Internal NHSN Data Validation

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HAI Validation Lead

2017 Annual NHSN Training

March 22nd, 2017
Session Objectives

- Describe attributes of
  - High quality HAI surveillance
  - Data quality measures
  - Why does it matter

- Consider
  - How internal data validation can help achieve high data quality

- Recommend
  - How facilities can validate their own data
Healthcare Associated Infections (HAI) Surveillance

- Ongoing
- Systematic collection
- Analysis
- Interpretation
- Dissemination

HAI data that is essential to planning and implementing prevention measures
Quality HAI Surveillance System Requires

- Simplicity
- Objectivity
- Flexibility
- **Data quality**
- Acceptability
- Sensitivity
- Positive predictive value
- Representativeness
- Timeliness
- Stability
Data Quality of HAI Surveillance Reflects

- Consistency of data
  - Completeness, timeliness, confidence on your data
- Validity
  - Accuracy of data

These surveillance attributes can be achieved by HAI Data Validation
Why Validate?

- These are YOUR facility data
  - Helps assess whether prevention efforts are effective

- Ability to hold up during external scrutiny (external validation by SHD or CMS)
  - Incomplete or inaccurate surveillance affects payment and/or facility reputation

- You may be surprised at what you find!
Types of HAI Data Validation

**Internal Validation**
- Active efforts by a reporting facility to assure *completeness* and *consistency* of NHSN data
- Built in as a routine facility process

**External Validation**
- Survey and audit process by external agency to *assure accuracy* of NHSN surveillance and reporting
- Requires additional resources
HAI Data Validation

Internal Validation
- Consistency
- Data Completeness
- Timeliness

External Validation
- Data Accuracy

Improves
HAI Internal Validation Would Provide

- Understanding of systematic weaknesses (and how to correct them)

- Assurance that surveillance data are of high quality
  - Complete, consistent and timely

- Coordination and partnership building with stakeholders

- Confidence in their own data
HAI Internal Validation Toolkit

https://www.cdc.gov/nhsn/validation/

NHSN Validation Guidance and Resources for 2016

- For Reporting Facilities: 2016 Internal Validation Guidance and Toolkit
  - 2016 Internal Validation Guidance and Toolkit [PDF - 1 MB]

- For Auditors: 2016 External Validation Guidance and Toolkit

- 2016 Resources
HAI Internal Validation Toolkit

- Step by step guidance for planning internal validation

- Data quality tools
  - CLABSI/CAUTI Denominator Survey (with key)
  - Surgical procedures and SSI Surveillance Methods Survey (with key)
  - LabID Event Surveillance Methods Survey (with key)
Appendix 1.3: CLABSI and CAUTI Denominator Counting Survey (with Key)

Instructions: Administer in person or by telephone, directly to individual's responsible for denominator counting. This form is color-coded so that it can be divided into a CLABSI denominator collection form (pink and orange) and a CAUTI denominator collection form (yellow and orange) in facilities where these tasks are performed by different persons. Orange indicates questions applicable to both CLABSI and CAUTI denominator collection.

**Facility OrgID:**
- Name/ID of individual interviewed:
- Interviewer initials:
- Date of survey:

**CLABSI/CAUTI/BOTH**
- NHSN location(s) covered:

**PATIENT DAYS (for both CLABSI and CAUTI denominator counters) Answer Key:**

1. How are patient days usually collected? (Choose one)
   - Electronically (document the software system utilized and link to CQS)
   - Manually (daily/weekly)
   - Some units electronic and some units manual

2. Is there a specified time when the denominator count is taken?  
   - Yes  
   - No
   The answer should be Yes

3. When is it done?
   Counts should be done at a specific time daily, preferably at nearly the same time throughout the facility to avoid errors when patients transfer

4. Describe the method used to count patient days:
   - (from NHSN) "To calculate patient days, for each day of the month at the same time each day, record the number of patients. At the end of the month, sum the daily counts and enter the total into NHSN."

