# Surgical Site Infection Prevention and Surveillance

**ACH IP Course, 2022**

Infection Prevention Training for ACH
Healthcare-Associated Infections Program
Center for Health Care Quality California
Department of Public Health

# SURGICAL SITE INFECTION PREVENTION

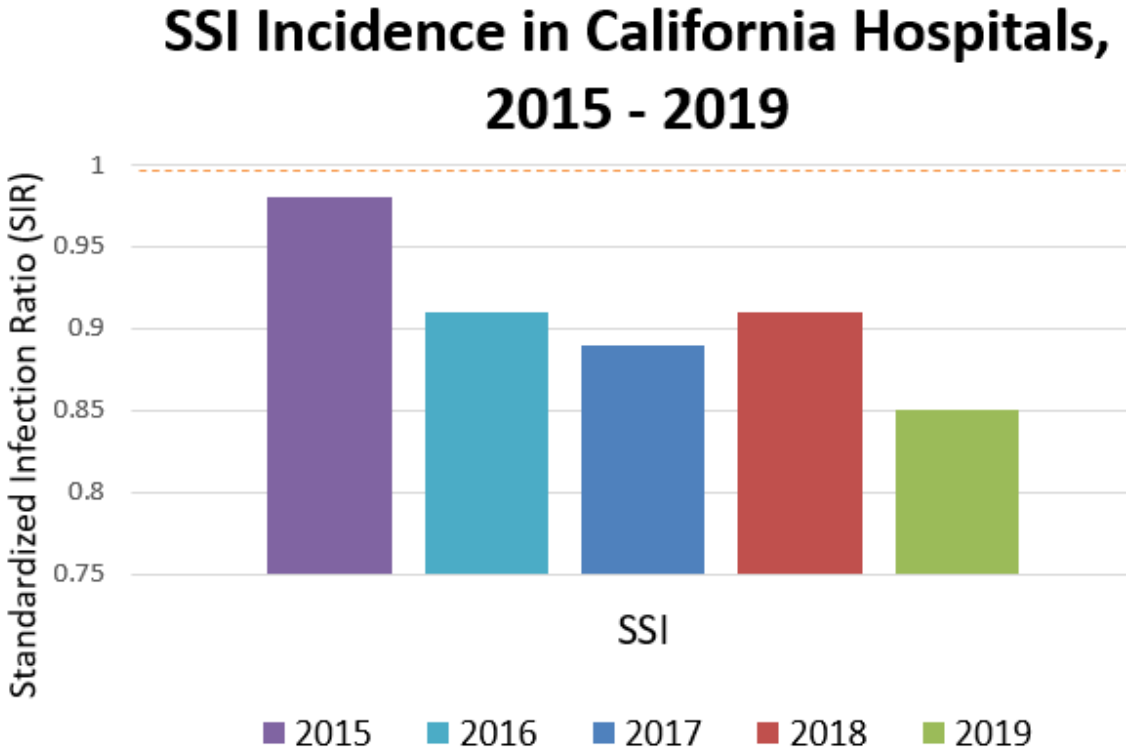
# Objectives

- Review the epidemiology of surgical site infections (SSI)
- Explore causes and mechanisms of SSI
- Describe evidence-based practices for preventing SSI
- Discuss adherence monitoring and feedback

# SSI in California Hospitals

**Reported 3,643 SSI in 2019**

- Adult: 682,211 surgeries with 3,532 SSI
- Pediatric: 23,181 surgeries with 111 SSI




CDPH HAI in California Hospitals Annual Report January to December 2019
(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AnnualHAIReports.aspx)

California Department of PublicHealth

# 2020 SSI Prevention Goal

- Target set by National Action Plan to Prevent HAI
  - Recommended by CDPH HAI Advisory Committee for California hospitals
- 30% SSI reduction from 2015 baseline = **SIR 0.70** in 2020

  On track if
  - **SIR 0.82** in **2018** *(for **each** procedure type)*
  - SIR 0.76 in 2019

# SSI in California Hospitals, COVID-19 Pandemic

- March 2020, California suspended HAI reporting requirements due to the COVID-19 pandemic
  - Affected SSI reporting for last quarter of 2019
    - 38 facilities did not report SSI rates
    - Undercounts of 2019 SSI infection and procedure rates suspected
      - Data analysis did not show substantial bias due to underreporting

CDPH HAI in California Hospitals Annual Report January to December 2019

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AnnualHAIReports.aspx)

# SSI Epidemiology

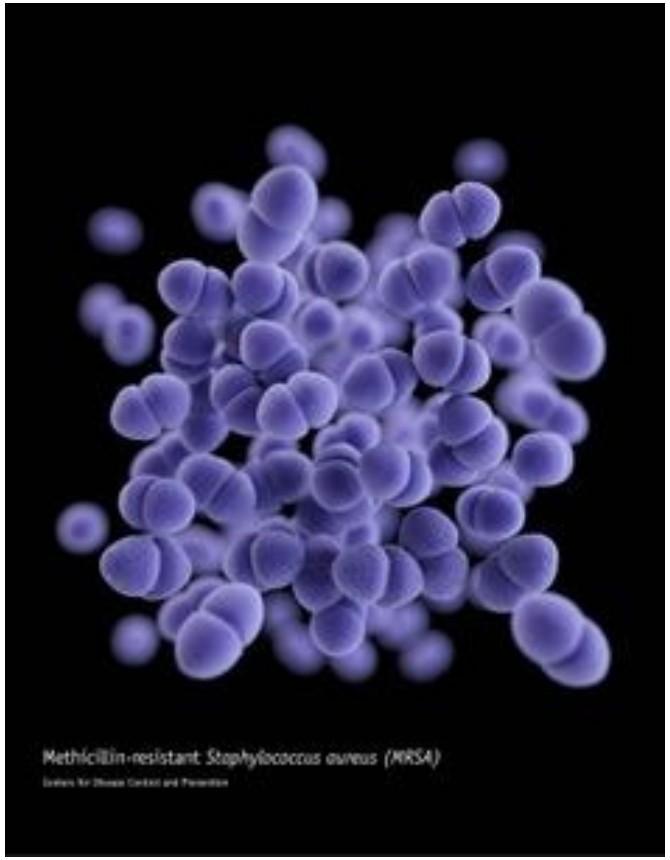
- SSI generally occur within 30 days following surgery
  - 8 California-mandated procedures monitored to 90 days
- 2% of hospitalized surgical patients acquire SSI
  - 3% die (75% attributable to the SSI)
  - Many result in long term disability
- SSI increase hospital length of stay by 7-10 days

