Introduction to NHSN

CDPH
California Department of
PublicHealth

Basics of Infection Prevention
2-Day Mini-Course
2016

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

CDPH California Department of PublicHealth

National Healthcare Safety Network (NHSN)

- Surveillance system used nationwide for reporting HAI from hospitals, long term care facilities, and hemodialysis clinics
  - Providing more transparency and accountability in healthcare
  - Surveillance system used by CDPH, other state 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

CDPH California Department of PublicHealth

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

CDPH California Department of PublicHealth

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

CDPH California Department of PublicHealth

Recommended Practices for Surveillance and NHSN

I. Assess the population
II. Select the outcome or process for surveillance

You may be required by regulation to perform surveillance for specific HAI and specific patient populations

CDPH California Department of Public Health

NHSN for Mandatory HAI Reporting (2015 update)

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)
- *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 2015*

CDPH California Department of PublicHealth

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* , 2013
- HCP Influenza Vaccination, 2013
- CLABSI & CAUTI in hospital wards , 2015

Reference: Healthcare Facility HAI Reporting Requirements to CMS via NHSN http://www.cdc.gov/nhsn/PDFs/CMS/CMS-Reporting-Requirements.pdf, January 2015

CDPH California Department of PublicHealth

NHSN for Mandatory HAI Reporting -

Required by **CMS** for reporting specific infections for

- Outpatient hemodialysis, 2012
- Inpatient rehabilitation facilities
  - CAUTI, all wards, 2012
  - HCP influenza vaccination, Oct 2014
- Ambulatory Surgery Centers
  - HCP influenza vaccination, Oct 2014

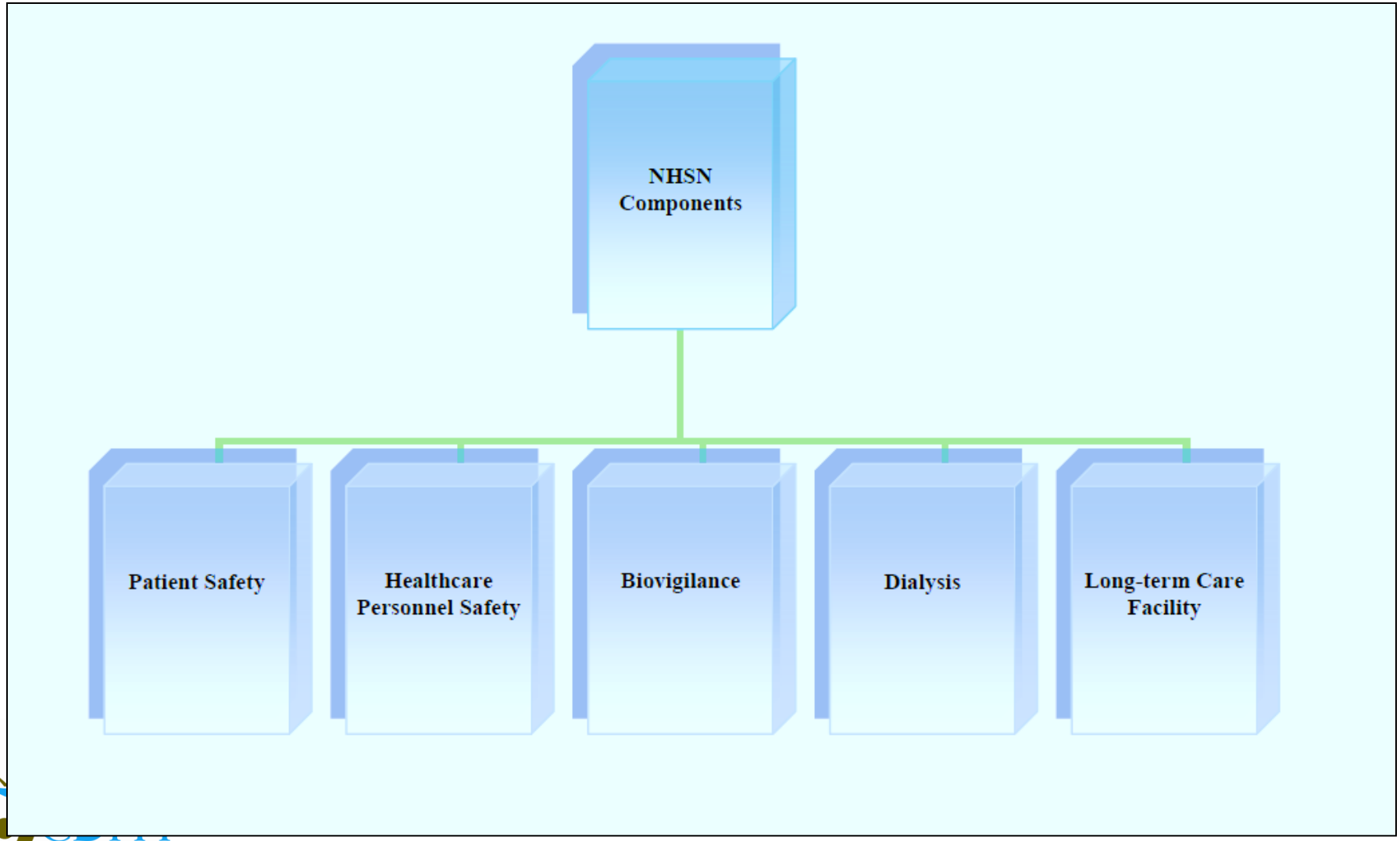
Reference: Healthcare Facility HAI Reporting Requirements to CMS via NHSN http://www.cdc.gov/nhsn/PDFs/CMS/CMS-Reporting-Requirements.pdf, December 2014

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
  - Examples: healthcare organization, CDPH
  - Facility confers rights for data access to the Group
    - CDPH accesses data required by statute
  - Facilities within Group cannot see each other's data
- Facility signed a data use agreement with CDC; allows CMS access to specific NHSN data

