Surgical Site Infection Surveillance

Last updated 2019
Objectives

• Discuss importance of accurate data collection in calculating surgical patient probability of SSI
• Discuss use of ICD-10 diagnostic “flag” codes to improve SSI case finding
• Review SSI surveillance definitions and methods
• Demonstrate how to report SSI data in NHSN
• Discuss NHSN data analysis and feedback to staff
SSI Surveillance Requirements

• Capture sufficient risk factor data for each **procedure**
• Consistently use standard surveillance methods **and** definitions to **identify SSI**
  • For CA hospitals, CDPH developed a standardized SSI surveillance approach using diagnosis codes to flag potential SSI
• Use **risk adjusted** methods that calculate an SSI probability for each surgical event
Surgical Procedure Definition

NHSN operative procedures

- Inpatient = admission and discharge dates on different days
- Take place in an operating room
- Involve at least one incision (including laparoscopic) made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure
- Full definition in the *NHSN Operative Procedure Category Mappings to ICD-10-CM Codes and CPT Codes*

[https://www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf](https://www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

NHSN Patient Safety Manual: Chapter 9
Reporting Procedure Denominator Data

• When multiple procedures codes are performed during the same surgery, each procedure code must be reported separately in the denominator data

Example: if surgery was performed on the colon and the small bowel during the same operation, both COLO and SB procedures should be reported
Procedure Risk Factor Data

Collect these risk factor data for each surgical procedure:

- Gender
- Age
- Height
- Weight
- ASA score - as proxy for underlying illness
- Yes/No: Emergency, Trauma, Anesthesia type
- Scope (*decreases risk*)
- Duration
- Diabetes status
- Incisional closure type
  - clean, clean-contaminated, contaminated, or dirty
- Surgical wound class

Additional risk factors are based on information in the hospital’s NHSN Annual survey (e.g., hospital bed size, medical school affiliation, etc.)
Clean Surgical Wound Class

- Operation where **no inflammation** encountered
- Respiratory, alimentary, genital, urinary tracts are **not** entered
  - Among CA reportable procedure types, clean wound class **cannot** be assigned for APPY, BILI, CHOL, COLO, REC, SB and VHYS
- Operation following **non-penetrating** (blunt) trauma
- Primarily closed with **no open drainage**

Wound class designation must be assigned by a person involved in the surgical procedure at the end of the surgery
Clean-Contaminated Surgical Wound Class

- 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*

Wound class designation must be assigned by a person involved in the surgical procedure at the end of the surgery.
Contaminated Surgical Wound Class

- 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 is encountered

Wound class designation must be assigned by a person involved in the surgical procedure at the end of the surgery
Dirty Surgical Wound Class

- Operation involving old traumatic wounds with retained devitalized tissue, or existing clinical infection, or perforated viscera
- Definition suggest the organisms causing post-op infection were present before the operation

Wound class designation must be assigned by a person involved in the surgical procedure at the end of the surgery

NSHN Patient Safety Manual, Chapter 9
Duration of Operative Procedure

- Interval between the surgery start time (incision) and the surgical procedure finish time
  - NHSN definition from the Association of Anesthesia Clinical Directors
  - Reported as hours and minutes

- Procedure finish time:
  - All instrument and sponge counts are completed and verified correct AND
  - All in OR post-op radiographic studies are complete, AND
  - All dressings/drains are secured, AND
  - Physicians/surgeons have completed all procedure-related activities on the patient
Surgical Closure

• SSI surveillance required for **BOTH** primary and non-primary surgical closure

• Closure definitions adapted from American College of Surgeons and NSQIP
  
  • **Primary Closure** – closure of the skin level during original surgery, regardless of the presence of wires, wicks, drains, devices or objects extruding through the incision
    
    • If any portion of the incision is closed at the skin level, in any manner, **primary closure** should be assigned
  
  • **Non-primary Closure** – closure other than primary
SSI Surveillance Period

- Post-operative monitoring period for most NHSN procedures is 30 days
  - Regardless of presence of an implant
- 8 California-required procedure types have 90-day NHSN monitoring period
  - Cardiac (CARD) and Pacemaker (PACE)
  - Coronary artery bypass graft (CBCB and CBGC)
  - Spinal fusion (FUSN)
  - Open reduction of fracture (FX)
  - Hip and knee prosthesis (HPRO and KPRO)
- Surveillance period for superficial SSI is 30 days for all NHSN procedures
Identifying SSI Using Diagnosis Codes

• CDPH-recommended SSI surveillance method

• **Identify specific** ICD-10 diagnosis codes to identify possible SSI

• During 2013 CDPH validation project, 50% unreported (missed) SSI were identified using this method