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Appendix 1.5: LabID Event Surveillance Methods Survey (with Key)

**LabID Event Surveillance Methods Survey**
Instructions: Administer this survey to the person who oversees NHSN LabID Event reporting

**Denominator Data Collection Questions**

| Name of individual interviewed | Position | 1. For FacWide/MRSA bacteremia | 2. For FacWide/MRSA CDI | interviewer initials | Date of survey:
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<td>Position</td>
<td>FacWide/MRSA bacteremia/CDI</td>
<td></td>
<td>True/False</td>
<td>T</td>
</tr>
</tbody>
</table>

| 1) For FacWide/MRSA bacteremia data are entered into NHSN once a month at the facility-wide level | True/False | T |
| 2) For CDI reporting, the denominator should include all completed CDI toxic tests | True/False | F (denominator = admissions and patient days) |
| 3) Patient days include only admitted patients on inpatient wards; observation patients located on inpatient wards are excluded | True/False | F (all patients housed in inpatient locations) |
| 4) For CDI reporting pediatric locations should be excluded from FacWide/MRSA reporting | True/False | F (NICU and well-baby locations and babies on IVP are excluded for CDI) |
| 5) For MRSA bacteremia reporting baby locations (NICU, newborn nursery, etc.) should be excluded from the denominator | True/False | F (no location exclusions for MRSA) |

**Numerator Data Collection questions**

| Name of individual interviewed | Position | 1. For FaceWide/MRSA bacteremia | 2. For FaceWide/MRSA CDI | interviewer initials | Date of survey:
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>Position</td>
<td>FacWide/MRSA bacteremia/CDI</td>
<td></td>
<td>True/False</td>
<td>T</td>
</tr>
</tbody>
</table>

| 6) For FaceWide/MRSA reporting, one monthly numerator for Events is reported at the facility-wide level | True/False | T |
| 7) For CDI reporting, the numerator should include toxic-positive CDI tests conducted on formalin-fixed tissues | True/False | F (Laboratories should only process and report results for anonymized studies) |
| 8) A second event is always reported if >14 days have passed from the most recent positive MRSA bacteremia or toxic-positive CDI test result | True/False | T |
| 9) A second event is only reported if >14 days have passed from the most recently reported LabID event | True/False | T |

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Suggestions for Planning Internal Validation

- **Annually**
  - Draft facility level surveillance and validation plan
  - Recruit partners and update staff training needs
  - Review facility descriptors, location mapping

- **Monthly**
  - Monthly HAI reporting plan is complete
  - Run analysis checks for missing, duplicate or inconsistent data

- **Routine**
  - Spot checks (denominator tracking, surgical procedures)
  - Active case finding
One-time Check: Electronic Denominator Data

- Electronic denominators estimates are commonly inflated
- Before you transition
  - Validate e-denominators with manual counts for 3 consecutive months
    - Counts should match within +/- 5% of manual counts
    - Work with IT to correct electronic counting problems, otherwise manual counts should be continued
    - Re-validate for 3 consecutive months
- Current users
  - Conduct spot checks of electronic data to assure continued good performance
Annual Checks
Recommended Annual Check: NHSN Manual

- Are staff up to date with NHSN protocol?
  - Review NHSN newsletter
  - Webinars
  - NHSN case-study series
Recommended Annual Check:

- Medical school affiliation
- Number of beds
- Location mapping
Adequacy of facility infrastructure

- Manual (daily/weekly sampled) or electronic denominator reporting is justified
- EMR systems, access to IT and other support services for planned data checks
- Ability to link laboratory and ADT data
Annual Check: CLABSI & CAUTI Manual Denominator Data

- Assure staff know correct NHSN procedures and definitions
- Assess denominator data collection practices
- Internal validation annually for one week for each location type
- Post new personnel orientation, consider having a competency checklist
Annual Check: Manual CLABSI/CAUTI Denominators

