Using NHSN Data Validation for Improved HAI Surveillance and Prevention

Educational Road Shows
18 Cities
May – July 2012

HAI Liaison Program
Healthcare-Associated Infections Program
Center for Health Care Quality
California Department of Public Health

Today's Presentation

1. Describe the attributes of quality HAI surveillance
2. Review 2011 NHSN data validation findings from 100 California hospitals
3. Identify best practices for case-finding
4. Review NHSN protocols, targeting highlighted issues
5. Demonstrate data validation process and forms for internal use by hospitals
6. Apply NHSN skills using case scenarios

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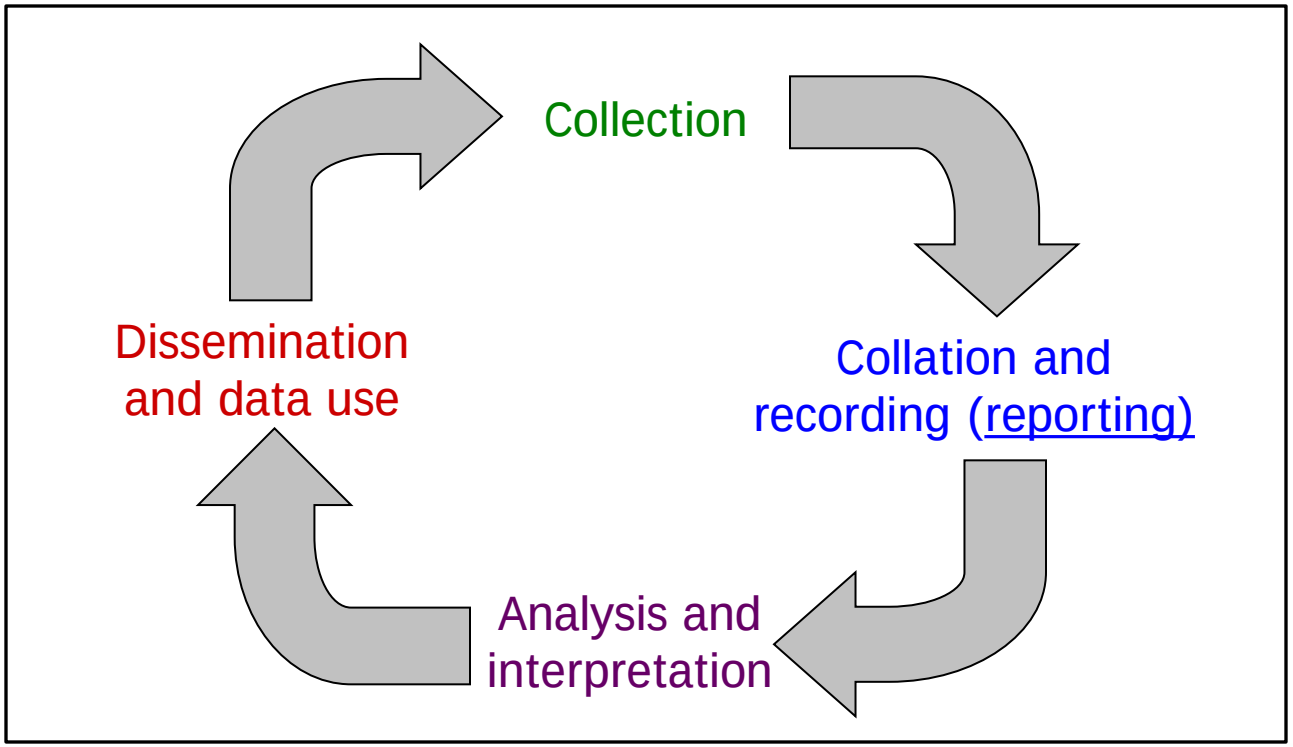
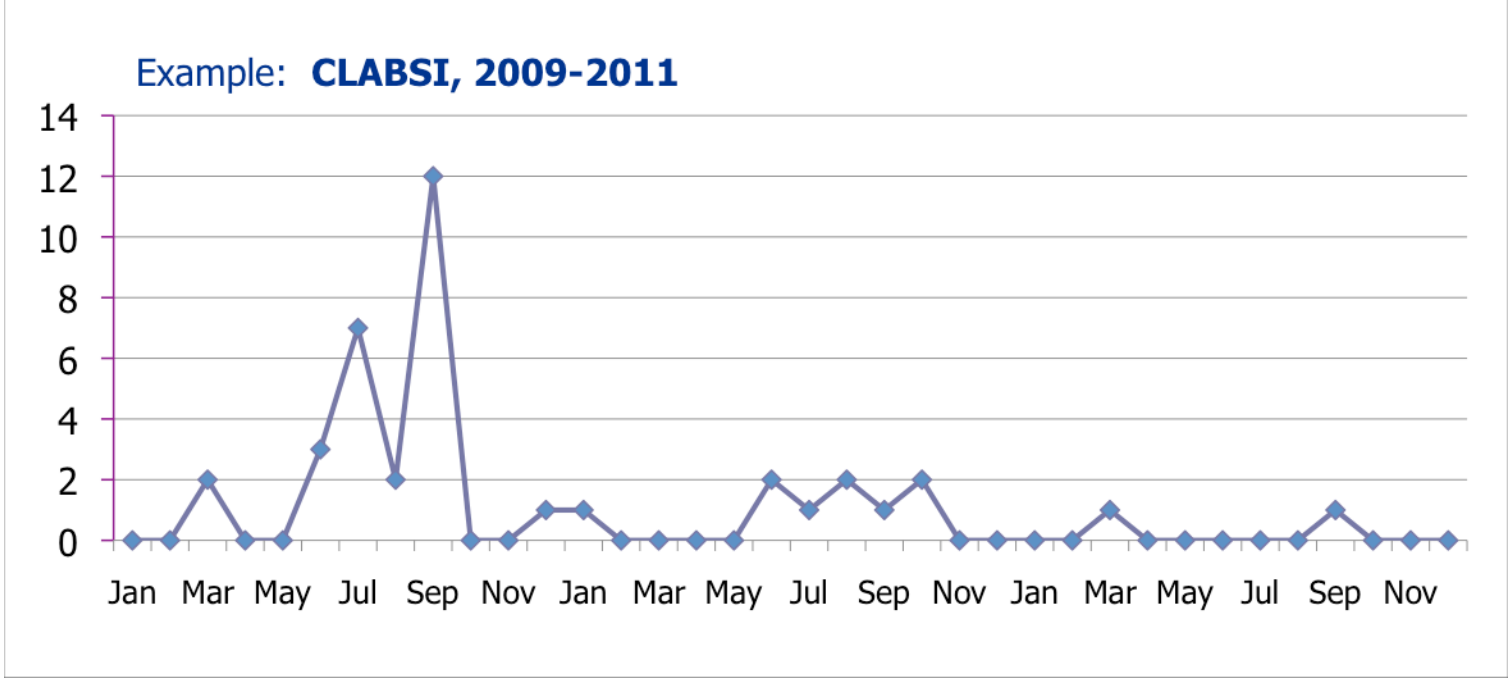
What is Surveillance?

- **System** that starts and ends with communication and action
- **Information** loop or cycle



Endpoint of HAI Surveillance?

- Data that demonstrate **HAI Prevention**



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Quality Surveillance for Healthcare-Acquired Infections (HAI)

Requires

CONSISTENCY

COORDINATION

CONFIDENCE

COMPASSION

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Consistency

Complete case-finding requires a comprehensive evaluation of a minimum clinical data set*

	Always Step 1	Step 2
CLABSI	Review every positive blood culture	Review for presence of central line
SSI	Identify and review all post-op hospital re-admissions (30d or 1y) Review all returns-to-OR	Review wound cultures but realize that culture-based surveillance alone misses 50-60% of SSI
MRSA/VRE BSI	Review all final *S.aureus* & Enterococcal bacteremia	Assess if ER-positives were admitted
CDI	Review all *C.difficile* toxin positives tests (PCR, assay, culture)	Assess if ER-positives were admitted

*NHSN protocols currently silent on expectations; revisions proposed

Coordination

- IP and Quality can't do it alone
- HAI surveillance needs to be a shared responsibility across hospital units, services, and disciplines
- The more connection of relevant clinical data points, the better the surveillance (e.g. new antimicrobial starts)
- Ongoing collection of patient risk factors (i.e. denominator data) requires data system solutions

Confidence

- ✓Know the HAI surveillance definitions
- ✓Apply definitions with confidence the same way every time
- ✓Seek assistance for ambiguity*

HAI Liaison Program Data Validation, 2011

Infection Definitions Worksheets

Instructions: 1) Use when reviewing positive blood cultures for determining and documenting whether the bacteremia is a primary bloodstream infection (or CLABSI), secondary to another site of infection, or contaminant. 2) Use for surgical site infection (SSI) surveillance. 3) DO NOT use for LabID C. difficile infection (CDI) or MRSA-VRE bloodstream infection surveillance. 4) Refer to often when performing surveillance. Make notes on individual infection pages as you are reviewing medical records. 5) For official (up-to-date) definitions, refer to NHSN at www.cdc.gov/nhsn.

Page			Page		
2	**Urinary tract Infections**		14	**Cardiovascular system infections**	
	SUTI	Symptomatic urinary tract infection		VASC	Arterial or venous infection
		• Catheter in place at time of specimen-2		ENDO	Endocarditis
		• Catheter recently removed, past 48h-3		CARD	Myocarditis or pericarditis
		• NOT catheter-associated - 4		MED	Mediastinitis
		• In infants and babies ≤ 1 year old - 5			
6	ABUTI	Asymptomatic UTI with Bacteremia	16	**Eye, ear, nose, throat, mouth, and URI infections**	
				CONJ	Conjunctivitis
7	**Surgical site infections**			EYE	Eye, other than conjunctivitis
	SIP	Superficial incisional primary SSI		EAR	Ear, mastoid
	SIS	Superficial incis. secondary SSI		ORAL	Oral cavity (mouth, tongue, or gums)
	DIP	Deep incisional primary SSI		SINU	Sinusitis
	DIS	Deep incisional secondary SSI		UR	Upper respiratory tract, pharyngitis
	SSI-xxx	Organ/space specific types			laryngitis, epiglottitis
		• BONE - 11 • JNT - 11			
		• BRST - 25 • LUNG – 21	19	**Gastrointestinal system infection**	
		• CARD - 15 • MED -15		GE	Gastroenteritis
		• DISC - 11 • MEN - 13		GIT	Gastrointestinal (GI) Tract
		• EAR - 17 • ORAL - 17		HEP	Hepatitis
		• EMET - 22 • OREP -22		IAB	Intrabdominal not specified elsewhere

AJIC major articles

CDC/NHSN surveillance definitio of health care–associated infectio and criteria for specific types of infections in the acute care settin

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

BACKGROUND

Since 1988, the Centers for Disease Control and Prevention (CDC) has published 2 articles in which nosocomial infection and criteria for specific types of nosocomial infection for surveillance purposes for use in acute care settings have been defined.[1,2] This document

population for which clinic
stricted to patients ≤1 year
incisional SSI descriptions
ify whether an SSI affects the primary or a secondary in-
cision following operative procedures in which more than 1 incision is made. For additional information about how these criteria are used for NHSN surveillance, refer

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

*Contact your CDPH Liaison IP or NHSN@cdc.gov

Compassion

- Patients want to feel safe
- Patient advocates want to be assured that providers are doing everything possible to prevent infections
- Identifying every HAI is necessary to understand what your patients are experiencing

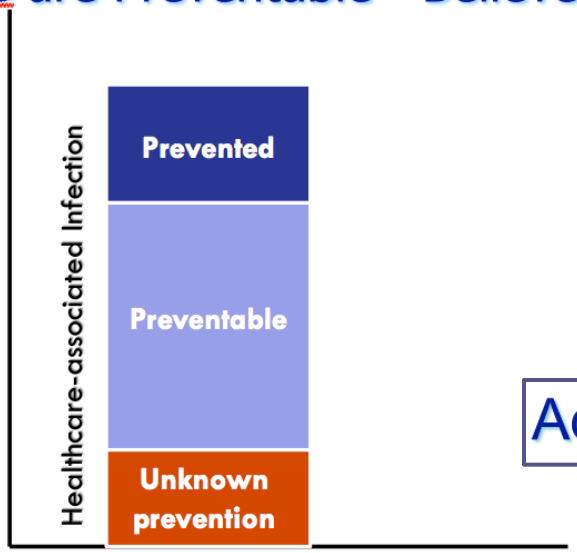
Compassion

Embrace the Cultural Change

Old: "Many infections are inevitable but *some* may be preventable"

New: "Each infection is potentially preventable unless shown otherwise"

Most HAIs are Preventable - Believe it!



