Introduction to NHSN

Basics of Infection Prevention
2-Day Mini Course
May 2017
Objectives

- Describe NHSN key terms
- Demonstrate how to use NHSN as both a surveillance system and the web-based platform used in California for public reporting
- Understand how to interpret NHSN reports of your data
National Healthcare Safety Network (NHSN)

- Surveillance system used nationwide for reporting HAI from hospitals, long term care facilities, ambulatory surgery centers and hemodialysis clinics
  - Providing more transparency and accountability in healthcare
  - Surveillance system used by LACDPh, CDPH, other health departments, and CMS for HAI reporting
  - Data used for HAI public reporting, pay for reporting, and pay for performance programs
- Accessed through a secure, web-based interface; open to all US healthcare facilities at no charge
NHSN for Mandatory HAI Reporting

Required by CDPH to meet mandated HAI reporting requirements in California acute care hospitals (including LTACs)

- CLIP in ICUs
- CLABSI facility-wide (from all inpatient locations)
- SSI from 29 operative procedures (per AFL 11-32)
- \textit{C difficile} from inpatients locations*
- MRSA and VRE bacteremia from inpatients*
  - If inpatient MRSA BSI related to central line, event must be reported also as CLABSI (entered in both NHSN modules)

*including ED and observational units

Reference NHSN Patient Safety Manual, January 2016*
NHSN for Mandatory HAI Reporting

Required by CMS for reporting specific infections for Medicare reimbursement from all U.S. acute care and LTAC hospitals:

- CLABSI in hospital ICUs, 2011
- CAUTIs in hospital ICUs, 2012
- SSI from colon and abdominal hysterectomies, 2012
- MRSA bacteremia and C. difficile LabID, 2013
- HCP Influenza Vaccination, 2013
- Medicare Beneficiary Number, 2014
- CLABSI & CAUTI in hospital wards, 2015
- VAE in Adult ICUs & wards, 2016 (LTACs only)

Reference: Healthcare Facility HAI Reporting Requirements to CMS via NHSN

September 2015
NHSN for Mandatory HAI Reporting

Required by CMS for reporting specific infections for

- Outpatient hemodialysis, 2012
  - Dialysis Event, 2012
  - HCP Influenza vaccination, 2015
- Inpatient rehabilitation facilities
  - CAUTI, all wards, 2012
  - HCP influenza vaccination, 2014
  - MRSA bacteremia and *C. difficile* LabID, 2015
- Ambulatory Surgery Centers
  - HCP influenza vaccination, 2014

Reference: Healthcare Facility HAI Reporting Requirements to CMS via NHSN

September 2015
NHSN Data Access

• Facilities own their NHSN surveillance data
  – May edit at any time to improve accuracy, completeness

• Facilities can (or may be required) to join one or more NHSN Group
  – Ex: healthcare organization, CDPH, LAC DPH
  – Facility confers rights for data access to the Group
  – Facilities within Group cannot see each other’s data

• Facility signed a data use agreement with CDC; allows CMS access to specific NHSN data
Enrolling in NHSN

http://www.cdc.gov/nhsn/ltc/enroll.html

1. Agree to the NHSN Rules of Behavior online and enter facility registration information.
   http://nhsn.cdc.gov/RegistrationForm/index
2. Receive ‘Invitation to Register’ email from SAMS.
3. Submit registration for your SAMS card including getting your ‘Identify Verification Request’ application notarized.
4. Receive your SAMS card (may take up to 8 weeks).
5. Enter your Contact Form and Facility Survey information.
   Contact Form: http://www.cdc.gov/nhsn/forms/57.101_FacConInf_BLANK.pdf
   Facility Survey: http://www.cdc.gov/nhsn/PDFs/LTC/forms/57.137_LTCFSurv_BLANK.pdf
6. Receive “NHSN Facility Enrollment Submitted” confirmation email from CDC, with Consent Form attached.
7. Submit your Consent Form to CDC via fax.
8. Receive “NHSN Facility Enrollment Approved” email from CDC.
Getting Ready for NHSN Reporting

Follow these instructions to set-up NHSN reporting.

Make sure your SAMS log-in is still active.
If you have forgotten your password, you can reset it online on the NHSN log-in page.

Have a list of facility locations, including bed size for each location.