• Majority of missed SSI occurred prior to hospital discharge
Identifying SSI

Use CDPH diagnosis flag code method for all SSI surveillance

Other methods may include

• Evaluate microbiology findings
  • But don’t rely on wound cultures alone; will miss >50% SSI
• Monitor surgical patients for readmission
• Involve perioperative and surgical unit staff
• Evaluate surgical patients during hospital stay
• Conduct unit rounds
• Review antimicrobial starts
• Monitor for returns to the OR during SSI surveillance
• Perform post-discharge surveillance
ICD-10 Diagnosis Code SSI Surveillance

• Find ICD-10 diagnosis codes in the post-op period to “flag” patients with possible SSI

• To apply
  1. Create a report of all procedures performed in a specific time period (1 or 2-week period)
  2. Query the billing department for patients on procedure list that have one or more ICD-10 diagnosis flag codes during the 30-day post-op surveillance period (90 days for 8 procedure types)

• Instructions and recommended codes for each procedure type on the CDPH HAI Program website, [www.cdph.ca.gov/HAI](https://www.cdph.ca.gov/HAI)

https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/UseOfICD-CMDiagnosisCodesToFlagPost-operativePatientsForFurtherEvaluationOfPossibleSSI-.aspx
Use ICD-10 Diagnosis Codes to Identify SSI

Example

- Codes that might indicate SSI following *appendectomy SSI*
  - K63.0  Abscess of intestine
  - K63.2  Fistula of intestine
  - K65.0  Generalized (acute) peritonitis
  - K65.1  Peritoneal abscess
  - K68.19 Other retroperitoneal abscess
  - L03.319 Cellulitis of trunk, unspecified
  - T81.4XXA Infection following a procedure, initial encounter
  - T81.83XA Persistent postprocedural fistula, initial encounter

- Full list of CDPH recommended ICD-10 diagnostic “flag” codes at [cdph.ca.gov/HAI](http://cdph.ca.gov/HAI)
NHSN SSI Surveillance Definition

Categorized based on depth of infection
Superficial Incisional SSI

- Infection occurs within 30 days after surgical procedure
  AND
- Involves only skin and subcutaneous tissue of the incision
  AND
- Meets at least 1 of 4 criteria:
  1. Purulent drainage from the superficial incision
  2. Organism isolated from incision culture or fluid (obtained aseptically)
  3. Diagnosis of superficial SSI by surgeon or attending physician or other designee
  4. Incision opened by surgeon or designee; culture positive or not cultured
     AND
     at least 1 of the following:
     Pain or tenderness
     Localized swelling
     Erythema
     Heat
Superficial Incisional SSI

• Do not report stitch abscess as an SSI (defined as minimal inflammation and discharge confined to points of suture penetration).
• Do not report a localized stab wound infection as an SSI.
• Do not report cellulitis by itself, it is not an SSI.
Deep Incisional SSI

- Infection occurs within 30 days after surgical procedure (unless it's one of the 13 procedures followed for 90 days)
- Involves deep soft tissues of the incision, e.g. fascial & muscle layers
- Meets at least 1 of 3 criteria:
  1. Purulent drainage from deep incision
  2. Abscess or evidence of infection involving deep incision detected on gross anatomical or histopathologic exam or imaging test
  3. Deep incision spontaneously dehisces OR opened by surgeon, attending physician or designee, and culture positive or not cultured*

*Patient has at least 1:
- fever > 38°C
- localized pain, or tenderness

*A culture negative finding does not meet this criteria.
Organ/Space SSI

- Infection occurs within 30 days after surgical procedure (unless its one of the 13 procedures followed for 90 days)
- Involves any part of body deeper than the fascial/muscle layers, opened or manipulated during the surgical procedure
- Meets at least 1 of 3 criteria:
  - 1. Purulent drainage from drain placed into organ/space
  - 2. Organism isolated from an aseptically-obtained culture of fluid or tissue in the organ/space
  - 3. Abscess or evidence of infection involving the organ/space that is detected on gross anatomical or by histopathologic or imaging test
- Meets surveillance definition for a specific NHSN infection site
# HEALTHCARE-ASSOCIATED INFECTIONS PROGRAM