# Source of SSI Pathogens

- Patient's flora
  - From skin, GI tract, mucous membranes
  - Due to inadequate skin prep
  - Seeding from pre-existing sites of infection
- Surgical personnel flora
  - Inadequate hand hygiene
  - Breaks in aseptic techniques
- Contaminated equipment *(less common)*
  - Surgical instruments
  - Medical devices in operating room
- Ventilation problems (less common)

# Common SSI Pathogens

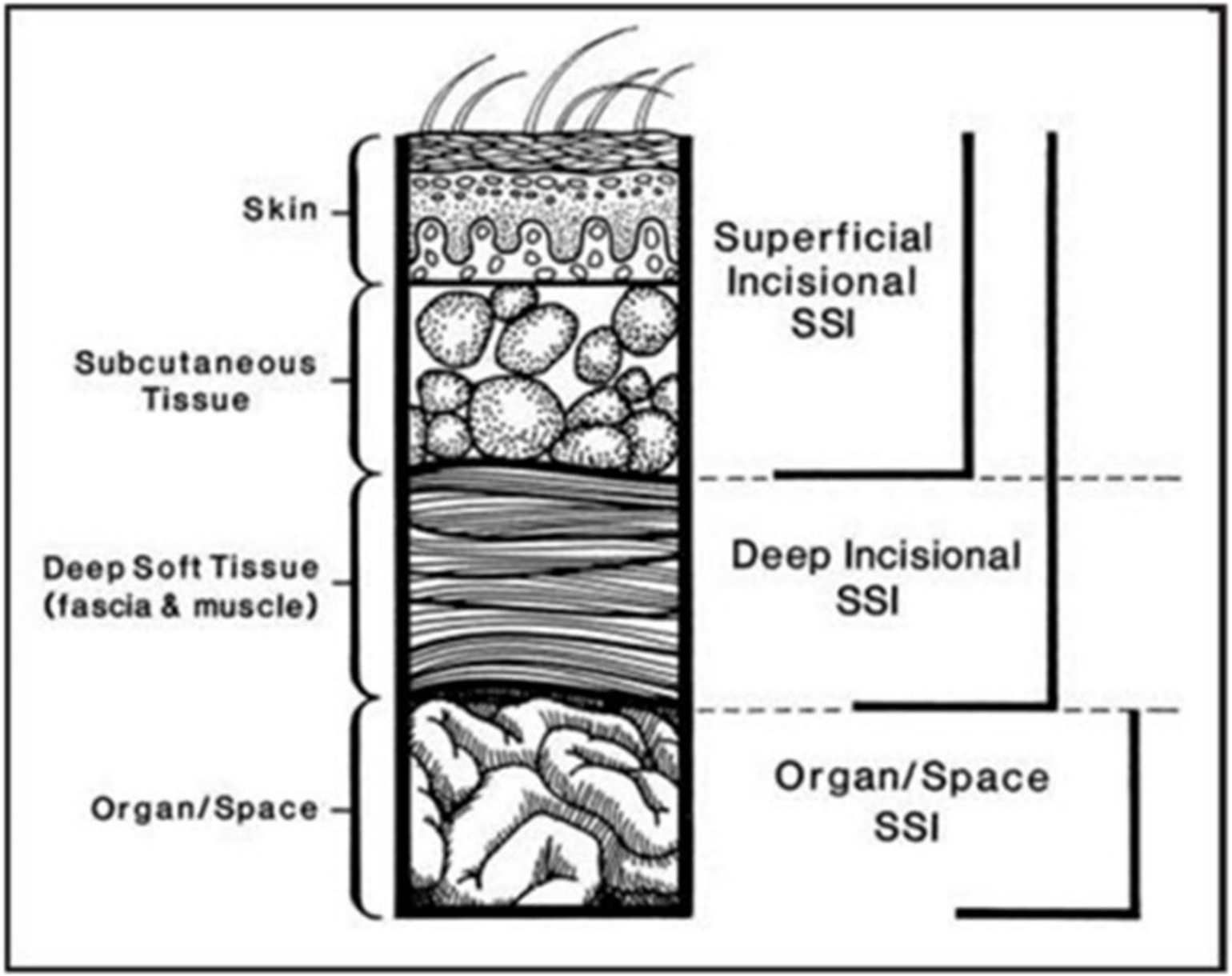
*Staphylococcus aureus* – 21%
*Escherichia coli* – 14%
Coagulase-negative Staphylococci – 8%
*Enterococcus faecalis* – 8%
*Pseudomonas aeruginosa* – 5%
Bacteroides - 5%




Appendix to Table 4 of the 2011-2014 NHSN Antimicrobial Resistance Report
(www.cdc.gov/nhsn/xls/reportdatatables/2014-appendix-pathogens.xlsx)

# SSI Types

- Categorized based on the depth of infection
- NHSN SSI definitions are based on these categories



# SSI Prevention – What works?

**Evidence-based SSI prevention practice** recommendations from

- **CDC/HICPAC** SSI Prevention Guideline**, 2017**
- **CDC SSI** Prevention Guideline**, 1999**