By month, gather the following information:
•   # resident admissions
•   Total resident days
•   # admissions on CDI treatment

For residents with an HAI gather the following information:
•   Gender, DOB, SSN, resident type (short/long stay)
•   Date of first admission to your facility, date of current admission, positive sample collection date
NHSN Annual Survey

• Form to be completed every year
• Information includes:
  – Demographics
    • bed size, affiliations, etc.
  – Microbiology practices
    • ie. tests performed
  – Infection Prevention and Control practices
    • Facility’s policies for preventing or controlling various HAIs
  – Antibiotic Stewardship Practices
    • Actions regarding antibiotic use within your facility
  – Electronic Health Records
    • what information can be found in EHR
# Long Term Care Facility Component—Annual Facility Survey

*required for saving

<table>
<thead>
<tr>
<th>Facility ID:</th>
<th>Tracking #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Survey Year:</td>
<td></td>
</tr>
<tr>
<td>*National Provider ID:</td>
<td>State Provider #:</td>
</tr>
</tbody>
</table>

## Facility Characteristics

*Ownership (check one):

- [ ] For profit
- [ ] Not for profit, including church
- [ ] Government (not VA)
- [ ] Veterans Affairs

*Certification (check one):

- [ ] Dual Medicare/Medicaid
- [ ] Medicare only
- [ ] Medicaid only
- [ ] State only

*Affiliation (check one):

- [ ] Independent, free-standing
- [ ] Independent, continuing care retirement community
- [ ] Multi-facility organization (chain)
- [ ] Hospital system, attached
- [ ] Hospital system, free-standing

---

**In the previous calendar year:**

*Average daily census: ________

*Total number of short-stay residents: ________  Average length of stay for short-stay residents: ________

*Total number of long-stay residents: ________  Average length of stay for long-stay residents: ________

*Total number of new admissions: ________

---

*Number of Beds: ________,  *Number of Pediatric Beds (age <21): ________

*Indicate which of the following primary service types are provided by your facility. On the day of this survey, indicate the number of residents receiving those services (list only one service type per resident, i.e. total should sum to resident census on day of survey completion):  

<table>
<thead>
<tr>
<th>Primary Service Type</th>
<th>Service provided?</th>
<th>Number of residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Long-term general nursing:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>b. Long-term dementia:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>c. Skilled nursing/Short-term (subacute) rehabilitation:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>d. Long-term psychiatric (non dementia):</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>e. Ventilator:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>f. Bariatric:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>g. Hospice/Palliative:</td>
<td>☐</td>
<td>________</td>
</tr>
<tr>
<td>h. Other:</td>
<td>☐</td>
<td>________</td>
</tr>
</tbody>
</table>

Continued >>
NHSN Structure – All Components

NHSN

- Patient Safety
- Healthcare Personnel Safety
- Long-term Care Facility
- Outpatient Dialysis
- Biovigilence

https://www.cdc.gov/nhsn/pdfs/pscmanual/1psc_overviewcurrent.pdf
NHSN Structure – Patient Safety Component

Patient Safety

- Device Associated Module: CLABSI & CLIP surveillance and reporting
- Procedure Associated Module: SSI surveillance and reporting
- Antimicrobial Use and Resistance
- MDRO & CDI Module: *C. difficile* & MRSA-VRE BSI surveillance and reporting
NHSN Structure – LTCF Component

Long-term Care Facility

- Urinary tract Infections
- MDRO & CDI LabID Event
- Prevention process measures
NHSN Structure – Healthcare Personnel Safety

- Healthcare Personnel Safety
  - Healthcare Personnel Exposure
  - Healthcare Personnel Vaccination
In NHSN, infection is NOT

- Colonization: presence of microorganisms on skin, mucous membranes, open wounds, excretions or secretions but not causing adverse clinical signs or symptoms

- Inflammation that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals
Key Term: Inpatient vs. Outpatient

NHSN Inpatient
  • A patient whose date of admission to the healthcare facility and the date of discharge are **different calendar days**

NHSN Outpatient
  • A patient whose date of admission to the healthcare facility and the date of discharge are the **same day**
CDC Location Mapping

- Each patient care area in NHSN is defined by the type of patients receiving care in that location.
- To define (or redefine) a patient care location:
  1. Determine the acuity level (e.g. critical care, ward).
  2. Determine the type of service (e.g. burn, surgical).
- Apply 80% Rule to designate patient type.