CDPH California Department of PublicHealth

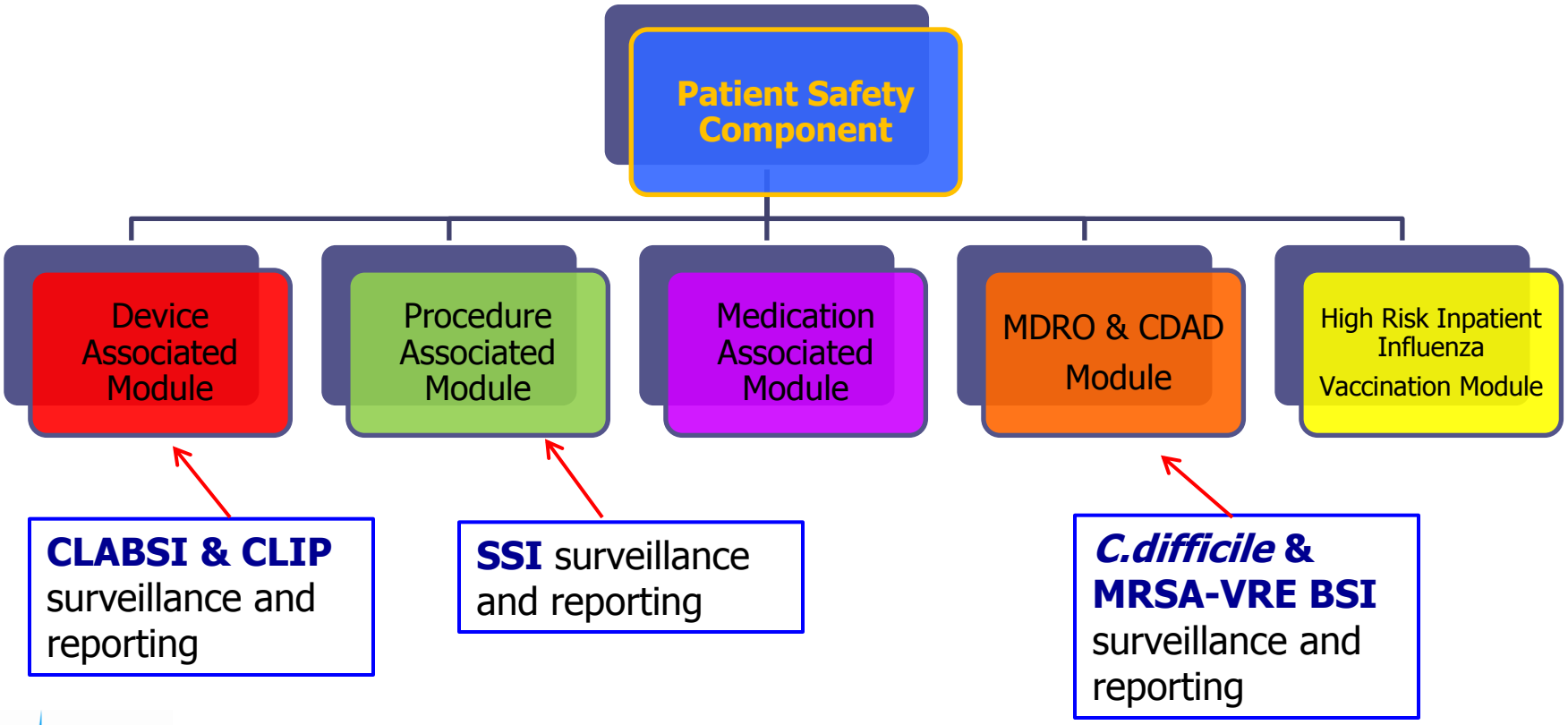
NHSN Structure – All Components, **2015**



California Department of PublicHealth

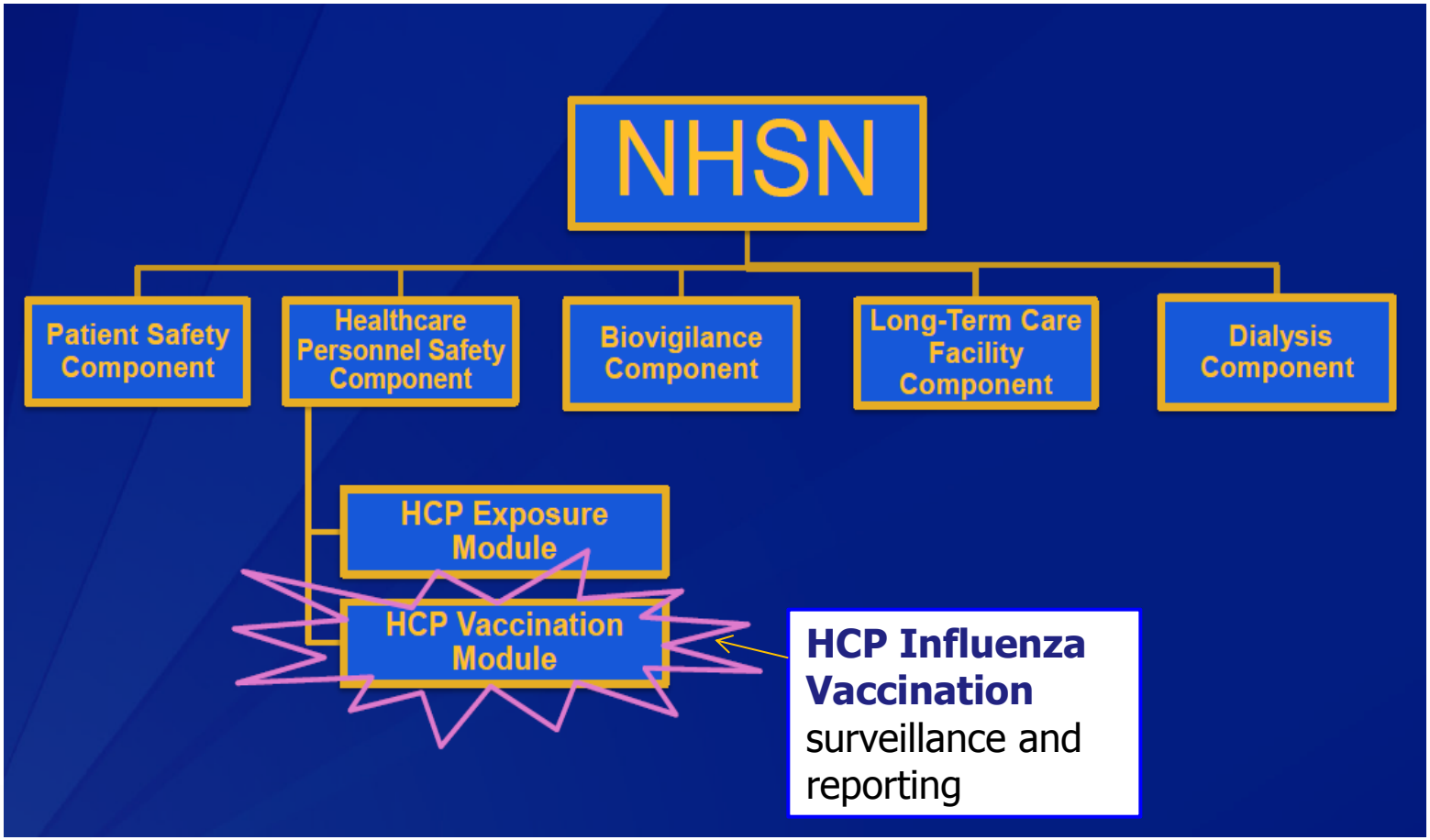
www.cdc.gov/nhsn/PDFs/pscManual/1PSC_OverviewCurrent.pdf