## Organ/Space SSI Sites

<table>
<thead>
<tr>
<th>Code</th>
<th>Site</th>
<th>Code</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>BONE</td>
<td>Osteomyelitis</td>
<td>LUNG</td>
<td>Other infections of the respiratory tract</td>
</tr>
<tr>
<td>BRST</td>
<td>Breast abscess or mastitis</td>
<td>MED</td>
<td>Mediastinitis</td>
</tr>
<tr>
<td>CARD</td>
<td>Myocarditis or pericarditis</td>
<td>MEN</td>
<td>Meningitis or ventriculitis</td>
</tr>
<tr>
<td>DISC</td>
<td>Disc space</td>
<td>ORAL</td>
<td>Oral cavity (mouth, tongue, or gums)</td>
</tr>
<tr>
<td>EAR</td>
<td>Ear, mastoid</td>
<td>OREP</td>
<td>Other infections of the male or female reproductive tract</td>
</tr>
<tr>
<td>EMET</td>
<td>Endometritis</td>
<td>PJI</td>
<td>Periprosthetic Joint Infection</td>
</tr>
<tr>
<td>ENDO</td>
<td>Endocarditis</td>
<td>SA</td>
<td>Spinal abscess without meningitis</td>
</tr>
<tr>
<td>EYE</td>
<td>Eye, or other conjunctivitis</td>
<td>SINU</td>
<td>Sinusitis</td>
</tr>
<tr>
<td>GIT</td>
<td>GI Tract</td>
<td>UR</td>
<td>Upper respiratory tract</td>
</tr>
<tr>
<td>HEP</td>
<td>Hepatitis</td>
<td>USI</td>
<td>Urinary System Infection</td>
</tr>
<tr>
<td>IAB</td>
<td>Intraabdominal, not specified</td>
<td>VASC</td>
<td>Arterial or venous infection</td>
</tr>
<tr>
<td>IC</td>
<td>Intracranial, brain abscess or dura</td>
<td>VCUF</td>
<td>Vaginal cuff</td>
</tr>
<tr>
<td>JNT</td>
<td>Joint or bursa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Find specific criteria at:

Infection Present at Time of Surgery (PATOS)

- Required field when reporting an SSI event
- Evidence of an infection present at the time of an index surgery
  - Important to assign correct wound class at the end of the index surgery (such as dirty, indicating infection)
- Patient does not have to meet NHSN infection definition at time of primary procedure, but there must be notation of evidence of infection or abscess present at the time of surgery
- Select PATOS=‘YES’ if infection related to SSI type
  - Example: Patient with intra-abdominal infection develops an organ space SSI, PATOS=‘YES.” If patient developed a superficial or deep incisional SSI, PATOS=‘NO’
- SSI reported with PATOS=YES excluded from SSI SIR calculations
SSI Following Multiple Procedures

- If more than one operative procedure is done through a single incision and an SSI occurs
  - First, attempt to determine the procedure associated with the infection
  - If it is not clear, use the NHSN principal operative procedure selection list to determine the priority procedure for which to attribute the SSI
- Example: For abdominal surgeries
  - COLO is higher priority (higher infection risk) than SB
  - SB is higher than REC
  - REC is higher than GAST

NHSN Patient Safety Module: Chapter 9, SSI Table 4
SSI Event Details

- **A** – SSI was identified during hospital admission, prior to discharge after the operation
- **P** – SSI was identified only by post discharge surveillance, including ED visit without readmission. If readmitted, use RF or RO
- **RF** – SSI was identified due to patient readmission to the same facility where the operation was performed
- **RO** – SSI was identified due to patient admission to a facility other than where the operation was performed
Reporting an SSI Event to NHSN

- Ensure all NHSN definitions are met
- Access NHSN portal
- Click Event/Add
- Add patient information
- Be sure to “link” event to procedure
- Follow prompts to report SSI
Reporting Procedures to NHSN

- Refer to NHSN for electronic upload of all procedures
- Access NHSN portal to manually enter or update procedure data
### NHSN Uses Procedure Data for SSI Risk Adjustment

**Table 3c. Predictive Risk Factors from the All SSI Logistic Regression Model, Adults ≥ 18 years of age**

<table>
<thead>
<tr>
<th>NHSN Operative Procedure</th>
<th>Risk Factor(s)-All SSI Model, Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>procedure duration</td>
</tr>
<tr>
<td>AMP</td>
<td>anesthesia, wound class, hospital bed size*, age, procedure duration</td>
</tr>
<tr>
<td>APPY</td>
<td>gender, wound class, hospital bed size*, closure, procedure duration, BMI</td>
</tr>
<tr>
<td>AVSD</td>
<td>procedure duration</td>
</tr>
<tr>
<td>BILI</td>
<td>gender, emergency, trauma, wound class, hospital bed size*, scope, age, procedure duration</td>
</tr>
<tr>
<td>BRST</td>
<td>ASA score, age, procedure duration, BMI</td>
</tr>
<tr>
<td>CARD</td>
<td>emergency, medical school affiliation*, age, procedure duration, BMI</td>
</tr>
<tr>
<td>CABG</td>
<td>gender, diabetes, trauma, medical school affiliation*, hospital bed size*, age, procedure duration, BMI, age-gender interaction</td>
</tr>
</tbody>
</table>