# Antimicrobial Prophylaxis

- Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines
  - Administer such that bactericidal concentration is highest in serum and tissues at time of incision
  - Administer before skin incision in all **Cesarean sections**
  - For all clean and clean/contaminated procedures, **STOP antibiotics** after incision is closed in the OR, even in the presence of a drain
- Topical antimicrobial agents (such as ointments, solutions, or powders) should not be applied to the surgical incision

# Antiseptic Prophylaxis

- Before surgery, patients should shower/bathe (full body)
  - Soap **or** an antiseptic agent
  - At least the night before the operative day
- Skin preparation in the operating room should be performed with an **alcohol-based** antiseptic

# Perioperative Care

- **During surgery**, control **blood glucose** level in **all patients (<200mg/dl**)
- Maintain perioperative **normothermia** in **all patients**
- Administer increased fraction of inspired oxygen (**$FiO_2$**) **during surgery** and **after extubation** in the immediate postoperative period for patients with **normal pulmonary function** undergoing anesthesia with endotracheal intubation

# Prosthetic Joint Arthroplasty

- Transfusion of blood products should not be withheld from surgical patients as a means to prevent SSI
- For prosthetic joint patients receiving systemic corticosteroid or other immunosuppressive therapy
  - in clean and clean-contaminated procedures
  - **do not administer additional antimicrobial** prophylaxis doses after the surgical incision is closed in the operating room
  - even in the presence of a drain

# Preparation of Surgical Patient

- Identify and treat remote infections before elective operation
  - Postpone elective operation until infection resolved
- **Do not remove hair** unless will interfere with the operation
  - If necessary, remove hair immediately before the operation with **clippers** immediately prior to procedure
- Encourage tobacco cessation for minimum of 30 days prior to surgery
- Ensure skin around incision site is free of gross contamination prior to antiseptic skin preparation

# Hand and Forearm Antisepsis for Surgical Team

- Perform preoperative hand and forearm antisepsis according to manufacturer's recommendations for the product being used
- Refer to additional recommendations in CDC Guidelines for Hand Hygiene in Healthcare Setting, 2002 *(summarized on next slide)*

# Surgical Hand Antisepsis

- Remove rings, watches, and bracelets before beginning the surgical hand scrub
- Remove debris from underneath fingernails using a nail cleaner under running water
- Perform surgical hand antisepsis using either an antimicrobial soap or an alcohol-based hand rub with persistent activity before donning sterile gloves
- When using an alcohol-based surgical hand-scrub product with persistent activity, allow hands and forearms to dry thoroughly before donning sterile gloves

# Operating Room Ventilation

- Maintain positive pressure ventilation in the operating room and adjoining spaces
- Maintain ventilation in accordance with recommendations from the Facilities Guidelines Institute's Guidelines for Design and Construction of Hospitals and Outpatient Facilities (current version, 2014), including
  - Number of air exchanges
  - Airflow patterns
  - Temperature
  - Humidity
  - Location of vents
  - Use of filters

# Cleaning and Disinfection of Environmental Surfaces

- Do not perform special cleaning or closing of OR after contaminated or dirty operations

# Reprocessing Surgical Instruments

- Sterilize all surgical instruments according to published guidelines and manufacturer's recommendations
- Immediate-use steam sterilization should never be used for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time.
  - This practice should be **reserved only for** patient care **items that will be used immediately** in emergency situations when no other options are available.
- Refer to CDC HICPAC 2008 Guideline for Disinfection and Sterilization in Healthcare Facilities for additional recommendations.

# Surgical Attire and Drapes

- Wear a **surgical mask** that fully covers the mouth and nose
  - When entering the operating room if an operation is about to begin or already under way
  - If sterile instruments are exposed
  - Wear the mask throughout the operation
- Wear a new disposable or hospital-laundered **head covering** for **each case**
  - Whenever entering the operating room
  - Ensure it fully covers all hair on the head and all facial hair not covered by the surgical mask
- Wear **sterile gloves** if serving as a member of the scrubbed surgical team
  - Put on sterile gloves after donning a sterile gown

# Surgical Attire and Drapes - continued

- Use surgical gowns and drapes that are effective barriers when wet
  - Materials that resist liquid penetration
- Change scrub suits that are visibly soiled, contaminated, and/or penetrated by blood or other potentially infectious materials

# Post-Op Incision Care

- Protect primarily closed incisions with a sterile dressing for 24-48 hours postoperatively

# Sterile and Surgical Technique

- Adhere to principles of sterile technique when performing all invasive procedures
- If drainage is necessary, use a closed suction drain
  - Place drain in a separate incision distant from the operative incision
  - Remove drain as soon as possible

# Hospital Role in SSI Prevention

- Ensure policies and practice reflect current evidence based practices
  - CDC guidelines
- Ensure staff competency upon hire and at least annually
  - Return demonstration to ensure competency
  - New hire orientation
  - Annual skills fair
- Perform SSI surveillance
- Develop an adherence monitoring program for SSI prevention practices
- Provide feedback to frontline staff and leaders
  - Present adherence results with SSI incidence to surgeons, perioperative services, and surgical units

# Are SSI Prevention Care Practices Used Routinely in YOUR facility?

## You won't know if you don't monitor!

# Adherence Monitoring for SSI Prevention

- OR observations
- Hand hygiene
- Safe injection practices
- Environmental cleaning and disinfection
- Device reprocessing
- High level disinfection of reusable devices
- Sterilization of reusable devices

CDPH Adherence Monitoring Tools
(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/MonitoringAdherenceToHCPracticesThatPreventInfection.aspx)

# Monitoring in the Operating Room

Healthcare-Associated Infections Program Adherence Monitoring
**Operating Room Observations**

**Regular monitoring with feedback of results to staff can maintain or improve adherence to SSI preve tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type**