NHSN Structure – Patient Safety Component



CDPH California Department of PublicHealth

NHSN Structure – HCP Safety Component



CDPH California Department of PublicHealth

http://www.cdc.gov/nhsn/PDFs/training/HCP-flu-Vaccination-Summary-Reporting-ASC-Training-slides.pdf

Long-term Care Facility

Healthcare associated infection

Laboratory identified (Lab ID) event

Prevention process measures

Modules of the LTCF Component

Recommended Practices for Surveillance and NHSN

III. Use surveillance definitions and protocols!

IV. Collect surveillance data

CDPH California Department of PublicHealth

Difference Between Clinical and Surveillance Definitions

- **Clinical criteria used by physicians for patient care and management may differ from surveillance criteria**
  - Clinical
    - Patient centered
    - Used for therapeutic decisions
  - Surveillance
    - Population based
    - Applied exactly the same way each time
    - Physician diagnosis of infection is acceptable for some infections

In NHSN, infection is **not**

- **Colonization** (presence of microorganisms on skin, mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms)

- **Inflammation** that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals

CDPH California Department of PublicHealth

NHSN HAI Surveillance Definitions

Look for annual updates to definitions
www.cdc.gov/nhsn

CDPH California Department of PublicHealth

CDC/NHSN Surveillance Definitions for Specific Types of Infections

NOTE: Substantive changes have been made to this chapter, including edits, additions, and deletions.

INTRODUCTION

This chapter contains the CDC/NHSN surveillance definitions and criteria for all specific types of infections. 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 additional 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, etc.). Refer to Chapter 2 (Identifying HAIs in NHSN) for specific guidance for making HAI determinations.

Infection criteria contained in this chapter may be necessary for determining whether a positive blood culture represents a primary bloodstream infection (BSI) or is secondary to a different type of infection (see Appendix 1 Secondary Bloodstream Infection (BSI) Guide). A BSI that is identified as secondary to another site of infection must meet one of the infection criteria 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.

NOTE: Criteria for urinary tract infections (UTI), bloodstream infection (BSI), pneumonia (PNEU) infections, ventilator-associated events (VAE) and surgical site infections (SSI) are no longer included in this chapter. For those criteria, see individual protocol chapters.

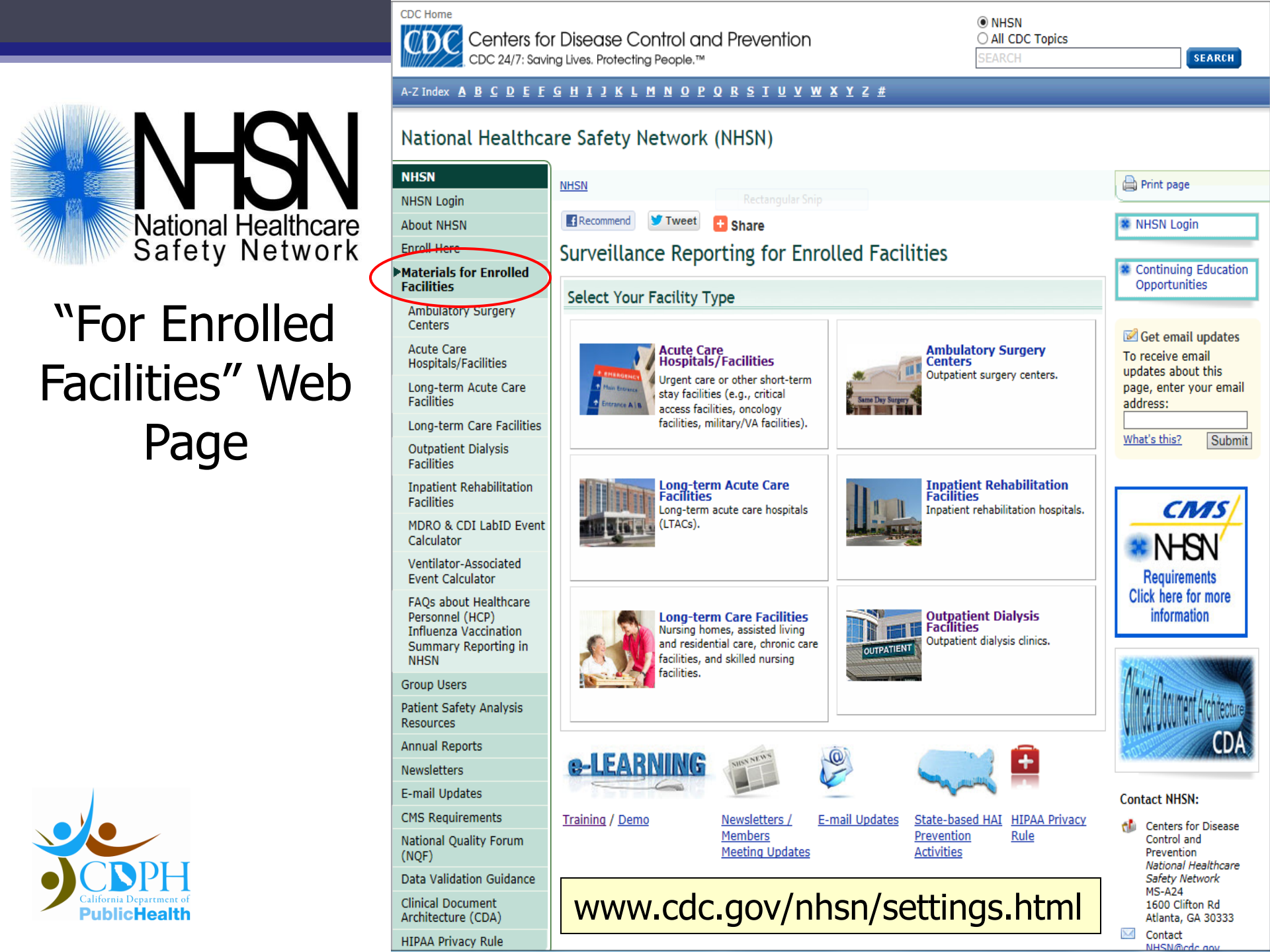
CRITERIA FOR SPECIFIC TYPES OF INFECTION