EXCEPTION: Medical/Surgical Locations (ICUs and wards):
  - If more than 60% medical patients, define as a medical location.
  - If more than 60% surgical, define as a surgical location.
Look for annual updates to definitions www.cdc.gov/nhsn
UTI - Surveillance for Urinary Tract Infections

Catheter-Associated Urinary Tract Infection (CAUTI) and non-catheter-associated Urinary Tract Infection (UTI) and Other Urinary System Infection (USI)

- Training
- Protocols
- Forms
- Support Materials
- Analysis Resources
- FAQs

How can I use NHSN with my facility data?

• Calculate and analyze infection measures
• Apply risk stratification methodology to your data
• Generate tables, graphs, charts
- The number of available functions (on the left blue navigation bar) depends on your NHSN User’s rights
- Your NHSN Facility Administrator sets (and can change) the rights for each User
- Types of User rights are: 1) Administrative (all functions available), 2) Analyze data, 3) Enter data, 4) View data
Prior to performing analysis, a data set must be generated.
Retrieves a copy from the NHSN servers in Atlanta.
Recommend you generate after data entry to include most recent data.
NHSN Analysis Options and Reports

- Analysis options are available only if you have generated a data set
- “Analysis Output Options” are the canned analysis reports developed by NHSN
- Options are presented in a series of expandable folders
- To view report Options:
  1. Chose a Module
  2. Chose “CDC-defined Output”
• All available analysis options are laid out
• CDC Defined Output are ‘canned’ reports you can modify by
  • Time period
  • Location
  • Provider
• Ability to save your modifications for future use
  • Access through Custom Output folder
Modifying a CDC “Canned” Report

If you want to pick a specific time period click here

Example: To select only specific locations click here and make selection

Then click here to pick which of your locations

Always check - Labels easier to read

<table>
<thead>
<tr>
<th>Select output format:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Format: CSV (Comma Separated Value)</td>
</tr>
<tr>
<td>Use Variable Labels</td>
</tr>
</tbody>
</table>

| Select a time period or Leave Blank for Cumulative Time Period: |
| Date Variable | Beginning | Ending |
| Clear Time Period |

| Specify Other Selection Criteria: |
| Show Criteria | Column + | Row + | Clear Criteria |
| location |

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Modifying a Report – Title and Format

Title/Format

Title:
Line Listing for All Central Line-Associated BSI Events

Format:
- html
- pdf
- xls
- rtf

Run Save Export Close
Modifying a Report – Time Period

The screenshot shows a user interface for modifying a report that includes a Time Period section. The interface allows users to select a date variable and set the beginning and ending dates for the time period. The selected date variables are:

- admDateYH
- admDateYM
- admDateYQ
- admDateYr
- admInitDate
- devInsertDate
- dischargeDate
- disDateYH
- disDateYM
- disDateYQ
- disDateYr
- d3ob
eventDate
evntDateYH
evntDateYM
evntDateYQ
evntDateYr
modifyDate
procDate
procDateYH
procDateYM
procDateYQ
procDateYr

The interface also includes buttons for running the report, saving it, exporting it, and closing the window.
Modifying a Report - Filters

Example: To select only specific locations click here and make selection.

Then click here to pick which of your locations.
## Line List – check data entry

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Patient ID</th>
<th>Date of Birth</th>
<th>Gender</th>
<th>Fac Admission Date</th>
<th>Event ID</th>
<th>Event Date</th>
<th>Event Type</th>
<th>Specific Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
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<td>LCBI</td>
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</tr>
</tbody>
</table>
# Sample Rate Table

This table provides valuable insights into healthcare safety and efficiency. Here's a breakdown of its components:

- **CLABSI Rate and p-Value**: This section shows your Central Line-Associated Bloodstream Infection (CLABSI) rate and p-value. The p-value helps determine if your rate is significantly higher or lower compared to the NHSN national rate (>0.05 NS).

- **Device Utilization Ratio**: This column compares your device utilization ratio to all similar hospital units in NHSN data from 2006 to 2008.

- **Percentile Distribution**: It indicates where your rate falls in the percentile distribution of all NHSN hospital rates.

- **Missing Data**: The table also reminds you to check for missing infections and missing summary data for each unit each month.