- Protocol: manual, daily or weekly sampling
  - Are staff counting correctly?
    - Definition of central line? Which lines are counted?
  - Missing or implausible data
    - # Patient days > # beds
    - # Catheter days > # patient days
  - Keeping logs of % of days in year
    - When catheter/central line days not collected
    - Patient days not collected

Review results with staff!
Annual Check: SSI Denominator Data (Procedures)

- Ensure denominator data are not missed
  - Identify all potential data sources
    - OR records system
    - Hospital discharge ICD-10-PCS codes
  - Data linkage of multiple sources
    - Reduces missing procedure data
    - Procedures reported by error
Examples: Common SSI Denominator Reporting Errors

- Multiple procedures performed via the same incision on the same trip to operating room
  - Facility will need to correctly determine which procedure to attribute the SSI event

- Patient returns to operating room for another procedure <24 hours of the first procedure
  - Ability to correctly apply 24 hour rule from the SSI protocol
Monthly Checks
Recommended Monthly Analysis Checks

- Analysis
  - Generate datasets
  - Output options
  - Advanced
  - Data Quality

Data Quality
- Line Listing - CDI Test Method History
- Line Listing - Duplicate Procedures
- Line Listing - Procedures on Patient DOB
- Line Listing - Procedures with 0 Duration
- Line Listing - Duplicate BSI/PNEU/UTI Events
- Line Listing - Duplicate SSI Events
- Line Listing - SSIs On Procedure Date
- Line Listing - Extremely High Incidence of SSI
- Line Listing - Events Reported with 0 Device Days
NHSN Alerts
SSI Denominator Quality Validation

National Healthcare Safety Network
Line Listing of Extremely High Incidence of SSI
As of: February 10, 2017 at 10:26 AM
Date Range: All HIGHSSINClD
Carefully review this list, which shows months where SSI incidence is extremely high.

<table>
<thead>
<tr>
<th>orgID</th>
<th>summaryYM</th>
<th>procCode</th>
<th>outpatient</th>
<th>ssiPlan</th>
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### NHSN SSI Quality Report at Hospital X

**Possible inpatient/outpatient misclassification**

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<tr>
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<th>eventID</th>
<th>eventDate</th>
<th>procDate</th>
<th>procCode</th>
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**Incomplete procedure**

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<th>procID</th>
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<th>procCode</th>
<th>Reason</th>
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<tr>
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<td>XX/XX/XXXX</td>
<td>HYST</td>
<td>Missing endoscope</td>
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<tr>
<td>Incomplete procedure</td>
<td>999999</td>
<td>XX/XX/XXXX</td>
<td>COLO</td>
<td>Unknown wound class</td>
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**Outlier/Invalid Duration**

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<th>procID</th>
<th>procDate</th>
<th>procCode</th>
<th>Hours</th>
<th>Min</th>
<th>Reason</th>
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<tbody>
<tr>
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<td>999999</td>
<td>XX/XX/XXXX</td>
<td>HYST</td>
<td>8</td>
<td>58</td>
<td>Proc duration - outlier</td>
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Data courtesy: TN Department of Health
## Impacts of SSI Quality Checks on Facility-Level Data

<table>
<thead>
<tr>
<th>Facility</th>
<th>Procedure</th>
<th>Error(s)</th>
<th>Correction(s)</th>
<th>Impact on Facility SSI Data</th>
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<tbody>
<tr>
<td>A</td>
<td>COLO</td>
<td>Unusually high infection incidence Missing 4 months of procedures</td>
<td>Added 127 missing procedures</td>
<td>Reduction of 2012 Complex (A/R) SSI SIR from 1.6 to 0.9</td>
</tr>
<tr>
<td>B</td>
<td>HYST</td>
<td>Unusually high infection incidence Missing 2 months of procedures</td>
<td>Added 88 missing procedures</td>
<td>Reduction of 2012 Complex A/R SSI SIR from 1.1 to 0.9</td>
</tr>
<tr>
<td>C</td>
<td>COLO</td>
<td>3 procedures missing variables required for risk adjustment</td>
<td>Added missing variables to 3 procedures</td>
<td>Number of expected infections based on risk adjustment for the 2012 Complex A/R SSI SIR increased from 0.36 to 0.43</td>
</tr>
</tbody>
</table>