Infection criteria have been grouped into 14 major types with some further categorized into specific infections. For example, there are three specific types of central nervous system infections (intracranial infection, meningitis or ventriculitis, and spinal abscess without meningitis) that are grouped under the major type of CNS–Central Nervous System.

The specific and major types of infection used in NHSN and their abbreviated codes are listed inTable 1, in alphabetical order by major type code and the criteria for each of the specific types of infection follow it.

NHSN Patient Safety Manual, Chapter 17

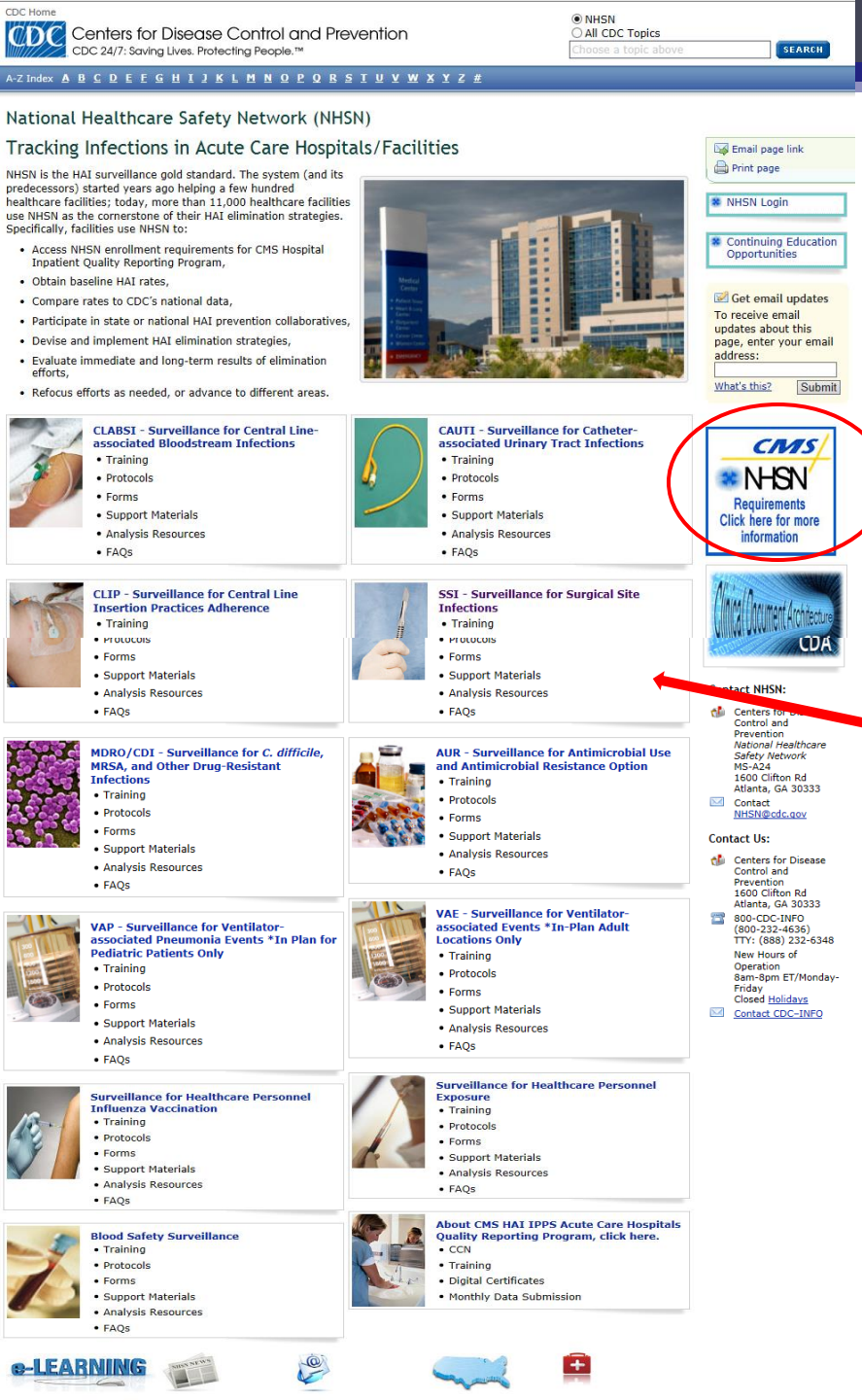
"For Enrolled Facilities" Web Page



www.cdc.gov/nhsn/settings.html

NHSN Acute Care Hospital-Specific Page

- Contains educational modules
- CMS requirements
- Links to emails and past newsletters



SSI Surveillance

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

www.cdc.gov/nhsn/acute-care-hospital

Special Edition!