**Instructions:** Observe each practice in the operating room and check a box if adherent, Yes or No. In t of "Yes" for adherent practices observed and the total number of observations ("Yes" + "No"). Calculat

| Surgical Site Practice | | OR Observations 1 | OR Observation 2 | OR Observation 3 |
|---|---|---|---|---|
| SS1. | Pre-operative hand antisepsis following manufacturer's recommendations. No long or artificial nails, no jewelry worn. | ☐ Yes ☐ No | ☐ Yes ☐ No | ☐ Yes ☐ No |
| SS2. | Hair not removed. If necessary, removed just prior to surgery with clippers. | ☐ Yes ☐ No | ☐ Yes ☐ No | ☐ Yes ☐ No |
| SS3. | Skin prep in OR with alcohol-based agent | ☐ Yes ☐ No | ☐ Yes ☐ No | ☐ Yes ☐ No |

# Monitoring Device Reprocessing

Healthcare-Associated Infections Program Adherence Monitoring
**Device Reprocessing**

**Regular monitoring with feedback of results to staff can maintain or improve adherence to device repro opportunities for improvement. Monitoring may be performed in any type of location where device rep**

**Instructions:** Observe each practice in the reprocessing area and check a box if adherent, Yes or No. In th for adherent practices observed and the total number of observations ("Yes" + "No"). Calculate adherenc

| Device Reprocessing Practices | | Procedure 1 |
|---|---|---|
| **DR1.** | Policies, procedures, and manufacturer reprocessing instructions for reusable medical devices used in the facility are available in the reprocessing area(s). | ☐ Yes ☐ No |
| **DR2.** | Reusable medical devices are cleaned, reprocessed (disinfection or sterilization) and maintained according to the manufacturer instructions. *Note: If the manufacturer does not provide such instructions, the device may not be suitable for multi-patient use.* | ☐ Yes ☐ No |
| **DR3.** | Single-use devices are discarded after use and not used for more than one patient. *Note: If the facility elects to reuse single-use devices, these devices must be reprocessed prior to reuse by a third-party reprocessor that it is registered with the FDA as a third-party reprocessor and cleared by the FDA to reprocess the specific device in question. The facility should have documentation from the third party reprocessor confirming this is the case.* | ☐ Yes ☐ No |

# Preventing SSI: The MOST Important Things

***Prevent the Devastating Effects of Deep/Organ Space SSI***

- ❑ **Prophylactic antibiotics**
  - Right drug, right dose, right time
    - ❑ No dose after incision closed
- ❑ **Alcohol-based** skin prep
- ❑ Blood glucose control, all patients
- ❑ Normothemia, all patients
- ❑ Increased Fi02, if normal function
- ❑ Pre-night shower or bath
- ❑ Treat other infections
- ❑ Smoking cessation at least 30 days
- ❑ No hair removal; if must, clippers
- ❑ Maintain positive pressure ventilation
- ❑ Hand hygiene
- ❑ Surgical attire worn entire time including mask and head cover (covering all head and facial hair)
- ❑ Clean and disInfet all surfaces between cases
- ❑ Flash sterilization only if emergency
- ❑ Sterile dressing for 24-48 hours

# Additional SSI Prevention References and Resources


- Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to prevent surgical site infections in acute care hospitals. *Infect Control Hosp Epidemiol*.35:605-27, 2014 www.jstor.org/stable/10.1086/676022
- Institute for Healthcare Improvement (IHI) (www.ihi.org/Engage/Memberships/MentorHospitalRegistry/Pages/InfectionPreventionSSI.aspx)
- Surgical Care Improvement Project (SCIP) (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/)

# SURGICAL SITE INFECTION SURVEILLANCE

# 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

# SSI Surveillance Requirements

| Infection Type | Hospital Locations Included in Surveillance | Infection (Event) Data Required Monthly | Denominator (Summary) Data Required Monthly | Link to NSHN Surveillance and Reporting Protocols |
|---|---|---|---|---|
| **Surgical Site infections (SSI)** | Operative procedures on patients whose admission (surgery) and discharge dates are different calendar days | Superficial incisional,* deep incisional, and organ/space infections that meet NHSN definitions and are associated with any of the 28 NHSN procedure codes mandated for CA hospital reporting; specifically, AAA, APPY, BILI, CARD, CBGB, CBGC, CHOL, COLO, CSEC, FUSN, FX, GAST, HPRO, HTP, HYST, KPRO, KTP, LAM, LTP, NEPH, OVRY, PACE, REC, SB, SPLE, THOR, VHYS, XLAP**<br><br>Descriptions and associated ICD-10 codes for each procedure category can be found on the NHSN website at NHSN Procedure Codes and Associated ICD-10 Codes (EXCEL)<br><br>*Superficial SSI are not included in the CDPH annual public HAI report, but are required to be reported per NHSN protocols for appropriate SSI risk adjustment | Enter every qualifying inpatient operative procedure performed from the list of the 28 NHSN procedure codes that have CA mandated surveillance. | NHSN Surveillance for SSI Events (CDC NHSN) |

CDPH HAI Reporting Guidance for California Hospitals
(cdph.ca.gov/Programs/CHCQ/HAI/Pages/CA_SpecificReportingGuidelines.aspx#)

California Department of PublicHealth

# 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 approach and cranial Burr holes) 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*

NHSN Patient Safety Manual: Chapter 9 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

# Operating Room Definition

An Operating Room (OR) is defined as:

- a patient care area that met the Facilities Guidelines Institute's (FGI) or American Institute of Architects' (AIA) criteria for an operating room when it was constructed or renovated
  - Examples:
    - Surgical operating room
    - C-section room
    - Interventional radiology room
    - Cardiac catheterization lab

# Reporting Procedure Denominator Data

- Closure type: Primary, non-Primary
- Wound class: Clean, Clean-contaminated, Contaminated, Dirty
- Procedure type
- If 2 or more are performed (trauma surgery), report each procedure on separate form
- Patient expires in OR – do NOT report as denominator data