Data courtesy: TN Department of Health
CLABSI/CAUTI Denominator Errors

Denominators for Intensive Care Unit (ICU)/Other locations (not NICU or SCA)

Mandatory fields marked with *

Facility ID: DHQP MEMORIAL HOSPITAL (ID 10018)

Location Code: ICU - ICU

Month: January

Year: 2015

Validation Error

Urinary Catheter Days may not exceed the Total Patient Days

Report No Events

Check Box(es) if Sampling Used

Total Patient Days: 250

Central Line Days: 10

Urinary Catheter Days: 300

Ventilator Days: 21

APRV Days: 5

Episodes of Mechanical Ventilation:

ICU: 2014M07 JOYREHAB WARD Y CAU

ICU: 2014M07 PEDREHAB WARD N CAU

ICU: 2014M08 5G CC Y CAU

ICU: 2014M09 5G CC Y CAU

VAE:
### National Healthcare Safety Network

**Line Listing for CDI Test Method History**

**As of:** February 10, 2017 at 10:22 AM

**Date Range:** All CDITE STMETHHISTORY

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<th>orgID</th>
<th>year</th>
<th>month</th>
<th>source</th>
<th>cdiTestMeth</th>
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<td>MDRO/CDI FacWideN Summary</td>
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</table>
Common CLABSI/CAUTI Numerator Errors

- Facilities more likely to ‘under-report’ than ‘over-report’ events
- Missed positive blood and urine cultures
- Unable to correctly identify “present on admission” status
- Incorrect assignment secondary BSI status
Common SSI Numerator Reporting Errors

- Depth of the SSI often improperly assigned
- Improper use of the infection present at the time of surgery (PATOS) criteria when there is no actual documentation of PATOS
- Failure to report an SSI event when PATOS = Yes
Routine Checks
Routine Case-Ascertainment Checks

- Validation of case-ascertainment should include periodically reviewing list of candidate cases
  - Use Medical Record Abstraction Tools (MRATS) to identify accuracy of case-ascertainment from a list of candidate cases
  - If candidate cases were ‘missed’ investigate why and how to fix it
Medical Records Abstraction Tools

2016 CAUTI Medical Record Abstraction Tool

1. IDENTIFIERS AND ABSTRACTED DATA - Fill in demographic (white) section and then complete the Section 2, screening questions. Fill in Tables 2A, 2B, 2C, and 3 to document information as needed to answer questions.

State
Facility (NHOI) org ID: code: ACH / LTACH / Connects / Int / Other

Date of Audit: ___/___/___

HICNO: Patient ID
Patient DOB
Reviewer Initials

Review Start Time: End Time:

FACILITY Admission Date ___/___/___
FACILITY Discharge Date ___/___/___

2. SCREENING QUESTIONS (may be answered in any order)

S1. Were any positive urine cultures collected on or after facility day 3 (day of physical admission to an inpatient location is Facility Day 1)?

Select one:
- Yes → Proceed
- No → STOP [a] Not a candidate VL CAUTI

Note: The complete list of UTI pathogens and common comments are provided in the supporting documents section of the NHOI website (http://www.cdc.gov/nhos/acute-care-hospitals/cauti/index.html)

S2. Were any positive urine cultures* taken during ANY validation location (VL) stay, the day of, or day after VL discharge?

Select one:
- Yes → Proceed
- No → STOP [a] Not a candidate VL CAUTI

S3. Was a Foley catheter in place for >2 calendar days AND in place during a VL stay for any period of time?

Select one:
- Yes → Proceed
- No → STOP [a] Not a candidate VL CAUTI

If yes to all 3 screening questions: there is a candidate VL CAUTI.