October 2010, Updated December 2010

NHSN National Healthcare Safety Network

evention (CDC) News

Your Guide to the Standardized Infection Ratio (SIR)

With the new version of NHSN (version 6.3), new output options are available that will permit the calculation of standardized infection ratios (SIRs) for central line-associated bloodstream infection (CLABSI) and surgical site infection (SSI) data. Each of these measures fall in line with the State-Specific Healthcare-associated Infections Summary Data Report, published by CDC. For SSIs, we will make the transition from SSI rates to the SSI SIR with this new version of the NHSN tool. The SSI SIR is the result of logistic regression modeling that considered all procedure-level data collected by NHSN facilities in order to provide better risk adjustment than afforded by the risk index. In addition, the SSI SIR provided to facilities within NHSN will be more precise and be calculated only if appropriate for comparisons. As we make this transition, we understand that you will have numerous questions, including how to operationalize this new statistic in your facility to drive prevention practices. This guide is intended to answer some of these questions.

Standardized Infection Ratio (SIR)

What is a standardized infection ratio (SIR)?

The standardized infection ratio (SIR) is a summary measure used to track HAIs at a national, state, or local level over time. The SIR adjusts for patients of varying risk

Read all NHSN Newsletters – great guidance!

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

CDPH California Department of PublicHealth

CDC Location Mapping

- Each patient care area in NHSN is defined by the type of patients receiving care in that location
  - Periodically reassess locations mapping for changes!
- To define (or redefine) a patient care location

  Step 1: Determine the acuity level (e.g. critical care, ward)

  Step 2: Determine the type of service (e.g. burn, surgical)
- Apply 80% Rule to designate patient type

  EXCEPTION: Medical/Surgical Locations (ICUs and wards)
  - Try to better define medical/surgical mixed units
  - If more than 60% medical patients, define as a medical location

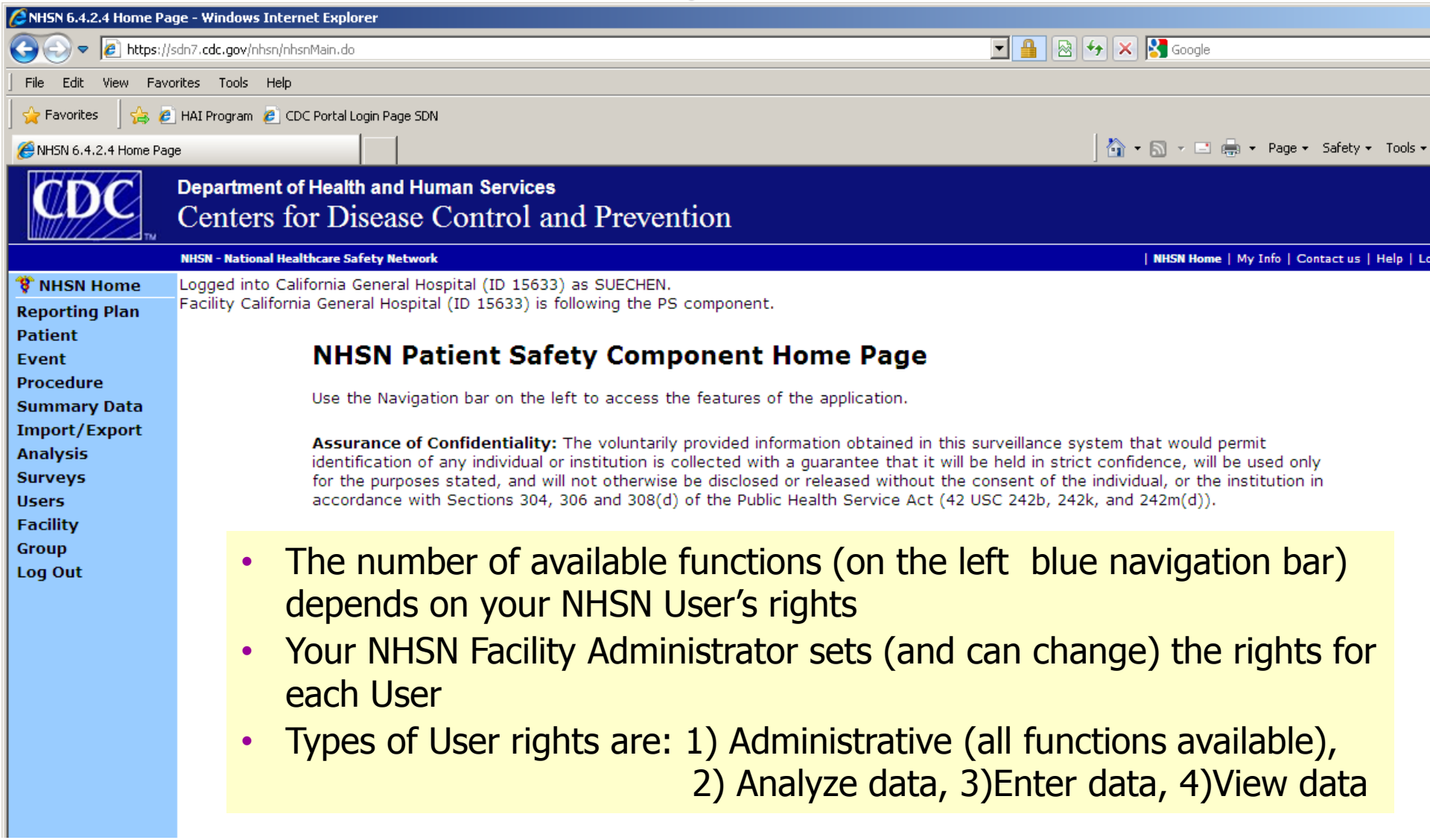
    If more than 60% surgical, define as a surgical location

NHSN Patient Safety Manual, Chapter 15

CDPH California Department of PublicHealth

NHSN Facility Home Page

Accessed via secure web portal



- 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

Recommended Practices for Surveillance and NHSN

V. Calculate and analyze infection rates
VI. Apply risk stratification methodology
VII. Report and use surveillance data

Can all be done within the NHSN system!

NHSN Rate Table

Review your Data Findings!