Adopt facility goal of "HAI Elimination"

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HAI Liaison Program and Quality Surveillance

Conditions of CDC grant funding, 2010-2011

- Enhance participation in the **National Healthcare Safety Network** (NHSN) for HAI surveillance and reporting
- Support the **use of NHSN data** for local HAI prevention efforts
- Develop and implement protocols for **NHSN data validation**

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Common Steps for HAI Data Validation

1) Select hospitals
2) Develop sampling framework
3) Select patient population for review
4) Abstract data from medical records
5) Use findings to improve surveillance

CDC, 2009

Objectives of HAI Data Validation, 2011

HAI Program Liaison IPs performed onsite data validation to

- Gain a better understanding of how NHSN surveillance protocols were understood and being applied
- Provide immediate one-on-one education and coaching to volunteer hospitals
- Develop targeted education and training to all CA hospitals based on common errors, identified gaps, misinterpretations

What this validation process was NOT:

- A research study
- Formal evaluation of HAI reporting implementation

Important to remember that findings may not be generalizable

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CDPH HAI Data Validation Tenets

• External	*Performed by CDPH HAI Program staff*
• Independent	*Reviews done by CDPH reviewers working alone*
• Voluntary	*HAI Program non-regulatory*
• "Real practice" model	*"Census" sample (records not targeted for review); comprehensive review of positive labs for 3 month time period*
• Reproducible	*Process can be duplicated by hospital*

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Validation Process

- Performed onsite review at each hospital 1 to 2½ days
  - Team of 2 Liaison IPs (1 IP for smaller hospitals)
- Started with lab line lists for 3 months; required access to medical records
- Assessed completeness and accuracy of reporting for
  - CLABSI
  - CDI (LabID)
  - MRSA BSI (LabID)
  - VRE BSI (LabID)

For LabID, we did not distinguish between (nor collect information on) community-onset vs. hospital-onset cases

- Interviewed 2 key hospital staff members (20-30 min each)
  - Denominator data collection processes
  - Hospital location mapping
- Used a standardized set of forms to capture data

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Presentation of Findings

- **Sensitivity**
  - Proportion of HAI reported by hospital among all patients with an HAI
  - High sensitivity indicates HAI are being identified and reported
- **Specificity**
  - Proportion of HAI not reported by hospital among patients without an HAI
  - High specificity indicates accuracy in “ruling out” HAI
- **Positive Predicted Value**
  - Proportion of HAI detected by hospital that actually are HAI
  - High PPV indicates accuracy in applying surveillance definitions

		HAI Liaison Program IP Review	
		HAI	Not an HAI
Hospital Surveillance Report	HAI	True positives	False positives
	Not an HAI	False negatives	True negatives

Positive Predictive Value

$$\frac{\text{True positives}}{\text{True positives + False positives}} \times 100$$

Sensitivity

$$\frac{\text{True positives}}{\text{True positives + False negatives}} \times 100$$

Specificity

$$\frac{\text{True negatives}}{\text{True negatives + False positives}} \times 100$$

Completing Validation Process

- Results of validation findings reviewed and left with the hospital prior to exit
  - Provided immediate onsite education to improve HAI surveillance and reporting
  - Hospitals expected to correct data in NHSN based on validation findings
- No hospital identifiers recorded on any validation forms or materials
  - Date and reviewer's initials removed from all forms immediately following data entry
  - Identifiable hospital results not maintained by CDPH
- Hospitals that participated will be offered opportunity to be acknowledged by CDPH
  - The precise manner of acknowledgement has not yet been determined

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Summary to Date

- All CA hospitals invited to participate, June 2011
- 100 hospitals volunteered within 9 days (30 put on waiting list)
- Onsite validation performed, July–Oct 2011
- Data entry and preliminary analysis, Dec 2011–Feb 2012
- Outreach and education plan developed for using validation findings to improve surveillance, March-April 2012
- Aggregate results approved for presentation, May 2012
- 17-city educational road show, May-July 2012
- Additional data analysis, ongoing

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Preliminary Validation Findings

Comparison of Hospital Characteristics

	California		Validation Sample	
Acute care hospitals	**433**		**100**	
Counties with hospitals	57		33	
Northern hospitals	197	(45%)	47	(47%)
Southern hospitals	236	(55%)	53	(53%)
LA County hospitals	101	(23%)	25	(25%)
Rural hospitals	63	(15%)	15	(15%)
Critical Access hospitals	28	(6%)	6	(6%)
Pediatric hospitals	12	(3%)	1	(1%)
Teaching hospitals	83	(19%)	28	(28%)
Bed size, mean	210		255	

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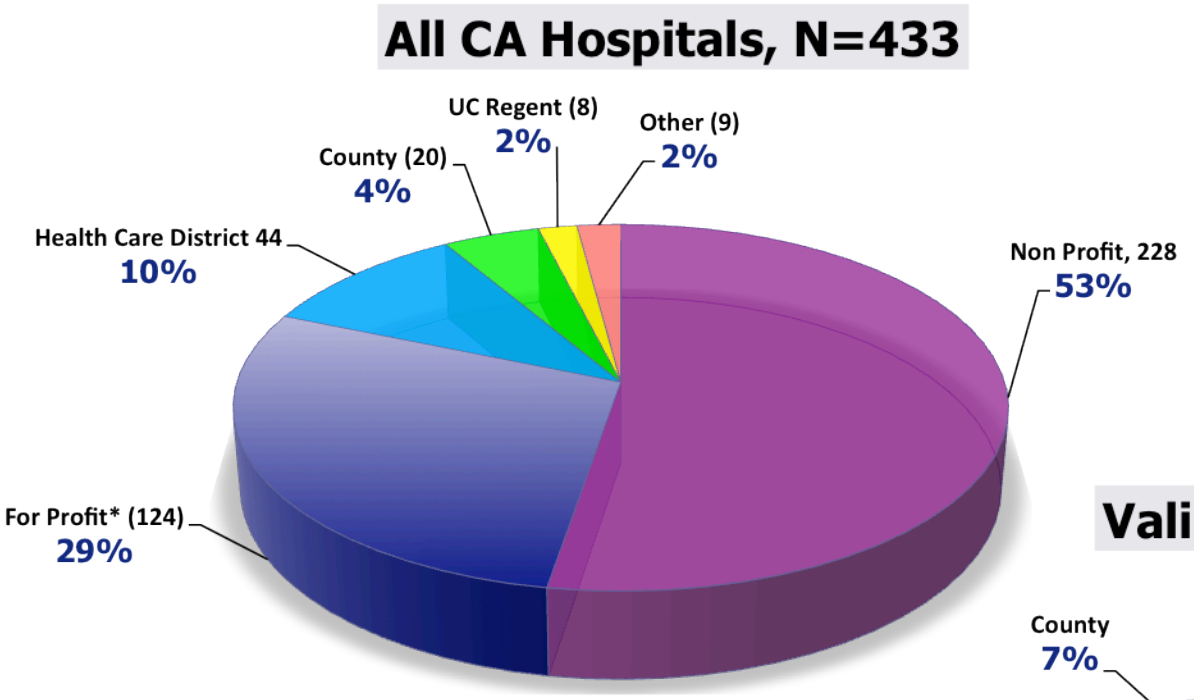
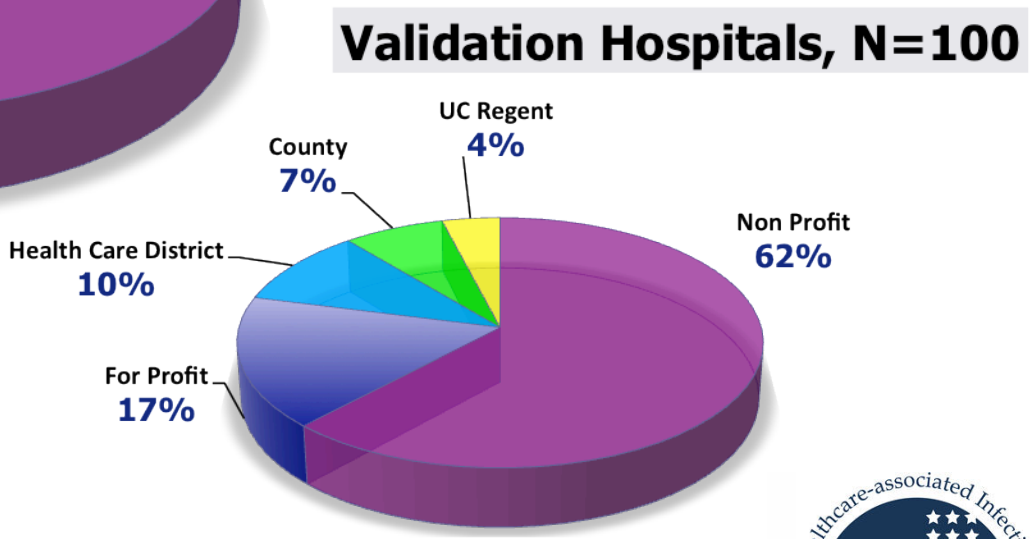
Hospital License Type



*Includes for-profit, limited



Quick Review of NHSN Reporting Rules

For LabID inpatient facility-wide surveillance:

- ✓Report every positive lab test from inpatients and from ED patients if admitted same calendar day
- ✓Do not report another positive from same patient still in the hospital (or readmitted to the hospital) until >14 days after previous
- ✓Ignore positive lab tests done in outpatient settings

For CLABSI surveillance, criteria are:

- ✓ Presence of central line within previous 48 hours, and
- ✓ One or more positive blood cultures (depending on organism), and
- ✓ Clinical review to determine patient symptoms, if infection present on admission, if BSI secondary to infection at another site, or if lab findings represent a contaminant

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Validation Findings by Infection Type

	CDI	MRSA BSI	VRE BSI	CLABSI
Description of labs reviewed	ED & inpatient *C difficile* toxin-positive tests, 3 mo.	ED & inpatient MRSA positive blood cultures, 3 mo.	ED & inpatient VRE positive blood cultures, 3 mo.	Inpatient "BSI events" of ≥1 positive blood cultures, 1-3 mo*
Labs reviewed by validators	3000	1300	239	4099
Reported by hospitals	2172	442	112	135
Reported in error (should *not* have been reported)	55	15	4	23
Not identified by hospital (should have been reported)	221	150	41	68
Sensitivity	90%	74%	73%	62%
Specificity	92%	98%	96%	99%
PPV	97%	97%	96%	82%

*dependent on volume

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Cases Reported in Error

	No.	Reason should not have been reported
CDI	55	Specific info not captured on validation forms - 22 For remaining 33, reasons were: *Test prior to patient admission date - 19* *ER specimen, patient not admitted – 6* *Not CDI toxin+ per final lab result – 5* *<14 days since prior – 2* *Patient <1 year old – 1*
VRE	4	*Not VRE per final lab result – 2* *ER specimen, patient not admitted – 1* *<14 days since prior – 1*
MRSA	15	*ER specimen, patient not admitted – 6* *Test prior to patient admission date – 5* *Not MRSA per final lab result – 2* *Specific info not captured - 2*
CLABSI	23	*2° to another site of infection – 14* *Contaminant – 6* *Present on admission - 3*

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Cases Missed, Should Have Been Reported

For all HAI types, many missed cases were due to inconsistencies between the final retrospective laboratory line lists and the lists or systems routinely used for IP surveillance

HAI	No.	Reason Missed
CDI	221	*Ruled duplicate but >14 days since last CDI – 17* *ER specimen, thought patient not admitted – 11* *Missed* - 193*
VRE	41	*Not in IP surveillance lab report - 4* *ER specimen, thought patient not admitted - 2* *Reported only as CLABSI - 2* *Delayed MICs – 2* *Missed* - 31*
MRSA	42	*ER specimen, thought patient not admitted – 2* *Missed* - 40*
CLABSI	68	*Ruled as 2° to another infection - 12* *Ruled a contaminant - 6* *Ruled present on admission - 4* *Disagreement with NHSN definition – 4* *Ruled continuation of previous BSI – 2* *Other reasons observed only once – 5* *Missed* – 35*