# Reporting Procedure Denominator Data

- Multiple procedures within 24 hours into the same incision or surgical space are considered the same procedure
- 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
- Surgical wound class
  - clean, clean-contaminated, contaminated, or dirty

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

- **Before the operation**
- 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**

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

NHSN Patient Safety Manual: Chapter 9 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

# 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

NHSN Patient Safety Manual: Chapter 9 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

# 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

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

**Use CDPH diagnosis flag code method for all SSI surveillance**

# Identifying SSI Continued

- Perform post-discharge surveillance
  - Post surgical surveys: Patient-reported signs and symptoms of infection (documented in the medical record by a healthcare professional)
  - Post operative visits at clinic site: documentation of infection and/or culture results
    - Culture should not be a swab without skin disinfection

# Excluded organisms

Well-known community organisms cultured from a surgical site are excluded from reporting:

**Excluded organisms**

- Blastomyces
- Histoplasma
- Coccicioides
- Paracoccidioides
- Cryptococcus
- Pneumocystis

**Organisms associated with latent infections also are excluded from meeting SSI criteria:**

- Herpes
- Shingles
- Syphilis
- Tuberculosis

# 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

# 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

CDPH ICD-CM Diagnosis Codes Tool
(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/UseOfICD-CMDiagnosisCodesToFlagPost-operativePatientsForFurtherEvaluationOfPossibleSSI-.aspx)

# Post-Operative ICD-10 Diagnosis "Flag" Code

| NHSN Procedure Category* | ICD-10 Diagnosis Flag Code |
|---|---|
| COLO | K63.0<br>K63.2<br>K65.0<br>K65.1<br>K68.19<br>K94.02<br>K94.12<br>L03.319<br>T81.31XA<br>T81.32XA<br>T81.4XXA<br>T81.83XA |
| HYST | K65.0<br>K65.1<br>L03.319<br>T81.31XA<br>T81.32XA<br>T81.4XXA |
| CSEC | K65.0<br>K65.1<br>L03.319<br>T81.31XA<br>T81.32XA<br>T81.4XXA |

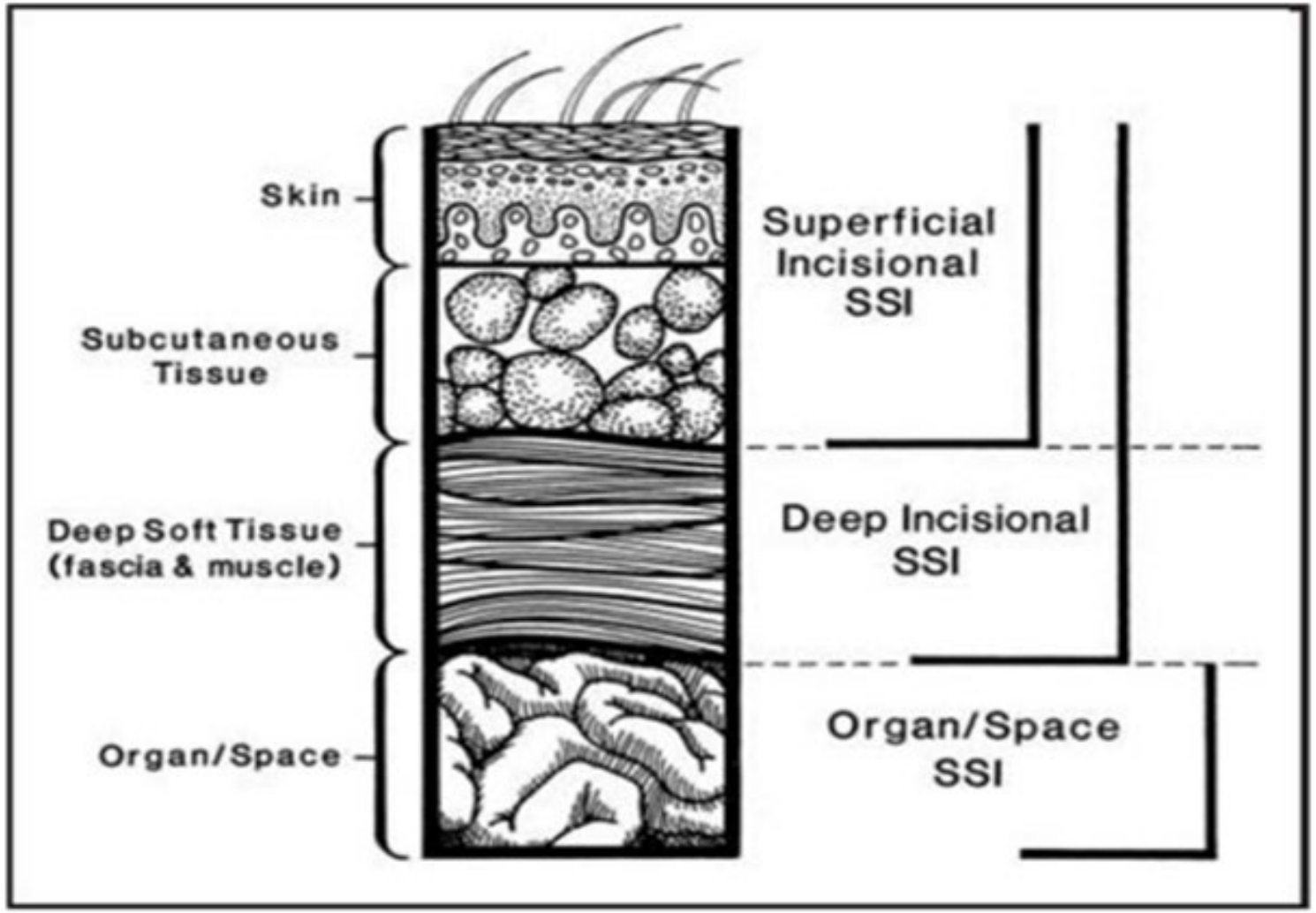
Use of ICD-CM10 Diagnosis Codes to "Flag" Post-operative Patients for Further Evaluation of Possible SSI (PDF)
(www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/UsingICD_DiagnosisFlagCodesforSSI_Surveillance110421_July2022.pdf)