### National Healthcare Safety Network

#### Rate Table for Central Line-Associated BSI Data for ICU-Other

As of: February 26, 2014 at 8:28 PM
Date Range: CLAB_RATE ICU summary YM 2013M07 to 2013M12

<table>
<thead>
<tr>
<th>Location</th>
<th>Summary Year/Month</th>
<th>CLA BSI Count</th>
<th>Central Line Days</th>
<th>CLA BSIRate</th>
<th>NHSN CLAB Pooled Mean</th>
<th>Incidence Density p-value</th>
<th>Incidence Density Percentile</th>
<th>Patient Days</th>
<th>CL Util Ratio</th>
<th>NHSN Line DU Pooled Mean</th>
<th>Proportion p-value</th>
<th>Proportion Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SICU</td>
<td>2013M07</td>
<td>0</td>
<td>280</td>
<td>0.000</td>
<td>1.2</td>
<td>0.7172</td>
<td>10</td>
<td>435</td>
<td>0.644</td>
<td>0.59</td>
<td>0.2672</td>
<td>63</td>
</tr>
<tr>
<td>1 SICU</td>
<td>2013M09</td>
<td>1</td>
<td>399</td>
<td>2.506</td>
<td>1.2</td>
<td>0.4602</td>
<td>86</td>
<td>448</td>
<td>0.891</td>
<td>0.59</td>
<td>0.0000</td>
<td>94</td>
</tr>
<tr>
<td>1 SICU</td>
<td>2013M10</td>
<td>1</td>
<td>250</td>
<td>4.000</td>
<td>1.2</td>
<td>0.2935</td>
<td>95</td>
<td>450</td>
<td>0.556</td>
<td>0.59</td>
<td>0.4323</td>
<td>45</td>
</tr>
<tr>
<td>1 SICU</td>
<td>2013M11</td>
<td>0</td>
<td>350</td>
<td>0.000</td>
<td>1.2</td>
<td>0.6600</td>
<td>10</td>
<td>400</td>
<td>0.875</td>
<td>0.59</td>
<td>0.0000</td>
<td>93</td>
</tr>
<tr>
<td>1 SICU</td>
<td>2013M12</td>
<td>0</td>
<td>315</td>
<td>0.000</td>
<td>1.2</td>
<td>0.6880</td>
<td>10</td>
<td>375</td>
<td>0.840</td>
<td>0.59</td>
<td>0.0000</td>
<td>92</td>
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<tr>
<td>3 SICU</td>
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<td>0</td>
<td>395</td>
<td>0.000</td>
<td>1.2</td>
<td>0.6257</td>
<td>10</td>
<td>442</td>
<td>0.894</td>
<td>0.59</td>
<td>0.0000</td>
<td>94</td>
</tr>
</tbody>
</table>

Source of aggregate data: *Am J Infect Control* 2013;41:1148-56

Data contained in this report were last generated on February 26, 2014 at 8:28 PM.
NHSN Standardized Infection Ratio (SIR)

- Driven by need for a **summary measure**
- Adjusts for differences in infection risk
  - e.g. by type of procedure and associated risk factors of patients undergoing that procedure in your hospital
- SIR compares #HAIs reported by your hospital with the “predicted” number of HAIs derived from NHSN referent data
Observed HAIs

SIR = \frac{\text{Predicted HAIs}}{\text{Observed HAIs}}

Examples:

If your hospital has 2 CLABSI per 1000 line days and national data predict 2.0 CLABSI per 1000 line days:

\[ \text{SIR} = \frac{2}{2.0} = 1.0 \]

If your hospital has 4 SSI per 100 Hip prosthesis procedures and national data predict 2.5 SSI:

\[ \text{SIR} = \frac{4}{2.5} = 1.6 \]
Interpreting SIR

- **Value of 1.0** = number of HAI observed in your hospital is the **same as the predicted** number of HAI for your hospital as derived from NHSN national referent data
  - Less than 1.0 = **fewer HAI** than predicted
  - Greater than 1.0 = **more HAI** than predicted

Note: In NHSN, the SIR will only be calculated for your hospital if the predicted is >1 (because can’t have less than a whole person infected)
“How do I interpret whether our SIR is significantly different (higher or lower) than NHSN data?”

1. If the p-value is above 0.05, the observed difference is not statistically significant.

2. If the 95% Confidence interval overlaps 1.0, the observed difference is not statistically significant.

*If the p-value is not significant, the confidence interval won't be significant either and vice versa.*

Note that the confidence interval indicates precision as well as significance.
SIR Interpretation - Example

Pretend this is “our” hospital.

<table>
<thead>
<tr>
<th>Org ID</th>
<th>Summary Yr</th>
<th>Infection Count</th>
<th>Number Expected</th>
<th>Central Line Days</th>
<th>SIR</th>
<th>SIR p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>10018</td>
<td>2009</td>
<td>9</td>
<td>7.191</td>
<td>3786</td>
<td>1.25</td>
<td>0.2962</td>
<td>0.653, 2.184</td>
</tr>
</tbody>
</table>

To discuss these findings:

1. “We had 9 CLABSI; 7.2 were expected. Our SIR is 1.25 or 25% higher than what would be predicted from national data.”