- Enter all qualifying positive urine cultures collected in any location in Table 1 (the Positive Urine Cultures), and indicate these collected in a validation location (VL).
- Document presence of Foley catheter (Table 2B on page 2), and UTI surveillance practice, (positive blood cultures Table 2B/Symptoms Table) as needed to evaluate each infection episode sequentially for a UTI. You will use these data to determine if the UTI was HAI, whether HAI-UTI was a CAUTI, and whether the CAUTI was attributable to a validation location. NHOI UTI Definitions are found below in Part 3.

Laboratory Cultures

2016 HYST Procedure/SSI Medical Record Abstraction Tool

For use in acute care hospital SSI validation following inpatient HYST procedures performed during Q1-Q4, 2016

1. Patient and Medical Record IDENTIFIERS

State
Facility org ID
Date of Audit
Reviewer initials

HICNO: Patient ID
Patient DOB
Gender: F M

Facility Admission Date 1 (for index HYST procedure):
Facility Discharge Date 1:

Review Start Time: End Time:

HYST Procedure Date: ___/___/2016

HISTIC (TOOL O/N FOR HYSTIC PERFORMED 1995)

HYST Procedure:

Describe in words all procedure(s) during index HYST surgery (e.g., hysterectomy, bilateral salpingo-oophorectomy (BSO), cesarean section, appendectomy)

Link to SSI section for ICD-10-PCS and CPT codes can be found in the "Supporting materials" section of the link below:

Record end admission dates below only if they occur within 30 days of HYST Procedure Procedure date - day 1 of 30.

Facility Admission Date 2:
Facility Discharge Date 2:

Facility Admission Date 3:
Facility Discharge Date 3:

2. NHOI Operative Procedure Criteria

- Did HYST operative procedure meet NHOI definition for infection procedure? (NHOI Manual 9:2 and 9:3)

- HYST procedure performed on NHOI inpatient in hospital infection O.R. equivalent where LL incision was made through skin/ subcutaneous membrane (including laparoscopic approach), or during intervention was an intervention that was not open during a prior procedure.

Note: incision closure is not longer than an element of the NHOI Operative Procedure definition, but addressed under risk-adjustment.

- No: If No, STOP [record] [a] Not a candidate HSI SSI; did not meet NHOI Operative Procedure definition.

- Yes: If Yes, proceed to 3.

*Note to evaluator:
- Do not report procedure if AGA score=6
- "NHOI Inpatient Operative Procedure" procedure performed on a patient whose date of admission to the healthcare facility and the date of discharge are different calendar days and the procedure took place in an inpatient O.R. equivalent. "O.R. equivalent" may include C-section room, interventional radiology room, or cardiac catheterization lab meeting PSI or AIA criteria; see Manual 0:3 for details.

Regardless of wound class at the time of procedure or closure method (primary vs. non-primary) all inpatient NHOI COLD procedures should be reported to the NHOI denominator, and all infections meeting HYST SSI criteria during the surveillance window should be reported.
Suggested Routine Checks

- Review of positive blood and urine cultures
- Spot checks of denominator reporting
Run Longitudinal Data Checks

- Review longitudinal trends and assess errors
  - Numerators by location and overall
  - Denominators by location and overall
  - Rates by location and overall
## How to Achieve Numerator Data Completeness

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<thead>
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<th>Minimum Requirement</th>
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<tbody>
<tr>
<td><strong>CLABSI</strong></td>
</tr>
<tr>
<td>• Review every positive blood culture</td>
</tr>
<tr>
<td><strong>CAUTI</strong></td>
</tr>
<tr>
<td>• Review every positive urine culture</td>
</tr>
<tr>
<td><strong>SSI</strong></td>
</tr>
<tr>
<td>• Identify and review all post-op patients and hospital readmissions related to infections</td>
</tr>
<tr>
<td>• Review wound cultures but realize culture-based surveillance missed 50-60% SSI</td>
</tr>
<tr>
<td>• Daily hospital rounds to identify infections not resulting in cultures</td>
</tr>
<tr>
<td>• Post discharge surveillance</td>
</tr>
<tr>
<td><strong>LabID event FacWideIN</strong></td>
</tr>
<tr>
<td>• Review all final lab test results (MRSA cultures, C. diff tests)</td>
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<tr>
<td>• Assess lab tests from ER and observation locations</td>
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### How to Achieve Denominator Data Completeness