# 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 (PDF) (www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/UsingICD_DiagnosisFlagCodesforSSI_Surveillance110421_July2022.pdf)

# NHSN SSI Surveillance Definition




Categorized based in depth of infection

# Superficial Incisional SSI

❑ Infection occurs within 30 days after surgical procedure

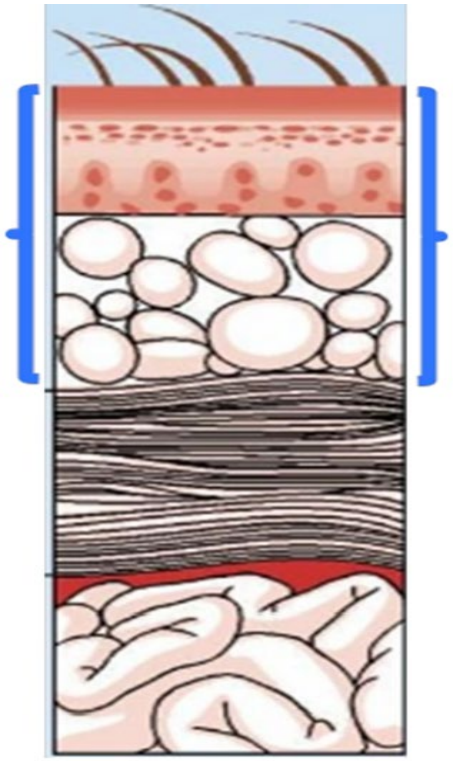
**AND**

❑ 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



The Ins and Outs of SSI Surveillance (PDF) (www.cdc.gov/nhsn/pdfs/training/2022/SSI-Surveillance-508.pdf)

California Department of PublicHealth

# 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 cellulitis by itself, it is not an SSI
- Do not report a localized stab wound infection as an SSI.

# Deep Incisional SSI

- ❑ Infection occurs within 30 days after surgical procedure (unless its one of the 13 procedures followed for 90 days)

**AND**

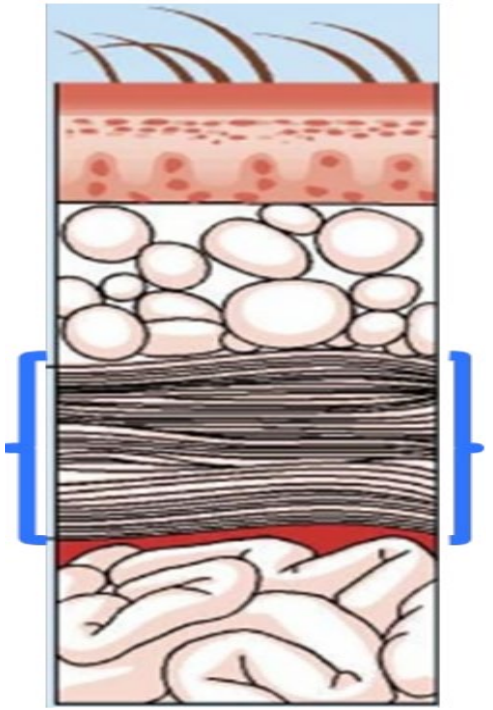
- ❑ Involves deep soft tissues of the incision, e.g. fascial & muscle layers

**AND**

- 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 histopathologic exam or imaging test
  - ❑ 3. Deep incision spontaneously dehisces **OR** opened by surgeon, attending physician or designee, and culture positive or not cultured*

**AND**

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



The Ins and Outs of SSI Surveillance (PDF) (www.cdc.gov/nhsn/pdfs/training/2022/SSI-Surveillance-508.pdf)

*A culture negative finding does not meet this criteria

California Department of PublicHealth

# Organ/Space SSI

- ❑ Infection occurs within 30 days after surgical procedure (unless its one of the 13 procedures followed for 90 days)

**AND**

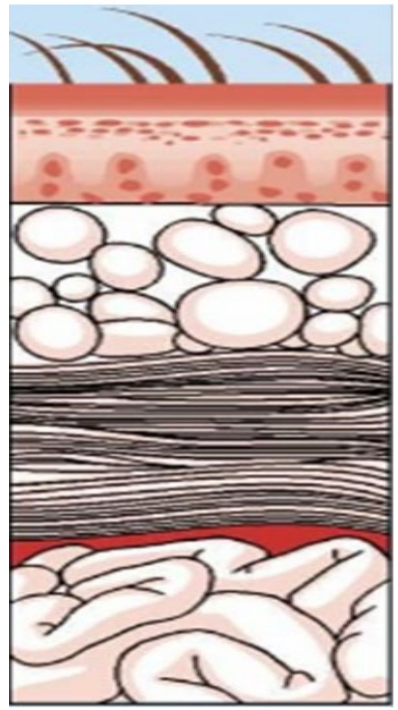
- ❑ Involves any part of body deeper than the fascial/muscle layers, opened or manipulated during the surgical procedure

**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 histopathologic or imaging test

**AND**

- ❑ Meets surveillance definition for a **specific NHSN infection site**



The Ins and Outs of SSI Surveillance (PDF) (www.cdc.gov/nhsn/pdfs/training/2022/SSI-Surveillance-508.pdf)

# Organ/Space SSI Sites

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

NHSN PCS Manual: Chapter 17, Surveillance Definitions (PDF)
(www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf)