Agreement could not be reached for only 8 unreported CLABSI

* Specific details not captured on validation forms

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HAI Elimination

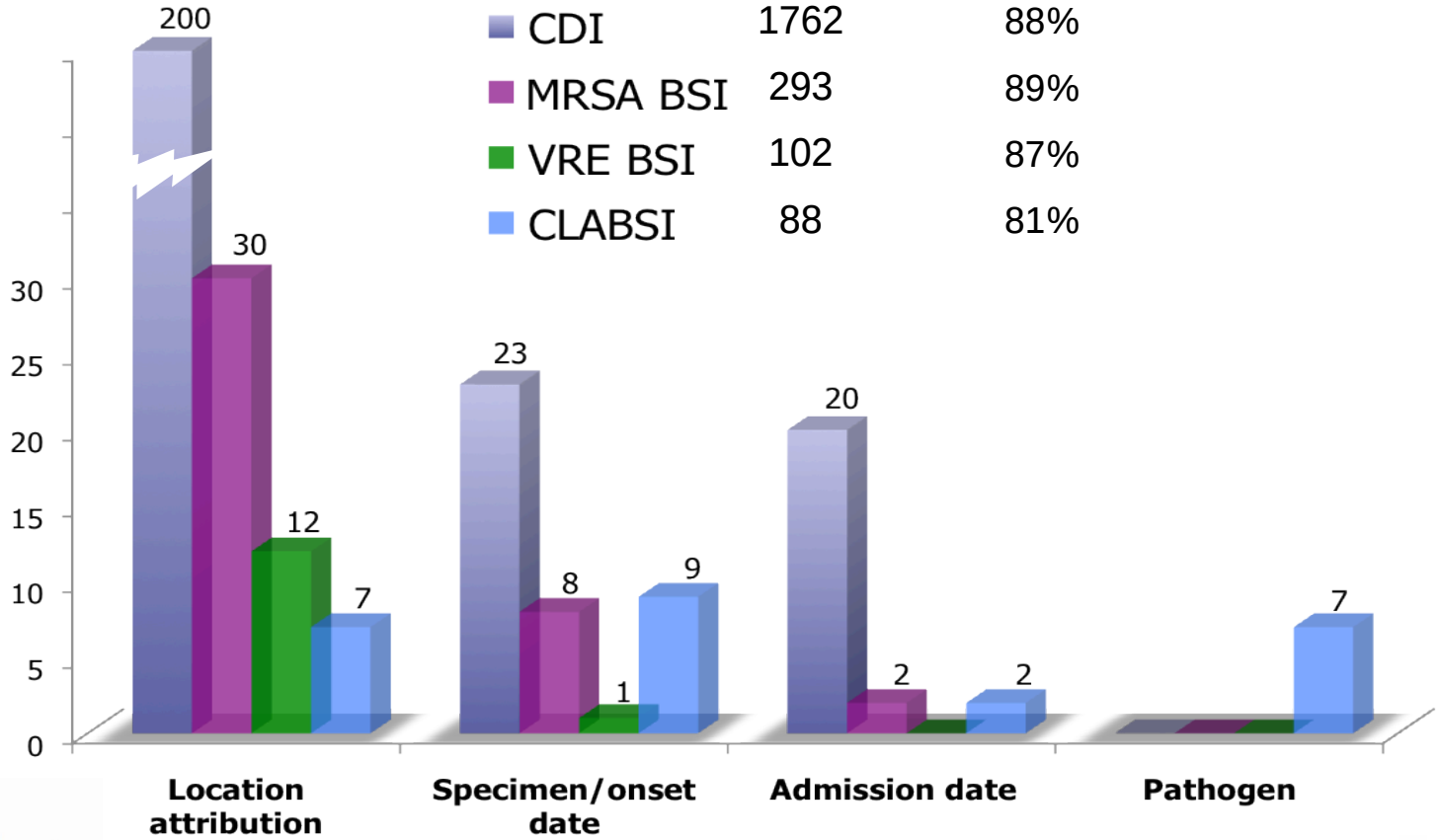
Percentage of Validation Hospitals with Complete Reporting*

CDI	MRSA BSI	VRE BSI	CLABSI
47%	58%	76%	57%

* All infections identified and reported; none missed

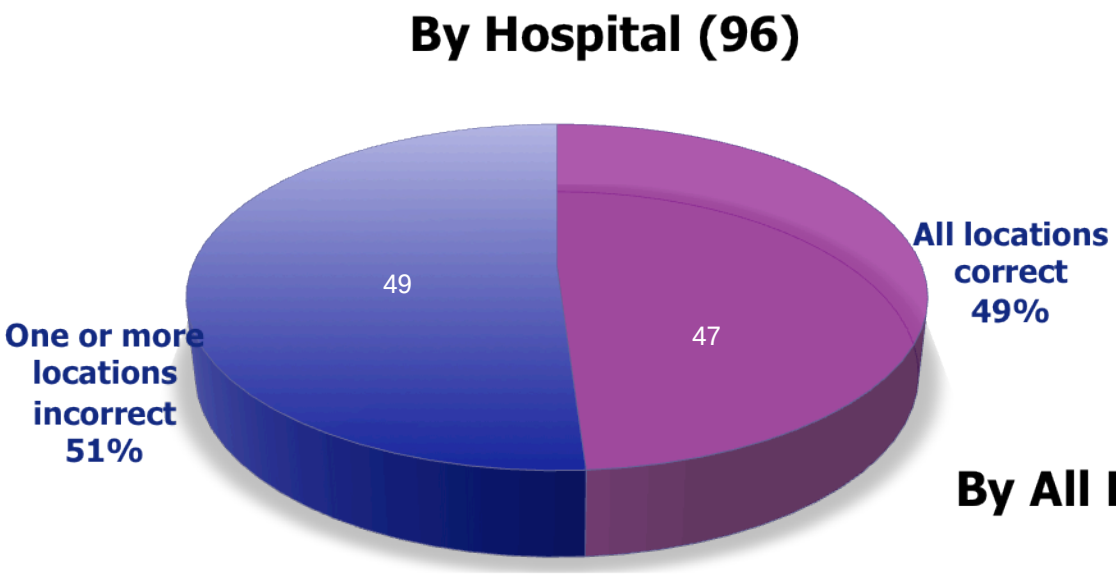
Assessing Accuracy of Reported Data

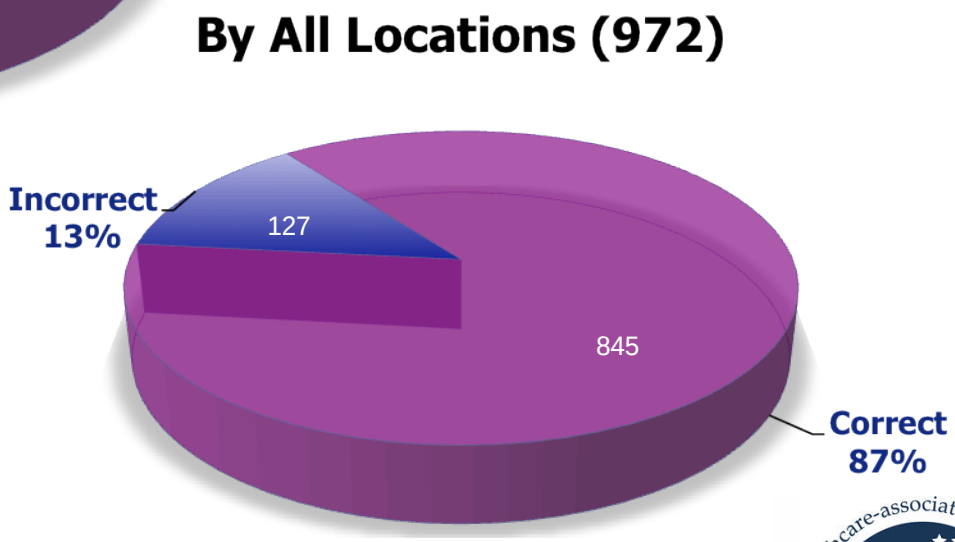
	No. reported cases reviewed	Accurate on all fields reviewed
CDI	1762	88%
MRSA BSI	293	89%
VRE BSI	102	87%
CLABSI	88	81%



Inaccurately reported fields

Accuracy of Location Mapping





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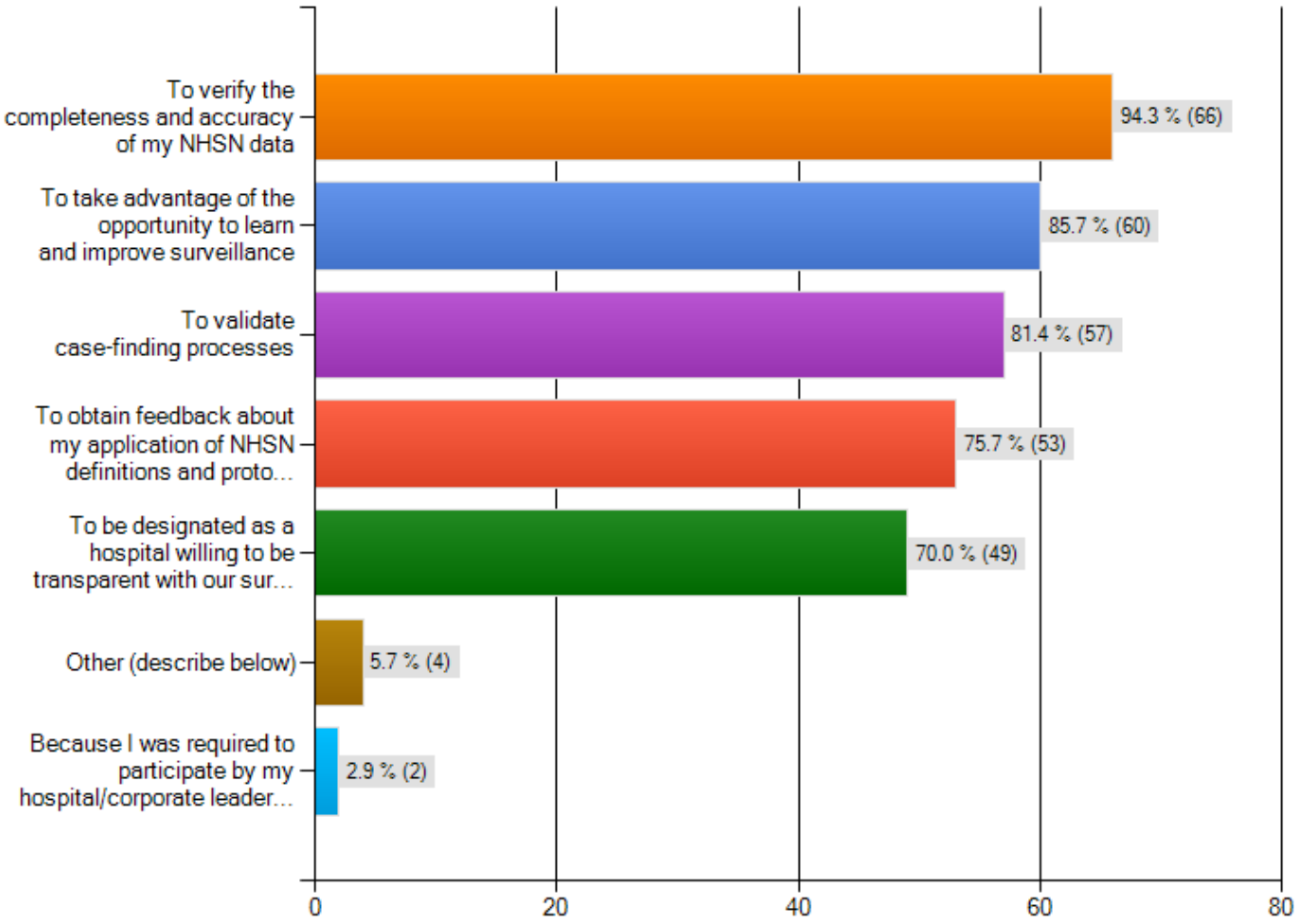
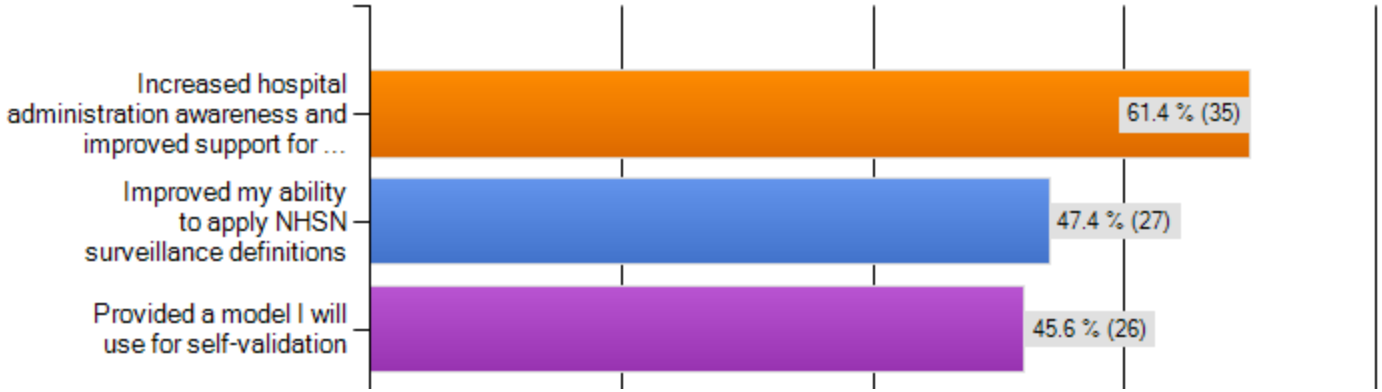
Post-Validation Survey - 70% Response Rate