Check first that all your infections are listed AND denominator data for 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_RATESICU summaryYM 2013M07 to 2013M12

Org ID=15633 CDC Location=IN:ACUTE:CC:S

Location	Summary Year/Month	CLA BSI Count	Central Line Days	CLA BSIRate	NHSN CLAB Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	CL Util Ratio	NHSN Line DU Pooled Mean	Proportion p-value	Proportion Percentile
1 SICU	2013M07	0	280	0.000	1.2	0.7172	10	435	0.644	0.59	0.2672	63
1 SICU	2013M09	1	399	2.506	1.2	0.4602	86	448	0.891	0.59	0.0000	94
1 SICU	2013M10	1	250	4.000	1.2	0.2935	95	450	0.556	0.59	0.4323	45
1 SICU	2013M11	0	350	0.000	1.2	0.6600	10	400	0.875	0.59	0.0000	93
1 SICU	2013M12	0	315	0.000	1.2	0.6880	10	375	0.840	0.59	0.0000	92
3 SICU	2013M08	0	395	0.000	1.2	0.6257	10	442	0.894	0.59	0.0000	94

Source of aggregate data: Am J Infect Control 2013;41:1148-66

Data contained in this report were last generated on February 26, 2014 at 8:26 PM.

CDPH California Department of PublicHealth

Sample Rate Table

Shows your CLABSI rate and p-value to determine if significantly higher or lower as compared to NHSN national rate (>0.05 NS)

Shows where your rate falls in the percentile distribution of all NHSN hospital rates

Shows your device utilization ratio compared to all similar hospital units in NHSN data 2006-2008

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_RATESICU summaryYM 2013M07 to 2013M12

Org ID=15633 CDC Location=IN:ACUTE:CC:S

Location	Summary Year/Month	CLA BSI Count	Central Line Days	CLA BSIRate	NHSN CLAB Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	CL Util Ratio	NHSN Line DU Pooled Mean	Proportion p-value	Proportion Percentile
1 SICU	2013M07	0	280	0.000	1.2	0.7172	10	435	0.644	0.59	0.2672	63
1 SICU	2013M09	1	399	2.506	1.2	0.4602	86	448	0.891	0.59	0.0000	94
1 SICU	2013M10	1	250	4.000	1.2	0.2935	95	450	0.556	0.59	0.4323	45
1 SICU	2013M11	0	350	0.000	1.2	0.6600	10	400	0.875	0.59	0.0000	93
1 SICU	2013M12	0	315	0.000	1.2	0.6880	10	375	0.840	0.59	0.0000	92
3 SICU	2013M08	0	395	0.000	1.2	0.6257	10	442	0.894	0.59	0.0000	94

Source of aggregate data: Am J Infect Control 2013;41:1148-66
Data contained in this report were last generated on February 26, 2014 at 8:26 PM.

CDPH California Department of PublicHealth

Check for missing infections AND missing Summary data for each unit each month!

NHSN Standardized Infection Ratio (SIR)

- Driven by need for a **summary measure**
  - e.g. replaces multiple rate comparisons for SSI
- 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

CLABSI (2006-2008)

SSI (2006-2008)

CAUTI (2009)

MRSA-BSI (2010-2011)

CDI (2010-2011)

CDPH California Department of PublicHealth

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)*

CDPH California Department of PublicHealth

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

Examples:

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

$$SIR = \frac{2}{2.0} = 1.0$$

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

$$SIR = \frac{4}{2.5} = 1.6$$

CDPH California Department of PublicHealth

"How do I interpret whether our SIR is significantly different (higher or lower) than NHSN data?"

Org ID	Summary Yr	Infection Count	Number Expected	Central Line Days	SIR	SIR p-value	95% Confidence Interval
10018	2009	9	7.191	3786	1.25	0.2962	0.653, 2.184

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.

CDPH California Department of PublicHealth

SIR Interpretation - Example

Pretend this is "our" hospital.

Org ID	Summary Yr	Infection Count	Number Expected	Central Line Days	SIR	SIR p-value	95% Confidence Interval
10018	2009	9	7.191	3786	1.25	0.2962	0.653, 2.184

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 CLABSIs. Observations over time (and more line days) will help us better understand how we compare. Our ultimate goal is to prevent all CLABSIs."

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

CDPH California Department of PublicHealth

SIR Interpretation - Example 2

Pretend this is our hospital.

Org ID	Summary Yr/Half	infCount	Number Expected	Central Line Days	SIR	SIR p-value	95% Confidence Interval
15331	2009H1	74	26.606	10065	2.78	0.0000	2.184, 3.492

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."

CDPH California Department of PublicHealth

SSI Risk Adjustment

- Models developed for each NHSN operative procedure
  - Specific factors found to increase SSI risk for that procedure
- Every patient undergoing a procedure in your hospital has a calculated SSI risk
- Based on your surgical patient population, the expected (predicted) number of SSI can be calculated

---

Example: HYST

Factors in the risk adjustment model that add to SSI risk are

- Age equal to or younger than 44 years
- ASA score of 3, 4, or 5
- Duration of surgery longer than 100 minutes (incision to close time)
- Procedure done at major teaching hospital (from NHSN Annual Survey)

CDPH California Department of PublicHealth

This table represents a partial list of 100 hypothetical patients who have undergone a HYST procedure and the risk factors present for each.

Patient	Age	Duration	ASA	Medical School Aff.	SSI	Probability of SSI
1	40	117	4	Y	0	0.050
2	53	95	2	N	0	0.004
3	30	107	2	Y	1	0.033
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
100	37	128	4	Y	1	0.050
				TOTAL	Observed (O)	Expected (E)
					3	2.91
				SIR= O/E =3/2.91 = 1.03		