# SSI Surveillance Requirements

| Infection Type | Hospital Locations Included in Surveillance | Infection (Event) Data Required Monthly | Denominator (Summary) Data Required Monthly | Link to NSHN Surveillance and Reporting Protocols |
|---|---|---|---|---|
| **Surgical Site infections (SSI)** | Operative procedures on patients whose admission (surgery) and discharge dates are different calendar days | Superficial incisional,* deep incisional, and organ/space infections that meet NHSN definitions and are associated with any of the 28 NHSN procedure codes mandated for CA hospital reporting; specifically, AAA, APPY, BILI, CARD, CBGB, CBGC, CHOL, COLO, CSEC, FUSN, FX, GAST, HPRO, HTP, HYST, KPRO, KTP, LAM, LTP, NEPH, OVRY, PACE, REC, SB, SPLE, THOR, VHYS, XLAP**<br><br>Descriptions and associated ICD-10 codes for each procedure category can be found on the NHSN website at NHSN Procedure Codes and Associated ICD-10 Codes (EXCEL)<br><br>*Superficial SSI are not included in the CDPH annual public HAI report, but are required to be reported per NHSN protocols for appropriate SSI risk adjustment | Enter every qualifying inpatient operative procedure performed from the list of the 28 NHSN procedure codes that have CA mandated surveillance. | NHSN Surveillance for SSI Events (CDC NHSN) |

CDPH Reporting Guidelines

(cdph.ca.gov/Programs/CHCQ/HAI/Pages/CA_SpecificReportingGuidelines.aspx#)

California Department of PublicHealth

# 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

# Infection Present at Time of Surgery (PATOS)

- 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'
  - An SSI event is attributed to the facility in which the NHSN operative procedure is performed.
- 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 Manual: Chapter 9 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

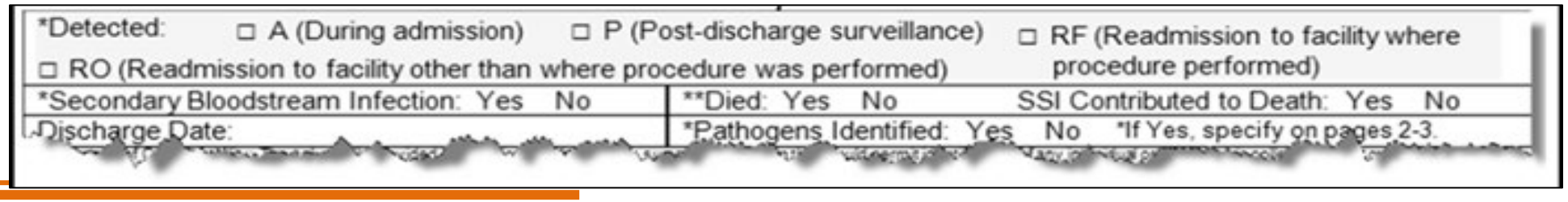
# SSI Event Details

**A** – SSI was identified during hospital **admission**, prior to discharge after the operation

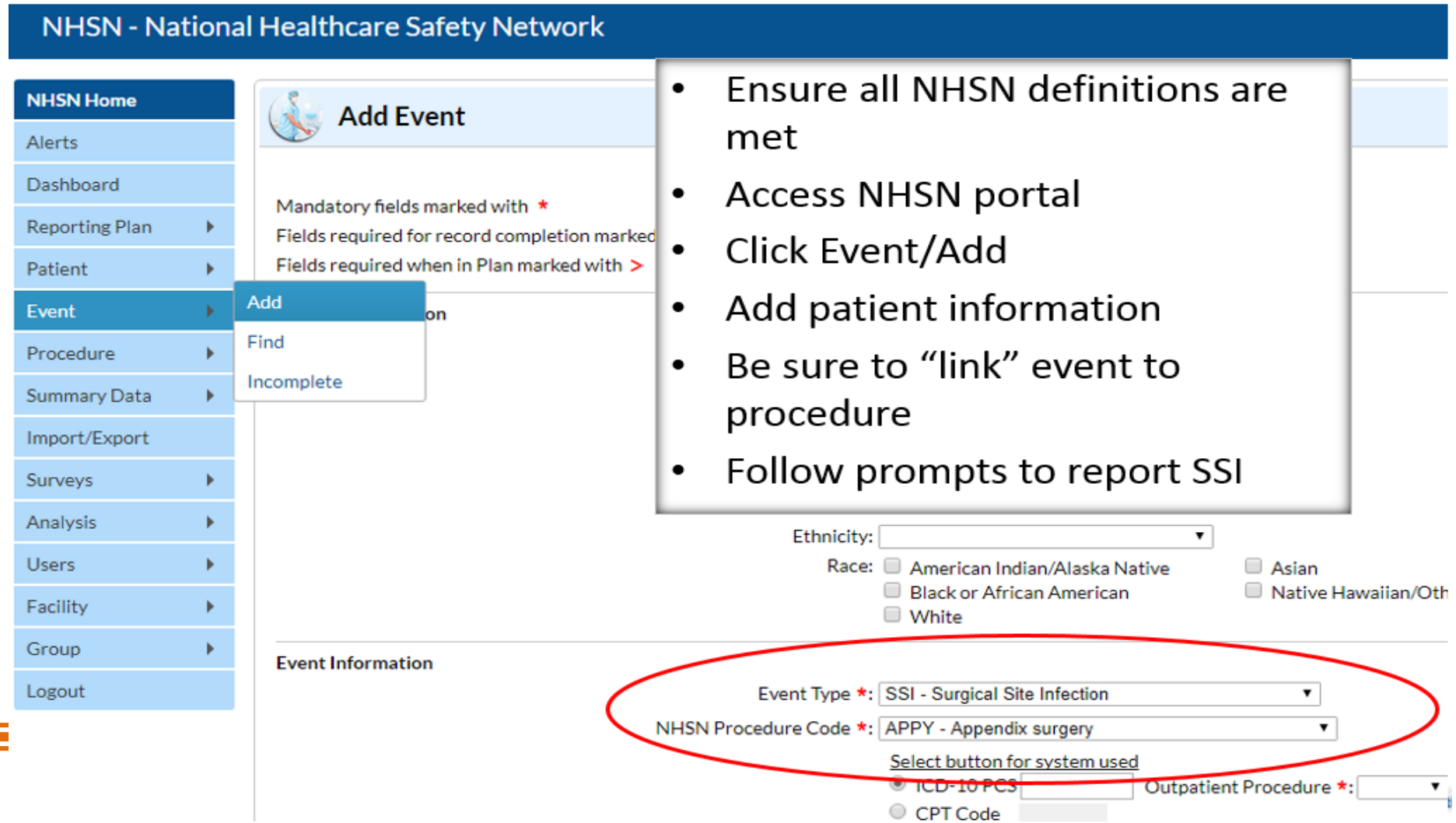
**P** – SSI was identified only by **post discharge** surveillance, including ED visit without readmission. If readmitted, use RF or RO