1. Why did you volunteer to participate in onsite data validation? (Select all that apply)

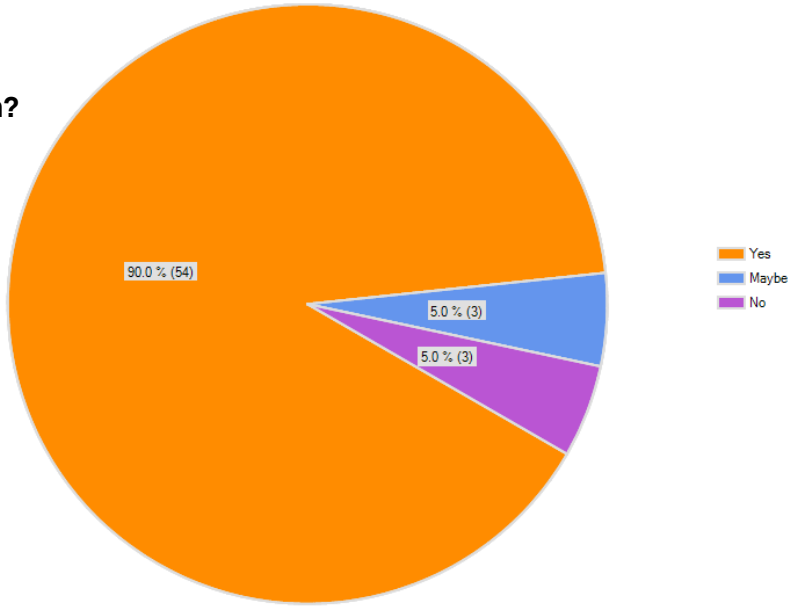


Post-Validation Survey

4. How did/will this validation experience affect your practice? (Select all that apply)



8. Would you volunteer again?



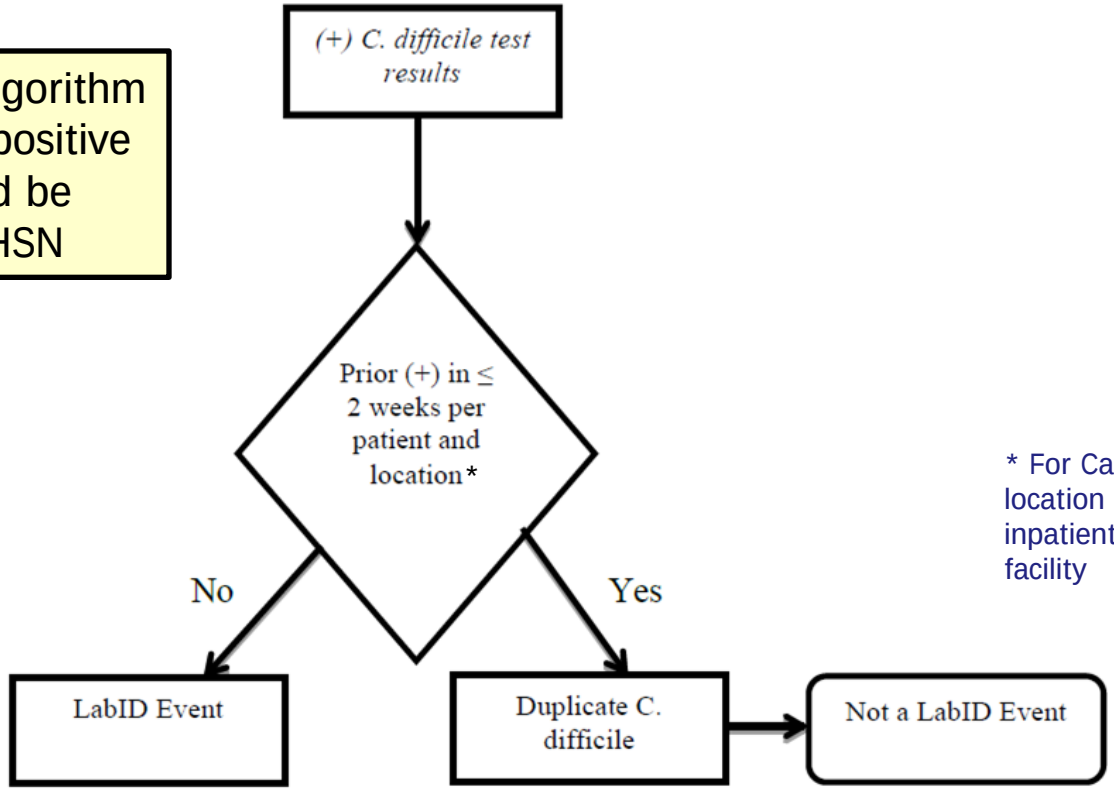
Improving CDI Surveillance

CDI Surveillance

- LabID method is a nationally-recognized quality measure for the surveillance of CDI (NQF endorsed)
- Requires no clinical review or further evaluation of positive lab finding
- Facility-wide Inpatient LabID surveillance must be in your monthly reporting plan per CA reporting requirements
  - Report ALL *C. difficile* toxin-positive tests from inpatients, and ED patients if admitted to your hospital the same calendar day

Figure 2. C. difficile test Results Algorithm for Laboratory-Identified (LabID) Events

Decision-making algorithm to determine if a positive CDI test should be reported to NHSN



* For California location means any inpatient unit in the facility

CDI LabID Surveillance

- NHSN algorithm categorizes CDI cases according to the admission and testing dates you enter

Community-Onset **(CO)**	For Inpatient surveillance, a LabID event collected ≤3 days after admission to the facility (i.e., days 1, 2, 3 or admission)
Healthcare Facility-Onset **(HO)**	LabID event collected >3 days after admission to the facility (on or after day 4)

Community-Onset Healthcare Facility - Associated **(CO-HCFA)**	LabID event collected from a patient who was discharged from the facility ≤4 weeks prior to current date of stool specimen collection

CDI LabID Surveillance (continued)

- NHSN also tracks if cases are new or recurrent
  - CDI is considered recurrent if >2 weeks and ≤8 weeks after last CDI event reported for that patient
- There is no advantage to not entering cases, regardless of what you know of patient's history with CDI

NHSN Patient Safety Manual – MDRO/CDI Module, Chapter 12, page 18-19

To report or not report?

- Was the specimen collected in the ED on a different day than admission?
  - Don't report. Only exception is if you are also doing outpatient surveillance (would be reported for outpatient location, ED). Remember, because you are required to do inpatient surveillance, you must *ALSO* report the 1st inpatient positive.
- We found a positive test that should be reported, but then realized we failed to report the 1st positive specimen. What should we do?
  - Report. But go back and report the 1st test date. Do not record a 2nd positive until ≥14 days from previous.
- What about a patient known to have a recent history of CDI (or other reportable MDRO)?
  - Report. ALL non-duplicate specimens should be reported, regardless of history

CDI Reporting Tips

- Check for prior positives before entering a CDI Event into NHSN
  - Prevents you from inadvertently reporting "the 2nd event" when in fact the first positive CDI was missed
- Until you are sure of completeness, do not rely on only one source (e.g. daily reports) for your CDI data
  - Ask lab to run a monthly retrospective report of final results
- Enter all toxin-positives, including those from patients with a history of *C difficile*
  - Not JUST because of mandates; rather you need to know for your prevention efforts

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Improving Completeness of CDI Reporting

Ensure you have identified and reported all CDI

- Ask your lab to run a retrospective line list of toxin-positive *C. difficile* for a given time period
  - i.e. the previous month or quarter
  - Sort by patient name or ID
- Using NHSN Analysis, run a line list of all CDI LabID events you reported in the same time period
- Compare the lists

Improving Accuracy of CDI Reporting

Verify that CDI are being attributed to the correct inpatient location

- Enter location where patient was when CDI specimen was collected
- If the CDI specimen was collected in the ED and the patient is admitted to the facility on the SAME date, report location as the admitting inpatient location
- NHSN 48-hour "transfer rule" does **not** apply for LabID events

NHSN Patient Safety Manual – Tables of Instructions, page 14-46

Improving MDRO BSI Surveillance

Difference Between CLABSI and MDRO BSI Surveillance and Reporting

CLABSI surveillance follows the protocol in the NHSN **Device-Associated Module**

- Requires positive blood culture plus review of clinical symptoms to ensure case definition is met
- CLABSI by definition are primary bloodstream infections

MRSA/VRE-BSI surveillance follows LabID method in NHSN **MDRO/CDI Module**

- Requires only the positive blood culture to meet the case definition for a LabID event
- Both primary and secondary bloodstream infections are included

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MDRO BSI and CLABSI Reporting (continued)

When MRSA or VRE is the pathogen causing CLABSI, you must report the event twice to capture in both the **Device-Associated** and **MDRO/CDI** Modules

Improving Completeness of MRSA/VRE Reporting

- Follow same reporting rules as for LabID CDI surveillance
- Check communications with your lab
- Verify data you are receiving from your lab are complete and final culture results
- Compare your daily lab reports to an end of month lab summary on all ED and inpatient MRSA/VRE BSI BSI

Improving Completeness of MRSA/VRE Reporting (continued)

- Cases may be missed if unclear description of MDRO status on lab reports
  - MDROs should be reported as “MRSA” or “VRE” rather than relying on review of the susceptibility profile
  - Work with lab so positive specimen results are straightforward
  - An unclear MDRO status can affect not only surveillance and reporting but also treatment, isolation, and cleaning practices

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Improving Completeness of MRSA/VRE Reporting (continued)

- Know how data are exchanged between laboratory system and third party surveillance software system (e.g. Medmined, Safety Surveillor)
  - Be aware of settings and filters used by third party software; may filter out data that should be reported to NHSN/CDPH
    - Duplicates (Must report cases if ≥2 wks from previous)
    - CO cases (Some systems filter out positive blood cultures in first 48 hours after admission)
  - Filters can vary for the same software (even within a hospital system!)
  - Check data from third party software sources against reports printed directly from your laboratory

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Improving CLABSI Surveillance

Improving CLABSI Case-finding

- Review every positive blood culture from inpatients
  - Many of the missed CLABSI had simply been MISSED
- First screen: Presence of central line during hospitalization
  - Develop your own method based on available information systems
- Know the surveillance definition!
  - Criterion 1: Single blood culture if a pathogen, which means <u>any</u> organism other than a common commensal; No other symptoms needed to confirm CLABSI
  - Criterion 2: 2 common commensal positive bloods plus 1 of 3 symptoms --- fever, chills, or hypotension
    - Cultures can be drawn up to 2 days apart
    - Same even if 1 at genus level (e.g. coag negative staph) and the other at species level (e.g. Staph epi)

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NHSN Patient Safety Manual, Device-Associated Module, CLABSI, Chapter 4, page 3

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Simplified View of CLABSI Definition

Patient with a central line must meet one of the following criterion

1

Patient of any age
- ☐ has a recognized pathogen cultured from one or more blood cultures

and

- ☐ Organism cultured from blood is not related to an infection at another site

2

Patient of any age
- ☐ has common skin commensals cultured from 2 or more blood cultures drawn on separate occasions

and

has **at least one** of the following signs or symptoms
- ☐ Fever (> 38°C), chills, or hypotension

and

- ☐ Signs and symptoms and (+) lab results are not related to an infection at another site

3

Patient ≤ 1 year of age
- ☐ has common skin commensals cultured from 2 or more blood cultures drawn on separate occasions

and

has **at least one** of the following signs or symptoms:
- ☐ Fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia

and

- ☐ Signs and symptoms and (+) lab results are not related to an infection at another

Note: Patient ≤1 year old can meet ANY criteria

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There 13 NHSN infection categories with 46 infections