Interpreted as a 5.0% risk of SSI for patient 1

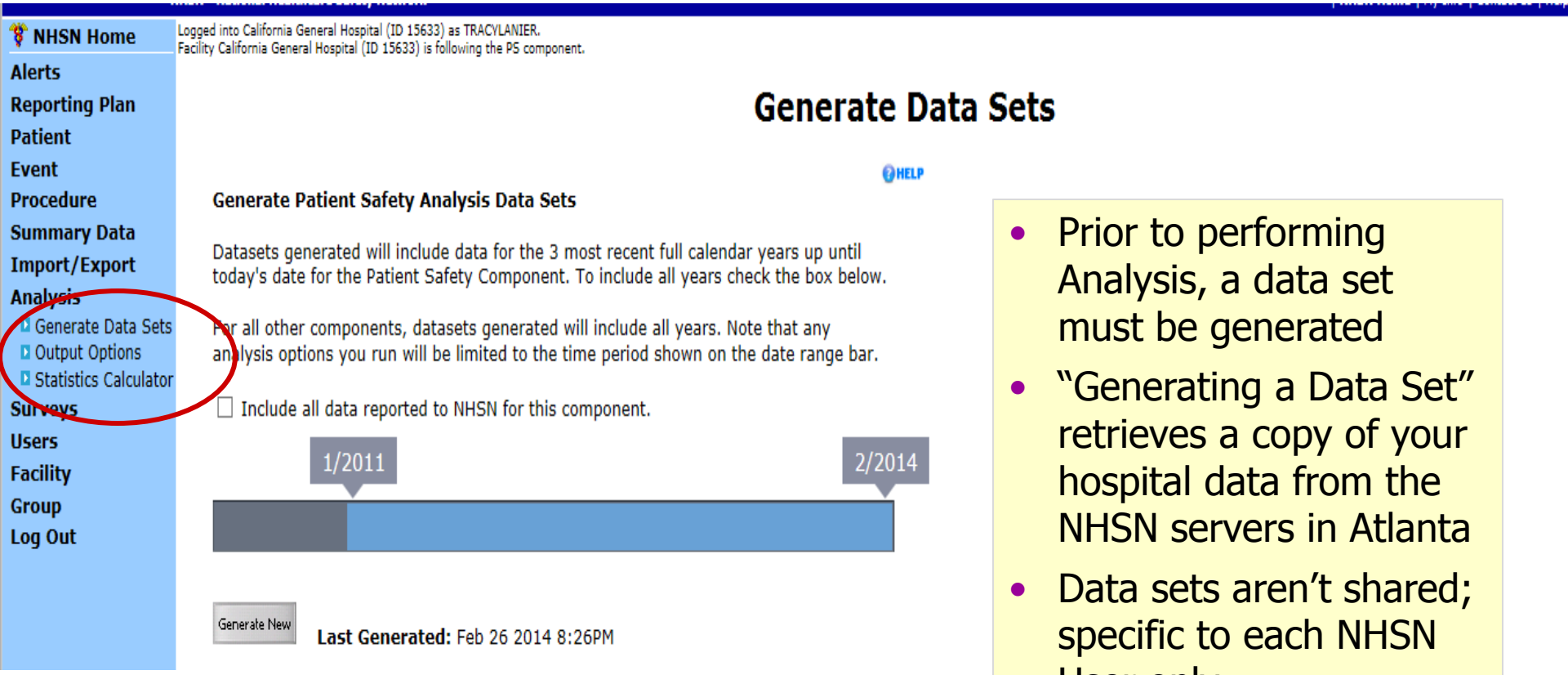
Probability of SSI is calculated for each surgical patient

SIR indicates 3% higher rate of SSI.

The SSI probabilities are added together to get the predicted (expected) number of SSI for this surgical patient population

CDPH California Department of PublicHealth

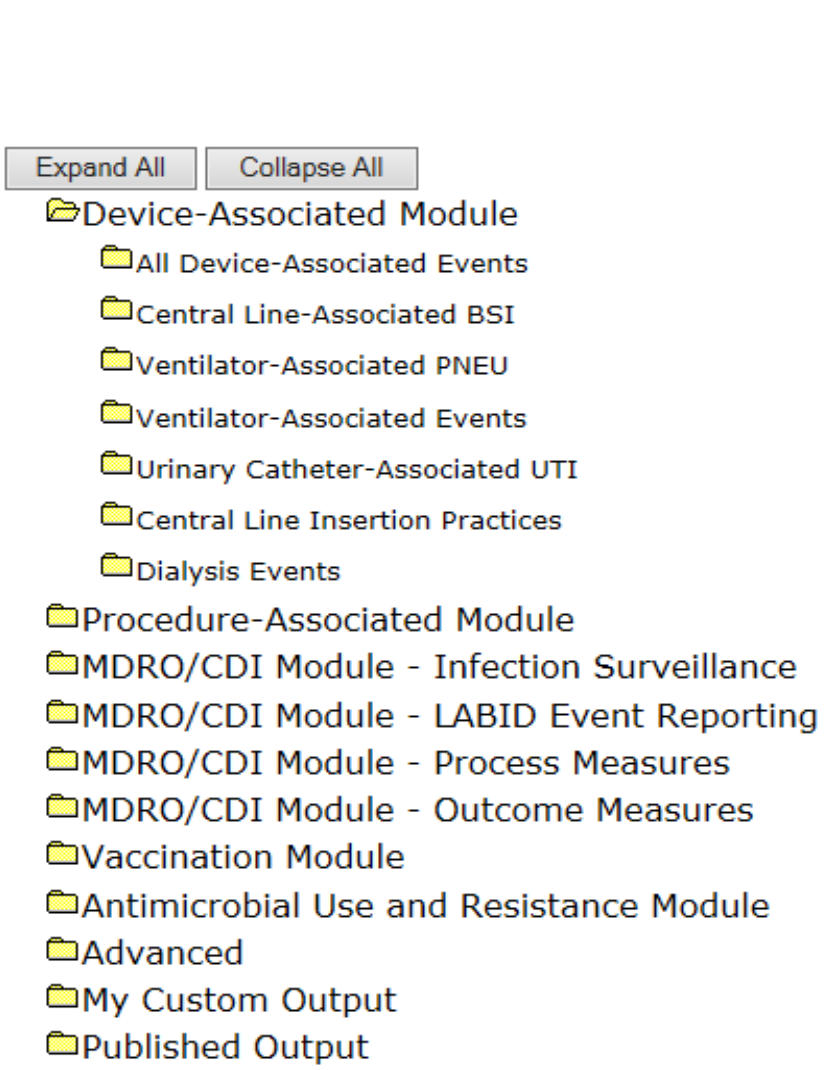
NHSN Data Analysis Functions



- Prior to performing Analysis, a data set must be generated
- "Generating a Data Set" retrieves a copy of your hospital data from the NHSN servers in Atlanta
- Data sets aren't shared; specific to each NHSN User only