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The NHSN Standard Infection Ratio: A Guide to SIR
SSI Risk Adjustment

- Risk models developed for each NHSN operative procedure
  - Includes only those risk factors found to increase SSI risk for that procedure
- Every patient undergoing a procedure in your hospital has a SSI risk probability calculated by NHSN
- Your hospital’s predicted number of SSI is the sum of your surgical patients’ risk probabilities
Calculating SSI Incidence

- NHSN applies the risk factors to calculate a probability of each procedure resulting in SSI.
- The sum of the probabilities from all patients that had the procedure in your hospital is the “predicted” number of SSI.
- To calculate incidence, NHSN compares SSI your hospital identified (observed) to the predicted number of SSI.

\[
SIR = \frac{\text{Observed SSI}}{\text{Predicted SSI}}
\]
NHSN Analysis

• Use SSI data to create charts and graphs to show progress
  • Create in NHSN or Export to Excel for further analysis
• Present results to your surgical team, surgical units, infection control committee, and leadership
• Present surgeon’s individual infection SIR
• Celebrate successes and focus on areas to improve

You must analyze your data to review progress!
To create a report
- Access NHSN portal
- Click Analysis/Reports, (remember to generate a data set first)
- Click PA Module/SSI
- Choose report you want to run
### NHSN SSI SIR Report

#### National Healthcare Safety Network
**SIR for Adult Complex AR SSI Data by Procedure (2015 Baseline) - Overall, by ProcCode**

As of: October 6, 2017 at 4:50 PM  
Date Range: 52 SIR ADULTCMPX53PROC summaryYr 2015 to 2016

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>Summary Yr</th>
<th>Procedure Count</th>
<th>infCountAdultCmpx</th>
<th>numPredAdultCmpx</th>
<th>Complex AR Model SIR</th>
<th>Complex AR Model SIR p-value</th>
<th>Complex AR Model 95% Confidence Interval</th>
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<tbody>
<tr>
<td>AAA</td>
<td>2015</td>
<td>11</td>
<td>0</td>
<td>0.075</td>
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<tr>
<td>AMP</td>
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<td>AMP</td>
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<td>APPY</td>
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<tr>
<td>APPY</td>
<td>2016</td>
<td>162</td>
<td>2</td>
<td>1.088</td>
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<td></td>
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<tr>
<td>COLO</td>
<td>2015</td>
<td>118</td>
<td>8</td>
<td>3.358</td>
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<td>COLO</td>
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<td>CRAN</td>
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<tr>
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<td>2.477</td>
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<td>FUSN</td>
<td>2015</td>
<td>100</td>
<td>2</td>
<td>1.178</td>
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</tbody>
</table>

**SIR for Facility**

- **AAA**: 3.19, p=0.0479, CI:1.013,7.691
- **APPY**: 1.872, p=0.3825, CI:0.314,5.186
- **COLO**: 1.787, p=0.1792, CI:0.724,3.716
- **CRAN**: 1.029, p=0.8931, CI:0.327,2.482

**SIR by Procedure**
SSI Surveillance Summary

• Consistent use of standard surveillance methods and SSI definitions are essential for accurate case finding

• Capturing complete and accurate data for each procedure is necessary to calculate each patient’s probability for SSI

• Use of ICD-10 diagnostic “flag” codes will improve case finding

• Analysis and feedback of SSI data is necessary to review progress in SSI reduction
References and Resources

- Centers for Disease Control and Prevention (CDC) [http://www.cdc.gov/HAI/pdfs/toolkits/SSI_toolkit021710SIBT_revised.pdf](http://www.cdc.gov/HAI/pdfs/toolkits/SSI_toolkit021710SIBT_revised.pdf)
- Institute for Healthcare Improvement (IHI) [http://www.ihi.org/Engage/Memberships/MentorHospitalRegistry/Pages/InfectionPreventionSSI.aspx](http://www.ihi.org/Engage/Memberships/MentorHospitalRegistry/Pages/InfectionPreventionSSI.aspx)
- Surgical Care Improvement Project (SCIP) [https://www.qualitynet.org/dcs/ContentServer?cid=1137346750659&pagename=Medqic/Content/ParentShellTemplate&parentName=TopicCat&c=MQPARENTS](https://www.qualitynet.org/dcs/ContentServer?cid=1137346750659&pagename=Medqic/Content/ParentShellTemplate&parentName=TopicCat&c=MQPARENTS)
- World Health Organization (WHO), [www.who.int/patientsafety/safesurgery/en/](http://www.who.int/patientsafety/safesurgery/en/)
Questions?

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

Or email HAIProgram@cdph.ca.gov