Each has a surveillance definition

Many infections can result in BSI

Access definitions via the NHSN website; most up-to-date

Table 1. CDC/NHSN major and specific types of health care–associated infections

UTI	**Urinary tract infection**		
	SUTI	Symptomatic urinary tract infection	
	~~ASB~~	~~Asymptomatic bacteriuria~~	
	OUTI ABUTI	Other infections of the urinary tract	
SSI	**Surgical site infection**		
	SIP	Superficial incisional primary SSI	
	SIS	Superficial incisional secondary SSI	
	DIP	Deep incisional primary SSI	
	DIS	Deep incisional secondary SSI	
	Organ/space	Organ/space SSI. Indicate specific type:	
		• BONE	• LUNG
		• BRST	• MED
		• CARD	• MEN
		• DISC	• ORAL
		• EAR	• OREP
		• EMET	• OUTI
		• ENDO	• SA
		• EYE	• SINU
		• GIT	• UR
		• IAB	• VASC
		• IC	• VCUF
		• JNT	
BSI	**Bloodstream infection**		
	LCBI	Laboratory-confirmed bloodstream infection	
	~~CSEP~~	~~Clinical sepsis~~	
PNEU	**Pneumonia**		
	PNU1	Clinically defined pneumonia	
	PNU2	Pneumonia with specific laboratory findings	
	PNU3	Pneumonia in immunocompromised patient	
BJ	**Bone and joint infection**		
	BONE	Osteomyelitis	
	JNT	Joint or bursa	
	DISC	Disc space	
CNS	**Central nervous system**		
	IC	Intracranial infection	
	MEN	Meningitis or ventriculitis	
	SA	Spinal abscess without meningitis	
CVS	**Cardiovascular system infection**		
	VASC	Arterial or venous infection	
	ENDO	Endocarditis	
	CARD	Myocarditis or pericarditis	
	MED	Mediastinitis	

Continued

Table 1. Continued

EENT	**Eye, ear, nose, throat, or mouth infection**	
	CONJ	Conjunctivitis
	EYE	Eye, other than conjunctivitis
	EAR	Ear, mastoid
	ORAL	Oral cavity (mouth, tongue, or gums)
	SINU	Sinusitis
	UR	Upper respiratory tract, pharyngitis, laryngitis, epiglottitis
GI	**Gastrointestinal system infection**	
	GE	Gastroenteritis
	GIT	Gastrointestinal (GI) tract
	HEP	Hepatitis
	IAB	Intraabdominal, not specified elsewhere
	NEC	Necrotizing enterocolitis
LRI	**Lower respiratory tract infection, other than pneumonia**	
	BRON	Bronchitis, tracheobronchitis, tracheitis, without evidence of pneumonia
	LUNG	Other infections of the lower respiratory tract
REPR	**Reproductive tract infection**	
	EMET	Endometritis
	EPIS	Episiotomy
	VCUF	Vaginal cuff
	OREP	Other infections of the male or female reproductive tract
SST	**Skin and soft tissue infection**	
	SKIN	Skin
	ST	Soft tissue
	DECU	Decubitus ulcer
	BURN	Burn
	BRST	Breast abscess or mastitis
	UMB	Omphalitis
	PUST	Pustulosis
	CIRC	Newborn circumcision
SYS	**Systemic Infection**	
	DI	Disseminated infection

(<37°C rectal), apnea, bradycardia, dysuria, lethargy, or vomiting

and

patient has a positive urine culture, that is, $\geq 10^5$ microorganisms per cc of urine with no more than two species of microorganisms.

4. Patient ≤1 year of age has at least *1* of the following signs or symptoms with no other recognized cause: fever (>38°C), hypothermia (<37°C), apnea, bradycardia, dysuria, lethargy, or vomiting

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Primary BSI (CLABSI) or Secondary BSI ?

- Rule out a CLABSI if patient has a BSI but another site is suspected as being the primary site of infection
- Especially for patients with complex co-morbidities, review medical record for other primary sites of infection
- To classify a BSI as secondary to another site, the primary site of infection must meet the NHSN surveillance criteria

NHSN Patient Safety Manual, NHSN Surveillance Definitions, chapter 17, page 1

CLABSI or Secondary BSI (continued)

- Secondary BSIs are not reported as separate events in NHSN
  - When entering Events into NHSN (e.g. SSI, CAUTI, PNEU, etc), there is a data field to indicate secondary BSI
- For many surveillance definitions, a positive blood culture is included in the criteria and can help define the infection *(see next slide)*

HAI Infection Definitions with "Positive Blood Culture" Included in Criteria

ABUTI - asymptomatic bacteremic UTI
BONE - osteomyelitis
BURN - burn infection
DECU - decubitus ulcer infection
ENDO – endocarditis
GIT - other GI tract infection
IAB - intraabdominal infection
MED - mediastinitis
MEN – meningitis
OREP - other infection of genital tract
PNU 2, PNU 3 - pneumonia
SA - spinal abscess w/o meningitis
ST - soft tissue infection
UMB - omphalitis
UR upper respiratory tract infection

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Laboratory Findings of Secondary BSI

- If the primary infection site **is cultured**, the secondary BSI must yield a culture of the same organism as that of the primary site

Example: Patient with E-coli isolated from urine and blood cultures meets the criteria for a symptomatic UTI

Report as SUTI with a secondary BSI

See NHSN Forms, Section 57-114, UTI

Laboratory Findings of Secondary BSI

- If the primary HAI site is **NOT cultured**, the secondary BSI must be a pathogen appropriate for the primary site

Example: Patient with central line has a post-op abscess detected by CT scan; meets criteria for GI tract infection. Also has a positive blood culture for *Bacteroides fragilis*.

Report as SSI-GIT with secondary BSI

Common Infections with Secondary BSI

- During the 2011 data validation reviews, many complex HAI cases were reviewed to confirm or rule-out CLABSI
- Commonly observed infections with secondary BSI were
  - UTI, symptomatic (SUTI)
  - UTI, asymptomatic with bacteremia (ABUTI)
  - Pneumonia meeting criteria 2 or 3 (PNEU 2, 3)
  - GI tract infection (GIT)
  - Intrabdominal infection (IAB)
  - Osteomylitis (BONE)
  - Endocarditis (ENDO)

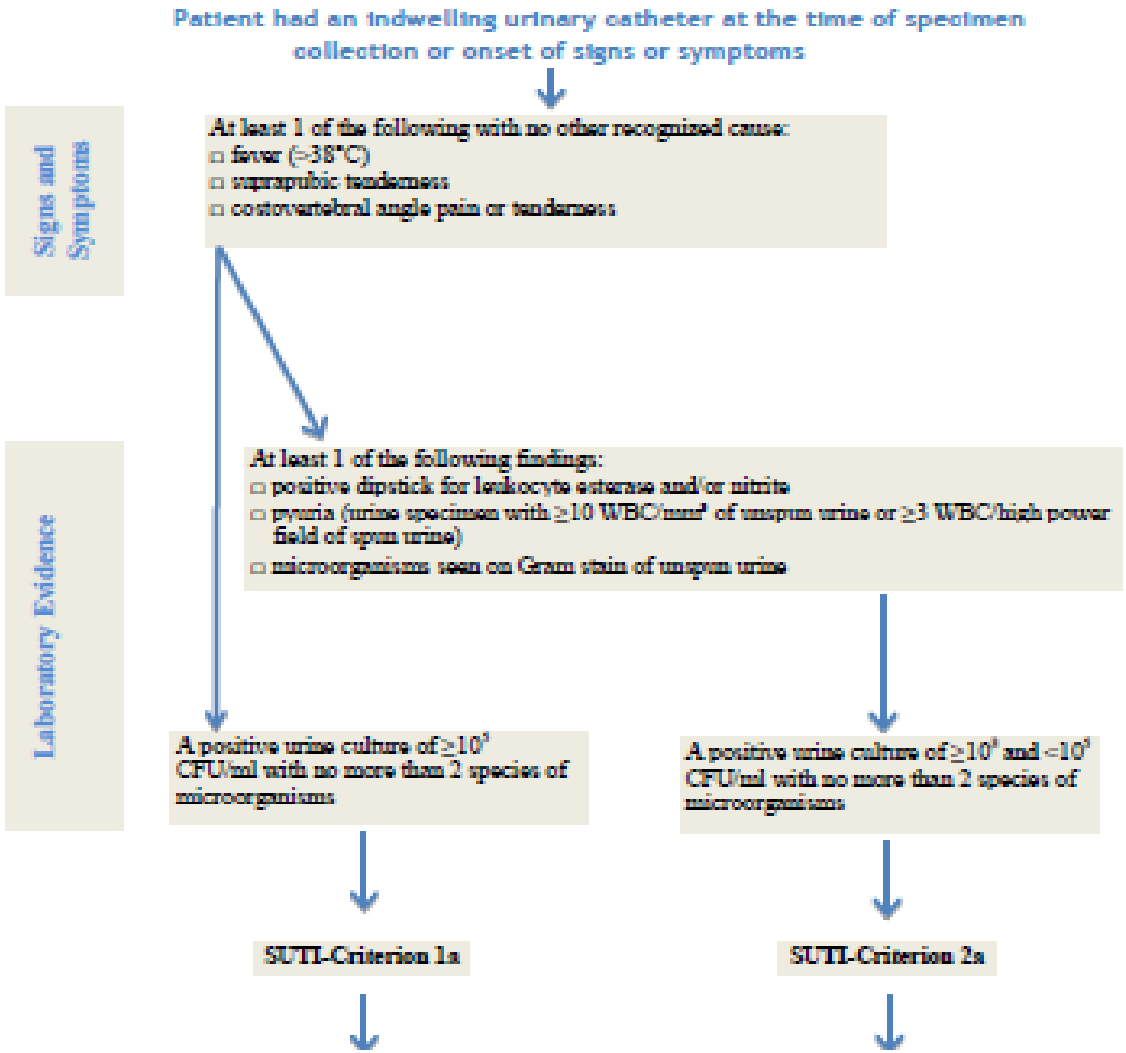
Example:

SUTI

Can have secondary BSI to SUTI, but positive blood culture not in SUTI definition.

Meaning, BSI is not needed or used to <u>define</u> SUTI

Figure 1: Identification and Categorization of SUTI with Indwelling Catheter (see comments section page 7-8 thru 7-9 for important details)

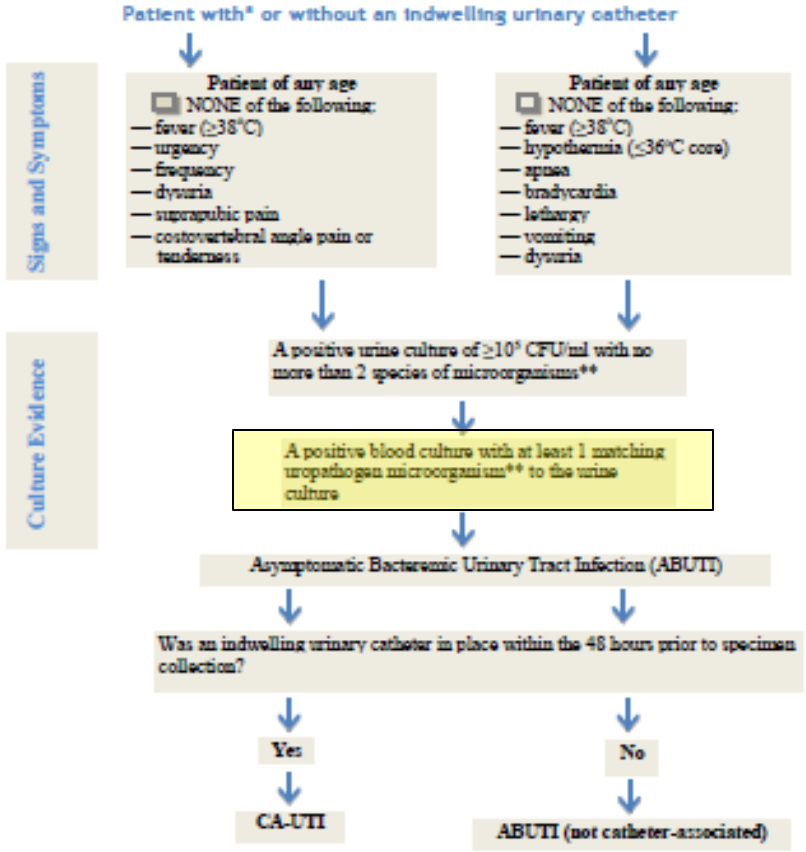


Example: ABUTI

Positive blood culture is in the ABUTI definition and is <u>required</u> to meet the definition.

NHSN has no definition for asymptomatic UTI without BSI.

Figure 5: Identification of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)



NHSN Ch7 p13

*The indwelling urinary catheter was in place within 48 hours prior to specimen collection s.

**Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, *Corynebacterium* (urease positive)†.

†Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified* (COS) or as C. *urealyticum* (CORIUR) if so speciated.