CDPH California Department of PublicHealth

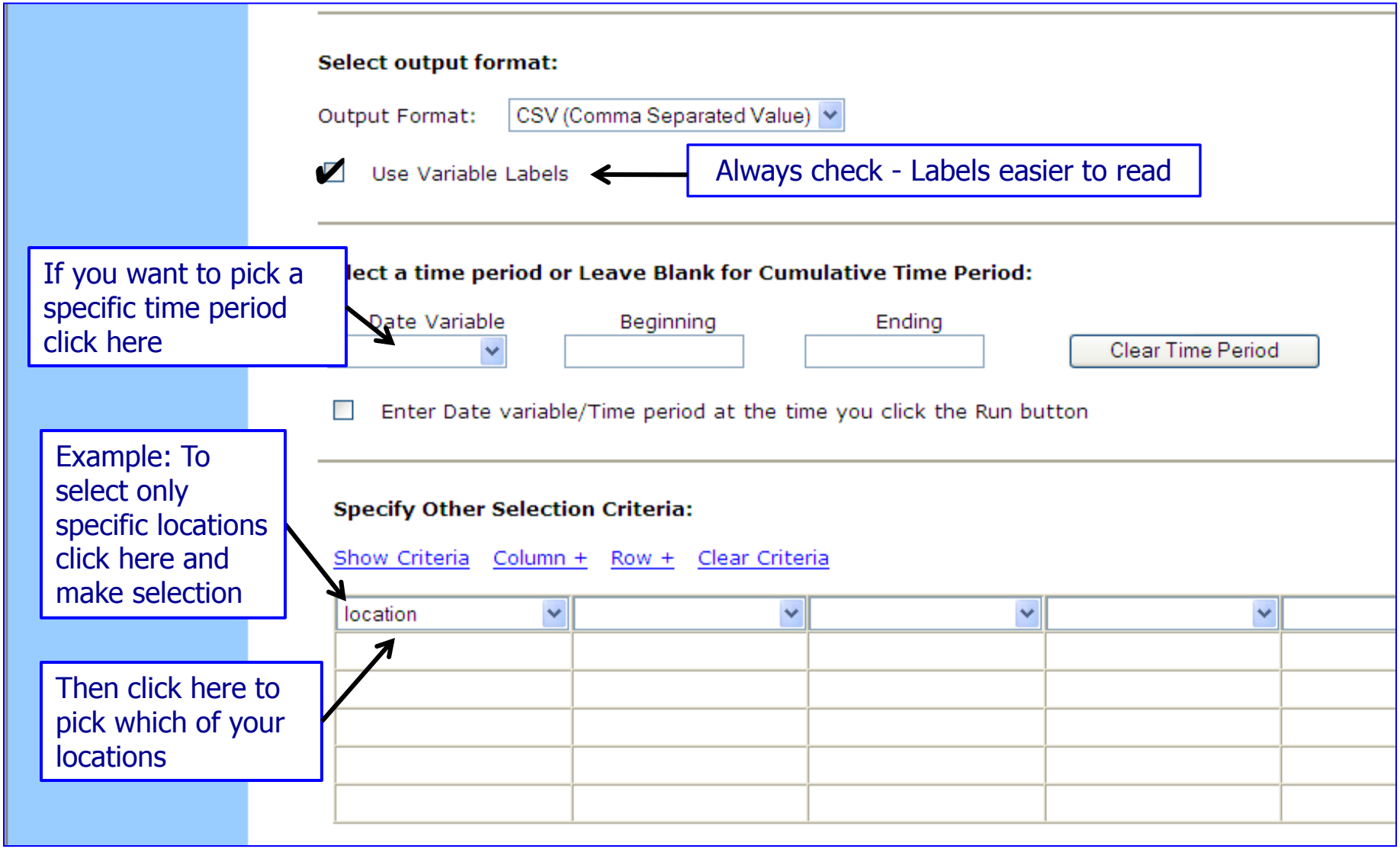
NHSN Analysis Options and Reports



- 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
  - Chose a Module
  - Chose "CDC-defined Output"

If you select to "Run" a report, all relevant data since starting NHSN reporting will be included. You can also "Modify" canned reports.

Modifying a CDC "Canned" Report



NHSN Help

Use website at www.cdc.gov/nhsn

Email questions to nhsn@cdc.gov

CDPH California Department of PublicHealth

For issues specific to California, NHSN help is also available from the CDPH HAI Program
www.cdph.ca.gov/hai

California Department of Public Health (CDPH)

Home | Programs | Services | Health Information | Certificates & Licenses | Publications

en Español
- Su salud en su idioma

Most Popular Links
- Birth, Death, & Marriage Certificates
- Licensing and Certification
- WIC

Quick Links
- About Us
- CDPH Open Data Portal
- Decisions Pending & Opportunities for Public Participation
- Diseases & Conditions
- Job Opportunities
- Local Health Services
- Newsroom
- Public Availability of Documents

Related Links
- California Health and Human Services Agency
- Department of Health Care Services (includes Medi-Cal)
- State Agencies Directory

Home > Programs > Healthcare Associated Infections Progra

Healthcare-Associated Infections (HAI) Program

The Healthcare-Associated Infections (HAI) Program is one of two programs in the Center for Health Care Quality of the California Department of Public Health. The Program was created by mandate to oversee the prevention, California's general acute care hospitals. HAIs 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 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 pr engaged 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 The vision of the HAI Program is to eliminate HAIs for all Californians.

What You Can Do To Prevent HAI

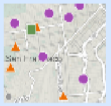
Me And My Family

Healthcare Providers

Public Health Partners

HAI Committee & Laws

My Hospital's Infections Map



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 Hospital's 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
- Smaller Volume Hospitals Homepage

Includes tailored guides, slide sets, implementation tools

HAI Education for Healthcare Professionals
- Sustaining Infection Prevention Progress
- Educational Offerings by HAI Program Staff -- 2015 Educational Calendar

Resources
- Association of Professionals in Infection Control and Hospital Epidemiology (
- Centers for Disease Control and Prevention (CDC) -- selected links
- Society for Healthcare Epidemiology of America (SHEA) -- selected links
- Infectious Diseases Society of America (IDSA) (New Window) -- selected lin
- UCSD Infection Prevention Course -- Designed to Meet CA SB 158 Requirem

Contact Us
- HAI Program

In Summary

NHSN is a surveillance system

- It is also the platform for recording data, which meets the regulatory reporting requirements for CDPH 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 HAI Program Liaison IP

CDPH California Department of PublicHealth

Questions?

For more information, please contact any HAI Liaison Team member.

Thank you

CDPH California Department of PublicHealth