Surgical Site Infection Surveillance
Objectives

• Review SSI surveillance definitions and methods
• 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
• Demonstrate how to report SSI data in NHSN
• Discuss NHSN data analysis and feedback to staff
SSI Surveillance Requirements

• Consistent use of standard surveillance methods and SSI definitions
• Capture of sufficient risk factor data for each procedure performed
• Application of risk adjustment methods that calculate an SSI probability for each surgical patient
Clinical vs Surveillance Definitions

Clinical criteria used by physicians for patient care and management may differ from surveillance criteria

• Clinical
  • Patient centered
  • Used for therapeutic decisions

• Surveillance
  • Population based
  • Applied exactly the same way each time
  • Physician diagnosis of infection is acceptable for some infections
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Identifying SSI

- Engage peri-operative and unit staff to assist in SSI surveillance
- Evaluate clinical and microbiological findings post-op
  - Cannot rely on wound cultures alone to find SSI
- Evaluate surgical patients during hospital stay
  - Rounds on units
  - Pharmacy reports of antimicrobial use
  - Patient temperature charts/logs
  - Operating room schedule of surgeries/re-operations
- Monitor surgical patients for readmission
- Perform post-discharge surveillance
Perform Post-discharge Surveillance

- CDPH strongly recommends using ICD-10 diagnostic “flag” codes to identify possible SSI

- Example:
  1. Create a report of all procedures performed in a specific time period
  2. Query the billing department for those patients on the list AND that had an ICD-10 diagnostic “flag” code during the surveillance period (30-90 days)

- During 2013 CDPH validation project, as many as 50% missed SSI were identified using this “flag” code method
Example of ICD-10 Diagnostic Codes “Flag Codes”

- Examples of post operative flag codes that might indicate an 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

For more ICD-10 diagnostic “flag” codes go to: cdph.ca.gov/hai
**SSI Surveillance Period**

- Post-operative monitoring period determined by NHSN procedure category
- 13 NHSN procedure types require 90-day monitoring period
- All other procedure categories monitored for 30 days regardless of presence of an implant
- For all NHSN procedure categories, superficial SSI are monitored for 30 days only
NHSN SSI Surveillance Definition

Categorized based on depth of infection
Superficial Incisional SSI

- Infection occurs within 30 days after surgical procedure
- Involves only skin and subcutaneous tissue of the incision
- 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

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 its 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 one of the 13 procedures followed for 90 days)
  - AND
- Involves any part of body deeper than the fascial/muscle layers, opened or manipulated during the surgical procedure
  - AND
- 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
  - AND
- Meets surveillance definition for a specific NHSN infection site
### 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:

Surgical Procedure Definition

An NHSN operative procedure meets the following criteria:

• Takes place in an OR (meeting FGI or AIA criteria)

• At least one incision (including laparoscopic and cranial burr hole approach) is made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure

• Included in the *NHSN Operative Procedure Category Mappings to ICD-10-CM Codes and CPT Codes*
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
Procedural Risk Factor Data

Collect these risk factor data for each surgical procedure:

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

Additional risk factors are based on information in the hospital’s NHSN Annual survey (e.g., hospital bed size, medical school affiliation, etc.)
### Procedure-Associated Risk - Examples

**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>

The NHSN Standard Infection Ratio: A Guide to SIR  
Duration of Operative Procedure

• Interval between the surgery start time (incision) and the surgical procedure finish (PF) time
  • Defined by Association of Anesthesia Clinical Directors (AACD)
  • Reported as hours and minutes

• PF 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 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

Clean wound classification is not used in denominator data entry for APPY, BILI, CHOL, COLO, REC, SB, and VHYS

**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
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
- Patient does not have to meet the NHSN definition of SSI 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 it applies to the depth of the SSI that is being attributed to the procedure (e.g., an intra-abdominal case develops an organ space SSI. Superficial or deep SSI would be ‘NO’)
- SSI reported with PATOS=YES will be excluded from the SSI SIR
- Refer to the NHSN SSI Protocol for more examples
**SSI Following Multiple Procedures**

- If >1 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 before the patient was discharged from the facility following the operation.
- **P** – SSI was identified only as part of post discharge surveillance, including ED visit without readmission. If readmitted use RF or RO as appropriate.
- **RF** – SSI was identified due to patient readmission to the facility where the operation was performed.
- **RO** – SSI was identified due to patient admission to a facility other than where the operation was performed.
Adding Procedures to NHSN

- Refer to NHSN for electronic upload of all procedures
- Access NHSN portal to manually enter data
- Click procedure/add
- Enter patient data and SSI data
- Note risk data collected in procedure details
Add 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
NHSN SSI Analysis Reports

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

<table>
<thead>
<tr>
<th>Summary Yr</th>
<th>Procedure Count</th>
<th>inCountAdultCmpx</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>
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<td>3623</td>
<td>42</td>
<td>25.848</td>
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<td>2016</td>
<td>3486</td>
<td>32</td>
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</table>

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

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>Summary Yr</th>
<th>Procedure Count</th>
<th>inCountAdultCmpx</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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<tr>
<td>AAA</td>
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<tr>
<td>AMP</td>
<td>2016</td>
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<td>0</td>
<td>0.453</td>
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<tr>
<td>APPY</td>
<td>2015</td>
<td>177</td>
<td>4</td>
<td>1.255</td>
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<tr>
<td>APPY</td>
<td>2016</td>
<td>162</td>
<td>2</td>
<td>1.068</td>
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<tr>
<td>COLO</td>
<td>2015</td>
<td>118</td>
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<td>3.358</td>
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<td>0.0479, 1.013, 7.691</td>
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<tr>
<td>COLO</td>
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<td>126</td>
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<tr>
<td>CRAN</td>
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<tr>
<td>CRAN</td>
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<td>CSEC</td>
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<tr>
<td>FUSN</td>
<td>2015</td>
<td>100</td>
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<td>1.178</td>
<td>1.698</td>
<td>0.4452, 0.285, 5.809</td>
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</tbody>
</table>
NHSN Analysis

- NHSN applies the numerators (events) and denominators (risk factors) to calculate a standardized infection ratio (SIR) for your hospital based on the 2015 baseline data.
- 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!
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.
HEALTHCARE-ASSOCIATED INFECTIONS PROGRAM

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)

• CDC and HICPAC Recommendations for Prevention of SSI, 2017, [http://jamanetwork.com/journals/jamasurgery/fullarticle](http://jamanetwork.com/journals/jamasurgery/fullarticle)

• 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