Example: GIT
GI Tract Infection

GIT-Gastrointestinal tract (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least *1* of the following criteria:

1. Patient has an abscess or other evidence of infection seen during a surgical operation or histopathologic examination.
2. Patient has at least *2* of the following signs or symptoms with no other recognized cause and compatible with infection of the organ or tissue involved: fever (>38°C), nausea, vomiting, abdominal pain, or tenderness
   and
   at least *1* of the following:
   a. organisms cultured from drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
   b. organisms seen on Gram's or KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
   c. organisms cultured from blood
   d. evidence of pathologic findings on radiographic examination
   e. evidence of pathologic findings on endoscopic examination (eg, *Candida* esophagitis or proctitis).

NHSN Ch.17 p24

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Example: BONE Osteomyelitis

BJ–BONE AND JOINT INFECTION

BONE-Osteomyelitis

Osteomyelitis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from bone.
2. Patient has evidence of osteomyelitis on direct examination of the bone during a surgical operation or histopathologic examination.
3. Patient has at least *2* of the following signs or symptoms with no other recognized cause: fever (>38°C), localized swelling, tenderness, heat, or drainage at suspected site of bone infection

   and

   at least *1* of the following:

   a. organisms cultured from blood

   b. positive blood antigen test (eg, *H influenzae*, *S pneumoniae*)

NHSN Ch.17 p14

Improving SSI Surveillance

Protocol Review for SSI Surveillance

- SSI surveillance was not part of 2011 data validation
- Areas to highlight determined by HAI Liaison Program IPs based on common questions and observed issues

Primary and Secondary Incisional SSI

- SSI infections involving the incision can be
  - Superficial Incisional Primary or Secondary (SIP or SIS)
  - Deep Incisional Primary or Secondary (DIP or DIS)
- Simply stated, an SSI is "Primary" if the infection involves incision made for the primary surgical procedure
  - e.g. chest incision for a CABG, abdominal incision for COLO
- SSI is "Secondary" if infection involves <u>another</u> incision made during a procedure other than the primary incision
  - e.g. leg incision for CABG donor graft

Most surgeries have only 1 incision

Vast majority of superficial or deep incisional SSI are Primary and reported as SIP or DIP

Superficial Incisional SSI

Surveillance Definition

- ❑ Infection occurs within 30 days after surgical procedure

AND

- ❑ Involve only skin and subcutaneous tissue of the incision

AND

Patient has at least **1:**

- ❑Purulent drainage from incision
- ❑Organism isolated from incision culture or fluid (obtained aseptically)
- ❑Pain or tenderness
- ❑Localized swelling, redness, or heat

AND ❑ Incision opened by surgeon and found to be culture positive or was not cultured

- ❑Diagnosis of superficial SSI by surgeon or attending physician

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Superficial SSI – additional reporting instructions

- Do not report stitch abscess as an SSI
  - "Minimal inflammation and discharge confined to points of suture penetration"
- Do not report a localized stab wound infection as an SSI
- Cellulitis by itself is not an SSI

NHSN Manual: Ch 9, p 9

Deep Incisional SSI

Surveillance Definition

- Infection occurs within 30 days after surgical procedure if no implant or within 1 year if implant

AND

- Involves deep soft tissues of the incision, e.g. fascial & muscle layers

AND

Patient has at least **1:**

- Purulent drainage from deep incision but not from the organ/space of the surgical site
- Deep incision spontaneously dehisces **or** opened by surgeon **AND** is culture positive or not cultured **AND** fever >38°C, localized pain, or tenderness
- Abscess or evidence of deep infection found on direct exam, during reoperation, by histopathologic or radiologic exam
- Diagnosis of deep SSI by surgeon or attending physician

Organ Space SSI

Surveillance Definition

- Infection occurs within 30 after surgical procedure if no implant or within 1 year if implant

AND

- Involves any part of body that is opened or manipulated during the surgical procedure; excludes skin, fascia, or muscle layers, and subcutaneous tissue of the incision

AND

Patient has at least **1:**

- Purulent drainage from drain placed through stab wound into organ/space
- Organism isolated from incision culture or fluid (obtained aseptically)
- Abscess or evidence of organ/space infection found on direct exam, during reoperation, by histopathologic or radiologic exam

Organ Space SSI

Surveillance Definition

- Infection occurs within 30 after surgical procedure if no implant or within 1 year if implant

AND

- Involves any part of body that is opened or manipulated during the surgical procedure; excludes skin, fascia, or muscle layers, and subcutaneous tissue of the incision

AND

Patient has at least **1:**

- Purulent drainage from drain placed through stab wound into organ/space
- Organism isolated from incision culture or fluid (obtained aseptically)
- Abscess or evidence of organ/space infection found on direct exam, during reoperation, by histopathologic or radiologic exam

Wound Class

- Must be assessed at the time of the operation by a person present during the surgical procedure
  - e.g., surgeon, circulating nurse, etc.
- If the wound class is always assigned prior to surgery will lead to both inaccurate reporting and inaccurate risk adjustment!

NHSN Manual Ch16, p 11 & 12

Wound Class

Clean

Operation where no inflammation encountered

Respiratory, alimentary, genital, urinary tracts ***not*** entered

Operation following non-penetrating (blunt) trauma

Primarily closed with no open drainage

Clean - Contaminated

Operation entering respiratory, alimentary, genital, or urinary tracts

No evidence of infection, no major break in technique, no unusual contamination encountered

Operation involving biliary tract, appendix, vagina, and oropharynx

Contaminated

Operation following open, fresh, accidental wounds

Operation with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from GI tract

Includes operation where acute, non-purulent inflammation encountered

Dirty

Operation involving old traumatic wounds with retained devitalized tissue, **or** existing clinical infection **or** perforated viscera

Definition suggests the organisms causing post-op infection were present before the operation

NHSN Manual Ch16, p 11-12

Defining an Implant

- A nonhuman-derived object, material, or tissue that is placed in a patient during an operative procedure
- Requires 1 year post-op follow-up for SSI
- Includes
  - Porcine or synthetic heart valves
  - Mechanical heart
  - Metal rods
  - **Mesh**
  - Sternal wires
  - Screws
  - **Cements**
  - Internal **staples**
  - Hemoclips
  - **Other devices**
- Excludes
  - Non-absorbable sutures

Rationale: IPs "may not easily identify and/or differentiate the soluble nature of suture material used"

NHSN Newsletter v6.6 (Feb. 2012)
NHSN Manual Ch16, pg 4-5.
NHSN Manual, Ch 17 pg 313-314

Once an implant, always an implant?

- An object is considered an implant **until** it or the surrounding structures are **manipulated** for diagnostic or therapeutic purposes
  - "If infection develops after manipulation, do not attribute it to the operation in which the implant was inserted; instead attribute it to the latter procedure.

Data Correction

- Remember, if you note any errors or omissions, you can always go back and edit NHSN records to correct your data!
- If you find errors that require you to make numerous changes to your data after it has been entered into NHSN, record date when changes made
- Keep records of clinical or system issues that change your data to help understand variation over time

  Examples include:
  - Improved (more sensitive) testing methods
  - New lab computer software
  - Focused education on specimen collection processes

Remember that the "power of surveillance is in sharing findings with those who need to know and who can act on the findings to improve patient safety"

"Recommended Practices for Surveillance"
AJIC Am J Infect Control 2007; 35:427-40

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Healthcare-associated Infections HAI Elimination

Reporting and Using Surveillance Data

- Plan for distribution of NHSN data and findings
- Use NHSN analysis features to review and interpret your data
- Report to health care providers most able to impact patient care
- Report in a manner to stimulate process improvement
  - Use visual displays of data - charts, graphs, tables

AJIC Am J Infect Control 2007; 35:427-40

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Healthcare-associated Infections HAI Elimination

Steps for Advancing HAI Prevention Using HAI Data

- Think beyond public reporting and hospital-to-hospital comparisons
- Focus on HAI prevention progress within <u>your</u> hospital over time (requires you to find *all* the HAI that occur)
- Set HAI prevention goals and targets
- Remember the 4 C's of surveillance data quality
  - Consistency, coordination, confidence, compassion
  - Establish systems' approaches for identifying infections and capturing denominator data
  - Don't go it alone anymore!

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Healthcare-associated Infections HAI Elimination

10-MINUTE BREAK

Next up:

Performing data validation in YOUR hospital

Practicing NHSN using case-scenarios

Using the Data Validation Process and Forms

Form 1
Summary of Laboratory Data

Instructions: Determine which HAI(s) you wish to validate. Ask your laboratory to produce line lists directly from the laboratory information system for a 3-month time period.

- ☐ Toxin-**Positive *C difficile* tests** (PCR, assay, culture) from both inpatients and ED patients.
- ☐ **Positive blood cultures** for inpatients and ED patients (needed for MRSA/VRE BSI validation)
- ☐ **Positive blood cultures** from inpatients for each of 3 months (needed for CLABSI validation)

Reports should include date of admission to the hospital if possible.
Ask to have printed twice: sorted by date and then sorted by patient name or medical record number.

Months selected for validation:
☐Jan ☐Feb ☐Mar ☐Apr ☐May ☐Jun ☐Jul ☐Aug ☐Sep ☐Oct ☐Nov ☐Dec

Source data system for laboratory line lists: _____*e.g.Meditech, Sunquest, Cerner*

For CDI LabID Validation

Positive **CDI** from 3 mo _____ **[INCLUDE IN CDI REVIEW]**

*Include **each** positive CDI test result even if from same patient*

Number each positive CDI on your lab line list. Enter corresponding specimen dates in table on **Form 2**. Follow instruction on **Form 2** to complete validation review.

For MRSA & VRE BSI LabID Validation

From positive **blood cultures** (3 mo):

*Include **each** positive blood culture even if from same patient*

VRE-positive blood cultures _____ **[INCLUDE IN VRE BSI REVIEW]**

MRSA-positive blood cultures_____ **[INCLUDE IN MRSA BSI REVIEW]**

Number each VRE/MRSA blood culture on your lab line list. Enter the corresponding specimen dates in VRE or MRSA tables on **Form 3**. Follow instructions on **Form 3** to complete review.

For CLABSI Validation

From positive blood cultures from **Inpatients only, indicate total each MONTH**:

☐ Month _____ # ____ ☐ Month _____ # ____ ☐ Month _____ # ____

Use Table (page 2) to determine how many months feasible to include in review.
Check which months (above) you will include in the CLABSI validation review.

Positive blood cultures from **Inpatients** during months ✓'d to include in review_____

Separate BSI Events* _____ **[INCLUDE IN CLABSI REVIEW]**

**"Cluster" of positive blood cultures near same date for same patient counts as 1 event; single positive also counts as 1 event*

Number each BSI event on your lab line list. Enter the corresponding culture date (1st positive) and admission date in table on **Form 4**. Follow instructions on **Form 4** to complete review.

For most comprehensive review, review positive blood cultures from ED patients for recent hospital discharge:

_____ **[INCLUDE IN CLABSI REVIEW AS POSSIBLE]** Add to table on Form 4.

HAI Liaison Program Data Validation Forms Review Date: ___/___/11 Initials:_____

Determining time period for validation review: *In general, starting with 60 positive blood cultures results in approximately 40-55 infectious events and in-depth chart review of 10-15 records. The remaining generally require only cursory review to identify or rule out CLABSI (often accomplished using data available through EMR systems). The likelihood of identifying CLABSI is based on your underlying rate and the number of positive blood cultures you include in your validation.*

Determine number of months to include in CLABSI validation. √ boxes next to corresponding months on Form 1.

Total inpatient positive blood cultures in 3 mo.	***Review***	
≤ 60	*all 3 months*	
>60 and <120	*2 months*	*Select the month with the **greatest #,** then a 2nd month that makes a 2-month total closest to 60*
≥120	*1 month*	*Select the month with the **greatest #***

Form 2
CDI Events

Instructions:

1. Fill in the specimen date for each toxin-positive *C difficille* test as corresponds to the number on your laboratory line list (see Form1).
2. Using NHSN Analysis, produce a line list of CDI LabID Events reported by your hospital for the same 3-month validation review period.
3. For each numbered specimen, answer Q1 by referring to your NHSN line list. For CDI cases reported to NHSN, record NHSN Event #. If cases on your NHSN list are not included (i.e. were not on lab line list), add to the bottom of table.
4. Using patient information on the lab line list (i.e. name or medical record number), for each numbered CDI specimen, review patient's medical record to verify your decision to report or not report to NHSN. Carefully follow NHSN CDI LabID protocols/definitions; refer to them often.
   - For each specimen **NOT** reported to NHSN, indicate reason why in the appropriate column. If case should have been reported but was not, record as missed. Indicate a reason the case may have been missed.
   - For each specimen **Reported** to NHSN, verify if case met inpatient LabID criteria. If no, record reporting error and indicate reason. If yes, CDI LabID criteria met, compare specimen date, admission, and location as reported on NHSN line list to the same info in the medical record. Verify accuracy. Check box if correct as reported. If incorrectly reported, record accurate data in table.
5. Complete CDI section of Form 6, Validation Findings.