2. “However, this difference is not significantly different than that predicted by the national hospital data because our estimate is not very precise.” *

3. “In fact, our SIR may be anywhere from 35% below to more than double the predicted value (.65 – 2.2).”

4. “We will continue to monitor CLABSI’s. Observations over time (and more line days) will help us better understand how we compare. Our ultimate goal is to prevent all CLABSI’s.”

* Due to limited surveillance experience, e.g. too few line days across hospital units with predicted low rates.
To discuss these findings:

1. “We saw 74 CLABSI in 10,065 line days; 26.6 were predicted.”
2. The SIR is 2.78 or nearly 3 times higher than what would be predicted from national data.”
3. “This difference is significantly different than the national hospital data.”
4. “In fact, the precision of this estimate shows that our hospital is between 2 and 3 ½ times higher than predicted (C.I. 2.2 – 3.5).”
5. “We need to implement a CLABSI prevention program immediately.”
Risk Adjustment

• SIR adjusts for facility and patient level characteristics that can affect risk of infection within each facility

• SSI
  • Procedure type, patient ASA score, sex, duration of procedure

• CLABSI
  • Location within facility (ICU vs Ward)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>MRSA LabID</th>
<th>CDI LabID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med school affiliation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Facility bedsize</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CDI test type</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Admission prevalence rate</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
For issues specific to California, NHSN help is also available from the CDPH HAI Program [www.cdph.ca.gov/hai](http://www.cdph.ca.gov/hai)

Healthcare-Associated Infections (HAI) Program

The Healthcare-Associated Infections (HAI) Program is one of two programs in the [Center for Health Care Quality](http://www.cdph.ca.gov/hai) of the California Department of Public Health. The Program was created by mandate to oversee the prevention, control, and surveillance of hospital-acquired infections in California's general acute care hospitals. HAI's are the most common complication of hospital care. It is estimated that each year there are 722,000 infections, 75,000 deaths, and 1 in 25 hospital patients at any given time has an HAI. The cost associated with HAIs result in an estimated $30 billion in excess healthcare costs nationally each year. Since 2010, the HAI Program has produced annual public reports of hospital HAI data to inform choices of healthcare consumers and providers, and to engage in HAI prevention by performing site visits to hospitals with high infection rates, convening prevention collaboratives, and providing infection prevention education, and provided consultation and assistance to local public health departments.

The vision of the HAI Program is to eliminate HAI's for all Californians.

**What You Can Do To Prevent HAI**

- **Me And My Family**
- **Healthcare Providers**
- **Public Health Partners**
- **HAI Committee & Laws**

**Healthcare Associated Infections - Advisory Committee**
- HAI Advisory Committee

**Antimicrobial Resistance**
- Antimicrobial Resistance
- California Antimicrobial Stewardship Program Initiative
- Spotlight on Antimicrobial Stewardship Program Project Invitation 2014

**Public Reporting - Preventing Hospital Infections**
- New HAI Information and Reports
  - 2013 HAI Annual Report Now Published
- New My Hospitals Infections Map
  - Interactive Map 2013 Data -- This map can be used with some mobile devices and tablets.
- New Healthcare Personnel Influenza Vaccination Reports
  - Annual Report Now Published for 2013-2014 Respiratory Season

**New Links**
- HAI Program
NHSN Strengths

- Provides standards for surveillance across healthcare facilities
- Data risk-adjusted for comparison to national data
- Web-based; data housed remotely; data quality checks
- Data analysis tools built into system
- Adapting to electronic reporting using national electronic health record standards (e.g. HL7, CDA)
- Expandable to many health care settings
NHSN Limitations

- Data validation methods in development
- Requires following all NHSN protocols - detailed, lengthy
- Not easily integrated with electronic medical record for data import
- While training and support is provided by NHSN, its use is not as intuitive as initially assumed or hoped
In Summary

NHSN is a surveillance system

- It is also the platform for recording data, which meets the regulatory reporting requirements for Public Health and CMS

This slide set provides only an introduction to NHSN

- Intent not to provide every detail (you wouldn’t remember anyway)
- Enough information to get you started
- Available resources

The best way to begin NHSN surveillance?

- Take a deep breath and just start
- Find a mentor
- Consult with your designated liaisons at LACDPH and CDPH
Questions?