<table>
<thead>
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<th>Minimum Requirement</th>
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<tbody>
<tr>
<td><strong>CLABSI/CAUTI</strong></td>
</tr>
<tr>
<td>• Review presence of central line/ indwelling Foley catheter and complete collection of device days</td>
</tr>
<tr>
<td><strong>SSI</strong></td>
</tr>
<tr>
<td>• Review complete count of procedures based on ICD-10-PCS/CPT codes</td>
</tr>
<tr>
<td><strong>LabID event FacWideIN</strong></td>
</tr>
<tr>
<td>• Review total patient admissions/encounters for every location (including ER and observation locations)</td>
</tr>
</tbody>
</table>
Coordination of Support for IPs

- IP cannot do complete surveillance and validation alone
- Responsibilities of surveillance and data validation need to be a shared across hospital units, services and disciplines
- IP needs protected times for HAI prevention activities
# Who Can Support IP

<table>
<thead>
<tr>
<th>Partner</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI/CAUTI</td>
<td>• Trained CLABSI/CAUTI monitors</td>
</tr>
<tr>
<td></td>
<td>• IT to review electronic data downloads</td>
</tr>
<tr>
<td>SSI</td>
<td>• Surgery/ clinical staff</td>
</tr>
<tr>
<td></td>
<td>• Surgical ward staff</td>
</tr>
<tr>
<td></td>
<td>• Medical records</td>
</tr>
<tr>
<td>LabID event FacWideIN</td>
<td>• Trained LabID event monitors</td>
</tr>
<tr>
<td></td>
<td>• IT for data linkage between laboratory and ADT records</td>
</tr>
</tbody>
</table>
Validation Can Help Each Of These

- **Data completeness**
  - By double checking ALL candidate events until ruled out

- **Coordination**
  - Focusing facility systems to build tools to support surveillance and validation

- **Confidence**
  - Built via team training
Confidence In Your Data

- Facilities held accountable for using NHSN methods and definitions
- Teams must be up to date with NHSN surveillance definitions
- Be able to apply definitions with confidence every time
- Seek assistance for ambiguity
Partnership with State Health Department

- State HAI Coordinator can help conduct routine internal validation
  - Consider allowing state health department access to your facility data
  - HAI coordinator runs routine data quality checks for missing and implausible data
  - State Health Department collaborates with facilities in improving data quality
State Has Access To Facility Data

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>CAUTI</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>SSI-COLO</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>SSI-HYST</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>CDI</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>MRSA</td>
<td>76</td>
<td>24</td>
</tr>
</tbody>
</table>
States That Have Conducted Data Quality Checks: 6 Months of 2015 NHSN Data

- CLABSI: 72% Yes, 28% No
- CAUTI: 56% Yes, 44% No
- SSI-COLO: 63% Yes, 37% No
- SSI-HYST: 65% Yes, 35% No
- CDI: 63% Yes, 37% No
- MRSA: 57% Yes, 43% No
State Contact Facilities For Reporting Errors?

- Yes: 82%
- No: 18%
Triggers for Data Quality Checks Outside The Annual Plan

- New or modified patient care locations
  - are they accurately mapped?

- New or modified electronic medical record systems

- Unusual high incidence of events
  - Was denominator reporting complete?
  - Were all risk adjustment variable entered correctly?
  - Was there a change in testing method (e.g., CDI testing method)?
Summary

- Credible data is vital to HAI prevention
- In the era of “publicly looking good”, ongoing validation is the key towards improvement in prevention practices
- Regular internal validation will improve results in external validation
Thank You!

Questions
nhsn@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.