When review complete, make all needed corrections to your data in NHSN!

CDI Events Table.

Lab list #	Positive Cdifficile specimen date	Q1. Was CDI Event reported to NHSN?		If Q1 answer is **NO**, complete this section			If Q1 answer is **YES**, complete this section			
		YES √ NHSN Event #	NO √	Outpatient or ED specimen from patient not admitted to hospital same calendar day	Duplicate <14 days since last positive	MISSED Should have been reported √ Reason?	Reported in ERROR Does not meet inpatient LabID criteria √ Reason?	Correctly Reported Met inpatient LabID criteria Per instructions, √ box if data entered correctly in NHSN –or – enter correction. Specimen date	Admission date	Location attribution
C1	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C2	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C3	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C4	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C5	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C6	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C7	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C8	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C9	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
C10	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
Column totals:		_____	_____			_____	_____			

Form 3
MRSA & VRE BSI Events

Instructions:

1. Fill in the specimen dates for each MRSA and VRE positive blood culture in separate tables below. Numbers should correspond to numbers on your laboratory line list (see Form1).
2. Use NHSN Analysis to produce a line list of MRSA & VRE BSI Events reported by your hospital for the 3-month validation review period.
3. For each numbered blood culture below, answer Q1 by referring to your NHSN line list. For cases reported to NHSN, record NHSN Event #. If cases on your NHSN list are not included (i.e. were not on lab line list), add to the bottom of the appropriate table (MRSA or VRE).
4. Using patient information on the lab line list (i.e. name or medical record number), for each numbered blood culture, review patient's medical record to verify your decision to report or not report to NHSN. Carefully follow NHSN MDRO LabID protocols/definitions; refer to them often.
   - For each specimen **NOT** reported to NHSN, indicate reason why in the appropriate column. If case should have been reported but was not, record as missed. Indicate a reason the case may have been missed.
   - For each specimen **Reported** to NHSN, verify if case met inpatient LabID criteria. If no, record reporting error and indicate reason. If yes, CDI LabID criteria met, compare specimen date, admission, and location as reported on NHSN line list to the same info in the medical record. Verify accuracy. Check box if correct as reported. If incorrectly reported, record accurate data in table.
5. Complete MRSA and VRE sections of Form 6, Validation Findings.

When review complete, make all needed corrections to your data in NHSN!

MRSA Events Table

Lab list #	MRSA-positive blood culture specimen date	Q1. Was MRSA Event reported to NHSN? YES √ NHSN Event #	NO √	If Q1 answer is **NO**, complete this section: Outpatient or ED specimen from patient not admitted to hospital same calendar day	Duplicate <14 days since last positive	MISSED Should have been reported √ Reason?	If Q1 answer is **YES**, complete this section: Reported in ERROR Does not meet inpatient LabID criteria √ Reason?	Correctly Reported Met inpatient LabID criteria. Per instructions, √ box if data entered correctly in NHSN –or – enter correction. Specimen date	Admission date	Location attribution
M1	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M2	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M3	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M4	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M5	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M6	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M7	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M8	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M9	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
M10	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐

VRE Events Table

Lab list #	VRE-positive blood culture specimen date	Q1. Was MRSA Event reported to NHSN? YES √ NHSN Event #	NO √	If Q1 answer is **NO**, complete this section: Outpatient or ED specimen from patient not admitted to hospital same calendar day	Duplicate <14 days since last positive	MISSED Should have been reported √ Reason?	If Q1 answer is **YES**, complete this section: Reported in ERROR Does not meet inpatient LabID criteria √ Reason?	Correctly Reported Met inpatient LabID criteria Per instructions, √ box if data entered correctly in NHSN –or – enter correction. Specimen date	Admission date	Location attribution
V1	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V2	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V3	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V4	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V5	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V6	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V7	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V8	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V9	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V10	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V11	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V12	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V13	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V14	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V15	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V16	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V17	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V18	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐
V19	___/___/11	☐	☐	☐	☐	☐	☐	☐ ___/___/11	☐ ___/___/11	☐

Add additional pages as needed

Column totals: _____ _____ _____ _____

Form 4
BSI Events Table

Instructions:

1. Fill in first specimen date for each BSI event in table below. Numbers should correspond to laboratory line list (see Form1).
2. Use Analysis to produce CLABSI line list for the 1,2, or 3-month review period. Also print NHSN Event record for each reported CLABSI..
3. For each numbered BSI event, answer Q1 by referring to your NHSN line list. For cases reported to NHSN, record NHSN Event #. If CLABSI on your NHSN list but were not on lab line list, add to the bottom of the table.
4. For each BSI event, review patient's medical record to verify your decision to report or not report to NHSN. Carefully follow NHSN protocols and surveillance definitions; refer to them often.
   - For each CLABSI **Reported** to NHSN, complete a Form 5, CLABSI Validation Review. Record info on table in 1 of 2 columns as shown.
   - For each BSI event **NOT** reported to NHSN, indicate reason why in the appropriate column. If case should have been reported but was not, record as missed. Indicate a reason the case may have been missed.
5. Complete CLABSI section of Form 6, Validation Findings.

When review complete, make all needed corrections to your data in NHSN!

BSI Events Table.

Lab list #	First positive blood culture of each BSI Event Specimen date	Admission date	Q1. Was Event reported to NHSN as a CLABSI? YES √ NHSN Event#	NO √	If YES to Q1 Perform medical record review, complete Form 5, then fill in 1 of columns below Not a CLABSI Reported in error Why?	*Data fields correctly reported to NHSN? √ If NO, List	If NO to Q1 Perform medical review. Use BSI review work sheet if helpful. Stop as soon as you can complete one of the columns below. NO central line or no line in previous 48 hours	Present on admission and not discharged in previous 48 hours	Contaminant i.e. Common skin commensals Single +bld cx	≥2 +bld cx but no S/S	Secondary BSI Primary site of infection	MISSED CLABSI Should have been reported
1	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	___/___/11	___/___/11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Column totals: _____ _____

Form 5
CLABSI Review

✓one: ☐Confirm Accuracy of Reported CLABSI ☐Report CLABSI that was Missed

Instructions: Complete for each reported CLABSI. Check box (☑) if data field correct as reported to NHSN or fill-in correct information. -OR- use form to collect data for Missed CLABSI by filling-in all fields.

Lab Line List# _____ 1st positive blood culture ___/___/11 NHSN Event #: _____

Patient ID:

Gender: F M Other | Date of Birth: ___/___/___

Event Type: BSI | **Date of Event (onset):** ☐ ___/____/11

MDRO Infection Surveillance: ☐ "Yes, this infection's pathogen & location are not in-plan for Infection Surveillance in the MDRO/CDI Module"
☐ "No, this infection's pathogen & location are **not** in-plan for Infection Surveillance in the MDRO/CDI Module"

Date Admitted to Facility: ☐ ___/____/11 | **Location Attribution:** ☐ _____

Risk Factors

✗ Mark Relevant Location ☑If Reported Correctly

___If ICU/Other locations
Central line: Yes No ☐

___If Specialty Care Area,
Permanent central line: Yes No ☐
Temporary central line: Yes No ☐

___If NICU,
Non-umbilical central line: Yes No ☐
Umbilical catheter:: Yes No ☐
Birth weight (grams): _____ ☐

Location of Device Insertion: _____ *optional*

Date of Device Insertion: ____/_____/11 *optional*

☐ **Medical record review revealed NOT a CLABSI**

Notes:

Event Details

Specific Event: Laboratory-confirmed BSI

Criteria:
Signs & Symptoms *NOTE: S/S needed only if common skin commensal*

Any patient
☐ Fever
☐ Chills
☐ Hypotension

≤1 year old
☐ Fever
☐ Hypothermia
☐ Apnea
☐ Bradycardia

Laboratory

☐ Recognized pathogen from one or more blood cultures

☐ Common skin commensal from ≥2 blood cultures

Died: Yes No | If Died, BSI Contributed to Death: Yes No

Pathogen/s: ☐**Reported Correctly** If VRE or MRSA, reported also as LabID? ☐Yes ☐No

_____

Chart Review Work Sheet

Instructions: Use for notes to rule out or confirm CLABSI. Record final determination by checking appropriate boxes. Transfer findings to BSI Events table, Form 4.

☐ 1. BSI event from patient with no central line present or during previous 48 hours.

☐ 2. BSI associated with Infection that was **PRESENT ON ADMISSION** from patient not recently discharged from hospital in the previous 48 hours.

☐ 3. Positive blood culture was determined to be a **CONTAMINANT**, i.e. common commensal organism(s) from
- ☐ only one positive culture within a 2 day period
- ☐ 2 cultures on separate occasions, but patient with no signs/symptoms of infection

4. Infection was a **BSI SECONDARY TO ANOTHER SITE OF INFECTION**.

☐ UTI	☐ SSI
☐ PNEU	☐ Bone/Joint
☐ Central nervous system	☐ Cardiovascular
☐ EENT or URI	☐ LRI
☐ GI	☐ Reproductive tract
☐ Skin/ Soft tissue	☐ Systemic

Refer to NHSN Infection definitions to be sure criteria for primary infection site have been met!

☐ 5. Infection met NHSN surveillance criteria for **CLABSI**, and should have been reported to NHSN. Complete **Form 5,** CLABSI Review Form.

MEDICAL RECORD REVIEW: **Lab Line List# ___ 1st positive blood culture of Event ___/___/11**

HOSPITALIZATION

Hospital Admission Date___/___/___ *Reason for Admission_____*
Admitted from Home SNF Dialysis
Discharge Date ___/___/___ *Discharge disposition_____*
Date of 1st +blood Culture __/__/__ *Hospital location at time of 1st positive culture:_____*
Date admitted to location: __/__/__ *If on unit < 48 hrs, previous location _____*

CENTRAL LINE HISTORY

Date of initial central line insertion ___/___/___ *Location of Line Insertion _____*
Line type: _____ *Insertion site_____ Removal _____*
Date of 2nd central line insertion ___/___/___ *Location of Line Insertion _____*
Line type: _____ *Insertion site_____ Removal _____*
Date of 3rd central line insertion ___/___/___ *Location of Line Insertion _____*
Line type: _____ *Insertion site_____ Removal _____*

CLINICAL NOTES

_____
_____
_____
_____
_____

Date ____/2011 Reviewer's Name: _____

Form 6
Data Validation Findings

Validation results can be displayed using 2x2 tables and the accuracy and completeness of HAI surveillance and reporting can be calculated. Quantitative findings of data validation include sensitivity, specificity, and positive predictive value (defined below).

		Validation Review ("Gold Standard" or truth)	
		HAI	Not an HAI
Routine Hospital Surveillance	HAI	True positives	**False positives**
	Not an HAI	**False negatives**	True negatives

Positive Predictive Value (PPV) =

$$\frac{\text{True positives}}{\text{True positives + False positives}} \times 100$$

Sensitivity =

$$\frac{\text{True positives}}{\text{True positives + False negatives}} \times 100$$

Specificity =

$$\frac{\text{True negatives}}{\text{True negatives + False positives}} \times 100$$

Positive Predictive Value (PPV)

- Also called the precision rate.
- For HAI surveillance, PPV is the proportion of HAI reported that met the case definition.
- If PPV is high, it means the identified and reported HAIs really *are* HAIs.
- Measures **accuracy** in applying surveillance definitions and/or protocols.

Sensitivity

- Answers question "How likely are all true infections found?
- For HAI surveillance, sensitivity is defined as the proportion of HAIs identified and reported from the total of all patients who had an HAI.
- If sensitivity is low, it means HAIs were missed. The hospital's HAI rate could be higher than what is being reported.
- Measures **completeness** and implies effective surveillance methods.

Specificity

- Answers question "How likely are patients without an infection accurately identified as not having an infection?"
- For HAI surveillance, specificity is defined as the proportion of HAIs not reported from the total of all patients who did not have an HAI.
- If specificity is low it means not all the HAIs reported were actually HAIs. The hospital's HAI rate may actually be lower than what is being reported.

Example

Positive urine cultures reviewed for CAUTI validation = **100**

		Validation Review ("Gold Standard" or truth)	
		CAUTI	No CAUTI
Routine Hospital Surveillance	CAUTI **10**	8	**2** Reported in error
	No CAUTI **90**	**3** Missed	87

Positive Predictive Value (PPV) =

$$\frac{\text{8 True positives}}{\text{8 True pos. + 2 False pos.}} \times 100$$

80%

Sensitivity =

$$\frac{\text{8 True positives}}{\text{8 True pos. + 3 False neg.}} \times 100$$

73%

Specificity =

$$\frac{\text{87 True negatives}}{\text{7 True neg. + 2 False pos.}} \times 100$$

98%

Interpretation:

For the 100 urine cultures reviewed for CAUTI, the validation reviewers found **5** disparities.

