed Size (n=5342)



Percentages in parentheses from cohort that comprised 2006 NHSN Report

NHSN Hospitals by Medical School Affiliation (n=5342)



Percentages in parentheses from cohort that comprised 2006 NHSN Report

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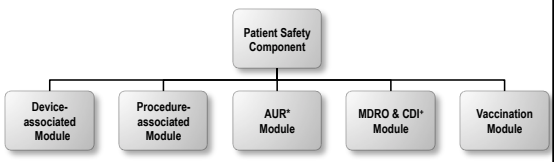
NHSN Structure

Patient Safety Component Modules



*Antimicrobial Use and Resistance

+Multidrug-Resistant Organism & *C. difficile* Infection

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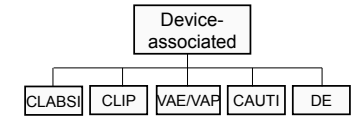
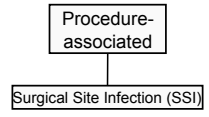
Patient Safety Component Modules



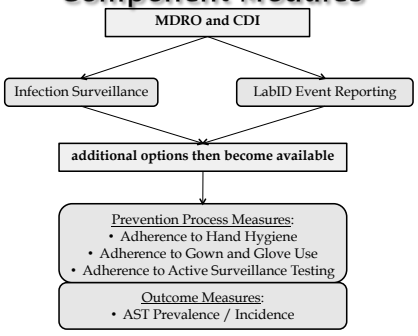
CLABSI Central line-associated bloodstream infection
CLIP Central line insertion practices*
VAE/VAP Ventilator-associated events / Ventilator-associated pneumonia
CAUTI Catheter-associated urinary tract infection
DE Dialysis event

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

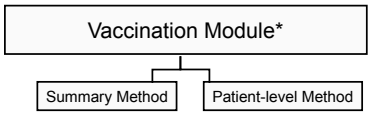
Patient Safety Component Modules



Patient Safety Component Modules



Patient Safety Component Modules



*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)

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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

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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)

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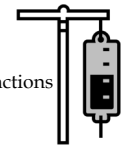
NHSN Biovigilance Component

- 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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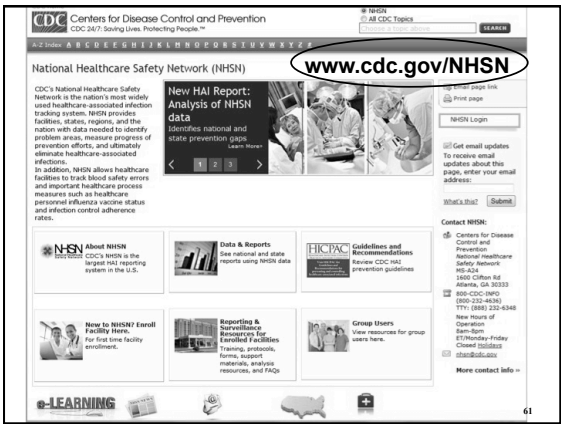

HAI Surveillance Resources

- National Healthcare Safety Network: www.cdc.gov/nhsn
  - Protocols, definitions, forms, training
- *Bennett & Brachman's* Hospital Infections, 5th ed., 2007, W. R. Jarvis, ed. (new edition coming soon)
- Hospital Epidemiology and Infection Control, 4th ed., 2011, C. G. Mayhall, ed.
- APIC Text of Infection Control and Epidemiology, 3rd ed., 2009

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HAI Surveillance Resources

- ICP Associates Hospital Infection Prevention Policies and Procedures
  - http://www.icpassociates.com/Products/HospitalInfectionControlManual/4,19,0.aspx
  - Several other specialty manuals
- Infectious Disease Surveillance, 2nd ed., 2012

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Coming Soon

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

04 June *(FREE Teleclass ... Broadcast live from CHICA-Canada Conference)*
GLOBAL PATIENT SAFETY
Speaker: Sir Liam Donaldson, World Health Organization

10 June *(FREE Teleclass ... Broadcast live from APIC Conference)*
INFECTION CONTROL DURING DISASTERS
Speaker: Steven Bock, New York City Langone Medical Center
Mie Saijo, Japanese Red Cross Ishinomaki Hospital, Japan

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