The hospital had identified and reported 10 CAUTI. The validation reviewers determined only 8 should have been reported; **2** did not meet the surveillance criteria.

The calculated **positive predictive value (PPV)** reveals that what routine hospital surveillance identifies as CAUTI meets the CAUTI surveillance criteria only 80% of the time.

For the other 90 positive urine cultures reviewed in which routine hospital surveillance identified no CAUTI, the validation reviewers identified **3** additional CAUTI.

The calculated **sensitivity** reveals routine hospital surveillance is identifying only 73% of the CAUTI occurring.

The calculated **specificity** reveals hospital routine surveillance accurately "rules out" CAUTI 98% of the time.

Data Validation for *C. difficile* Infections

Surveillance ime period: _____

From CDI Events Table, Form 2

Number of positive specimens in review = _____

		Validation Review	
		CDI	**No CDI**
Routine Hospital Surveillance	**CDI** ____ *Form 2, total Q1=Yes*	**A**	**B** *Reported in Error*
	No CDI ____ *Form 2 , total Q1 = No*	**C** *Missed*	**D**

Sensitivity = $\frac{A}{A + C}$ X 100 = _____

Specificity = $\frac{D}{D + B}$ X 100 = _____

Positive Predictive Value = $\frac{A}{A + B}$ X 100 = _____

Data Validation for MRSA Bloodstream Infections

Surveillance time period: _____

From MRSA Events Table, Form 3

Number of MRSA+ blood cultures in review = _____

		Validation Review	
		MRSA BSI	**No MRSA BSI**
Routine Hospital Surveillance	**MRSA BSI** ____ *Form 3, M total Q1 = Yes*	**A**	**B** *Reported in Error*
	No MRSA BSI ____ *Form 3, M total Q1 = No*	**C** *Missed*	**D**

Sensitivity = $\frac{A}{A + C}$ X 100 = _____

Specificity = $\frac{D}{D + B}$ X 100 = _____

Positive Predictive Value = $\frac{A}{A + B}$ X 100 = _____

Data Validation for CLABSI

Surveillance time period: _____

From BSI Events Table, Form 4

Number of positive blood culture "clusters" = _____

		Validation Review	
		CLABSI	**Not CLABSI**
Routine Hospital Surveillance	**CLABSI ____** *Form 4, total Q1 = Yes*	**A**	**B** *Reported in Error*
	Not CLABSI ____ *Form 4 total Q1 = No*	**C** *Missed*	**D**

Sensitivity = $\frac{A}{A + C}$ X 100 = _____

Specificity = $\frac{D}{D + B}$ X 100 = _____

Positive Predictive Value = $\frac{A}{A + B}$ X 100 = _____

Infection Definitions Worksheets

Instructions:
1) Use when reviewing positive blood cultures for determining and documenting whether a positive blood culture is a primary BSI (CLABSI), secondary BSI to another site of infection, or a contaminant.
2) Use for surgical site infection (SSI) surveillance.
3) DO NOT use for **LabID** CDI or MRSA-VRE BSI surveillance. Use LabID methods in the MDRO/CDI Module protocol.
4) Refer to often when performing surveillance. Make notes on individual infection pages as you are reviewing medical records.

Page

2 Urinary tract Infections
- SUTI — Symptomatic urinary tract infection
  - Catheter in place at time of specimen-2
  - Catheter recently removed, past 48h-3
  - NOT catheter-associated - 4
  - In infants and babies ≤ 1 year old - 5

6 ABUTI — Asymptomatic UTI with Bacteremia

7 Surgical site infections
- SIP — Superficial incisional primary SSI
- SIS — Superficial incis. secondary SSI
- DIP — Deep incisional primary SSI
- DIS — Deep incisional secondary SSI
- SSI-xxx — Organ/space specific types
  - BONE - 11
  - BRST - 25
  - CARD - 15
  - DISC - 11
  - EAR - 17
  - EMET - 22
  - ENDO - 14
  - EYE - 16
  - GIT - 19
  - IAB - 20
  - IC - 12
  - JNT - 11
  - LUNG – 21
  - MED -15
  - MEN - 13
  - ORAL - 17
  - OREP -22
  - SA - 13
  - SINU - 18
  - UR - 18
  - VASC - 14
  - VCUF - 22

8 Bloodstream infection
- LCBI — Lab-confirmed BSI

9 Pneumonia
- PNUI — Clinically defined pneumonia
- PNU2 — Pneu with specific lab findings
- PNU3 — Pneu in immunocompromised

10 PNU1 — Alternate clinical definition, ≤1yo

11 Bone and joint infections
- BONE — Osteomyelitis
- JNT — Joint or bursa
- DISC — Disc space

12 Central nervous system infections
- IC — Intracranial infection
- MEN — Meningitis or ventriculitis
- SA — Spinal abscess without meningitis

Page

14 Cardiovascular system infections
- VASC — Arterial or venous infection
- ENDO — Endocarditis
- CARD — Myocarditis or pericarditis
- MED — Mediastinitis

16 Eye, ear, nose, throat, mouth, and URI infections
- CONJ — Conjunctivitis
- EYE — Eye, other than conjunctivitis
- EAR — Ear, mastoid
- ORAL — Oral cavity (mouth, tongue, or gums)
- SINU — Sinusitis
- UR — Upper respiratory tract, pharyngitis laryngitis, epiglottitis

19 Gastrointestinal system infection
- GE — Gastroenteritis
- GIT — Gastrointestinal (GI) Tract
- HEP — Hepatitis
- IAB — Intrabdominal not specified elsewhere
- NEC — Necrotizing enterocolitis

21 Lower respiratory tract infection, other than Pneu
- BRON — Bronchitis, tracheobronchitis, tracheitis, without evidence of pneu
- LUNG — Other infections of lower resp tract

22 Reproductive tract infections
- EMET — Endometritis
- EPIS — Episiotomy
- VCUF — Vaginal cuff
- OREP — Other infections of male or female reproductive tract

23 Skin and soft tissue infection
- SKIN — Skin
- ST — Soft tissue
- DECU — Decubitus ulcer
- BURN — Burn
- BRST — Breast abscess or mastitis
- UMB — Omphalitis
- PUST — Pustulosis
- CIRC — Newborn circumcision

26 Systemic Infection
- DI — Disseminated infection

SURGICAL SITE INFECTION

Criterion 1

- Infection occurs within 30 days after the operative procedure

and

- involves only skin and subcutaneous tissue of the incision

and

Patient has at least one of the following:

- a.) purulent drainage from the superficial incision
- b.) organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- c.) ≥ 1 of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon and is culture positive or not cultured (a culture-negative finding does not meet this criterion)
- d.) diagnosis of a superficial incisional SSI by the surgeon or attending physician

→ Superficial incisional SSI (SUP INC)

Criterion 1

- Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure

and

- involves deep soft tissues (e.g. fascial and muscle layers) of the incision

and

Patient has at least one of the following:

- a.) purulent drainage from the deep incision but not from the organ/space component of the surgical site
- b.) a deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or not cultured when the patient has at least one of the following signs or symptoms: fever (>38◦C), or localized pain or tenderness. A culture-negative finding does not meet this criterion.
- c.) an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- d.) diagnosis of a deep incisional SSI by the surgeon or attending physician

→ Deep incisional SSI (DEEP INC)

Criterion 1

- Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure

and

- infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure

and

Patient has at least one of the following:

- a.) purulent drainage from a drain that is placed through a stab wound into the organ/space
- b.) organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
- c.) an abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- d.) diagnosis of an organ/space SSI by the surgeon or attending physician

→ Organ/space SSI (ORGAN/SPACE) ***NOTE: Criteria for a specific site organ/space SSI must also be met*

GASTROINTESTINAL SYSTEM INFECTIONS

GE - Gastroenteritis

Gastroenteritis must meet at least 1 of the following criteria:

☐ 1. Patient has an acute onset of diarrhea (liquid stools for more than 12 hours) with or without vomiting or fever (> 38°C) and no likely noninfectious cause (eg. diagnostic tests therapeutic regimen other than antimicrobial agents. Acute exacerbation of a chronic condition. or psychologic stress).

☐ 2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: ☐nausea, ☐vomiting, ☐abdominal pain, ☐fever (>38°C), or ☐headache
and
at least 1 of the following:

a. ☐an enteric pathogen is cultured from stool or rectal swab
b. ☐an enteric pathogen is detected by routine or electron microscopy
c. ☐an enteric pathogen is detected by antigen or antibody assay on blood or feces
d. ☐evidence of an enteric pathogen is detected by cytopathic changes in tissue culture (toxin assay)
e. ☐diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

GIT- Gastrointestinal tract (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least 1 of the following criteria:

☐ 1. Patient has an abscess or other evidence of infection seen during a surgical operation or histopathologic examination.

☐ 2. Patient has at least 2 of the following signs or symptoms with no other recognized cause and compatible with infection of the organ or tissue involved: ☐fever (>38°C), ☐nausea, ☐vomiting. ☐abdominal pain, or ☐tenderness
and
at least 1 of the following:
☐organisms cultured from drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
☐organisms seen on Gram's or KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
☐organisms cultured from blood
☐evidence of pathologic findings on radiographic examination
☐evidence of pathologic findings on endoscopic examination (eg. *Candida* esophagitis or procti)

HEP - Hepatitis

Hepatitis must meet the following criterion:

☐ Patient has at least 2 of the following signs or symptoms with no other recognized cause: ☐fever (>38°C), ☐anorexia, ☐nausea, ☐vomiting, ☐abdominal pain, ☐jaundice, or ☐history of transfusion within the previous 3 months
and
at least 1 of the following:

a. ☐positive antigen or antibody test for hepatitis A, hepatitis B, hepatitis C. or delta hepatitis
b. ☐abnormal liver function tests (eg. elevated ALT/AST. bilirubin)
c. ☐cytomegalovirus (CMV) detected in urine or oropharyngeal secretions.

Reporting instructions

- Do *not* report hepatitis or jaundice of noninfectious origin (alpha-l antitrypsin deficiency. etc).
- Do *not* report hepatitis or jaundice that results from exposure to hepatotoxins (alcoholic or acetaminophen-induced hepatitis. etc).
- Do *not* report hepatitis or jaundice that results from biliary obstruction (cholecystitis).

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- Department of Health Care Services (includes Medi-Cal)
- State Agencies Directory

Home > Programs > Healthcare Associated Infections Program

Healthcare Associated Infections (HAI) Program

The Healthcare Associated Infections (HAI) Program is one of three programs in the Center for Health Care Quality of the California Department of Public Health. The Program is responsible for the surveillance, reporting, and prevention of infections in California's general acute care hospitals as mandated by Senate Bills 739, 1058, and 158. The Program was authorized in December 2009.

HAIs are the most common complication of hospital care and are listed among the top ten leading causes of death in the United States. It is estimated that each year there are more than 1.7 million infections, 99,000 deaths, and $3.1 billion dollars in excess healthcare costs in acute care hospitals alone. Based on this data it is estimated that approximately 200,000 infections occurr in California each year with an annual cost of about $600 million - $1.6 billion. The vision of the HAI Program is to eliminate HAIs for California patients.

Healthcare Associated Infections
- HAI Information and Reports
  Links to All Pages on HAIs and Mandatory Public Reporting

Healthcare Associated Infections - Advisory Committee
- HAI Advisory Committee

Information for Infection Prevention Programs
- AFLs, Legislation, and Regulations
- New 2012 Educational Road Show
- March Madness 2012
- 2 Day Mini Course
- NHSN Guidance Specific to California Hospitals
- Healthcare Associated Infections and Infection Control Guidelines
- HAI Liaison IP Assignments by County (PDF, New Window)

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

Public Reporting and Information
- New Surgical Site Infection Prevention Measures
  Mandatory Reporting
- New Interactive Map - Surgical Site Infections, April 2011--June 2011
  An easy way to view SSIs by hospital
- Central Line associated Bloodstream Infection (CLABSI)
- Methicillin-resistant Staphylococcus aureus (MRSA) and Vancomycin-resistant Enterococcus (VRE)
- Clostridium difficile Infection (CDI)
- Central Line Insertion Practices (CLIP)
- Surgical Site Infections -January-2009--March-2011

Influenza Information
- Healthcare Personnel Influenza Vaccination
- New Current Reporting and Data Collection Forms and Information
  Includes Influenza Vaccination Forms
- Influenza Vaccination Information for Consumers

Antimicrobial Resistance
- New The California Antimicrobial Stewardship Program Initiative
- California Antibiogram Project

Contact
- HAI Program

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Healthcare-associated Infections HAI Elimination