**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



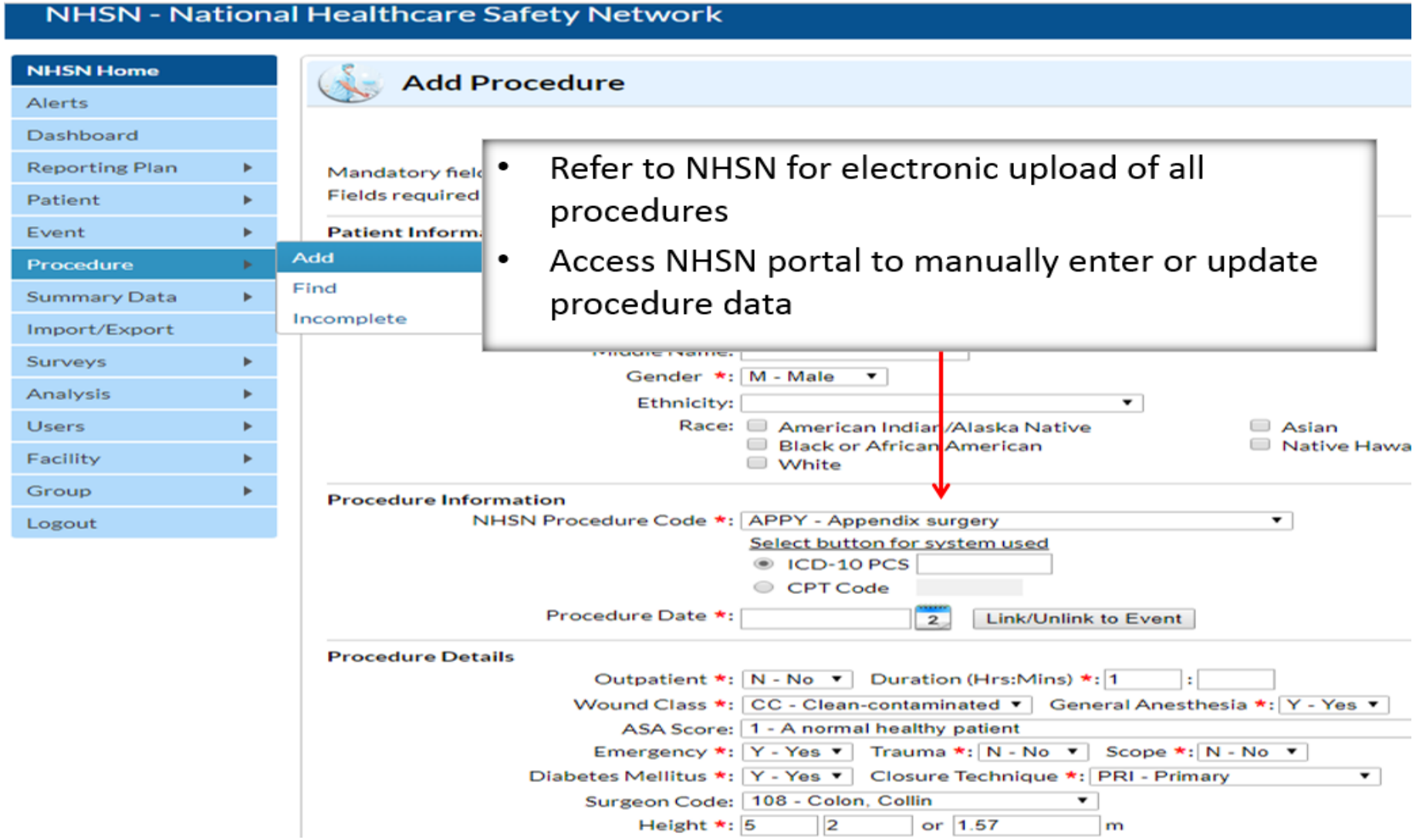
# Reporting an SSI Event to NHSN




- 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

California Department of PublicHealth

# Reporting Procedures to NHSN




California Department of PublicHealth

# NHSN Updates

- Operative Procedure Codes: SSIs not listed or required to report can be investigated as an HAI, but not required to report to NHSN or CDPH
- Denominator reporting: More than one operative procedure through the same incision/surgical space within 24 hours: reporting instruction updated to capture when a patient has more than one operative procedure within 24 hours via the same incision OR into the same surgical area

# What about…

| Question | Answer |
|---|---|
| SSI attribution when several NHSN procedures are performed on different dates? | Attribute the SSI to the procedure most recently performed |
| SSI where multiple NHSN procedures are done at different surgical incision sites? | Report a single SSI assigning the level as the deepest level infected |
| If a procedure is coded as open and scope? | The procedure should be reported to NHSN as Scope = NO. The open designation is considered a higher risk procedure. |

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

The NHSN Standard Infection Ratio: A Guide to SIR (PDF)
(www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf)

# 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

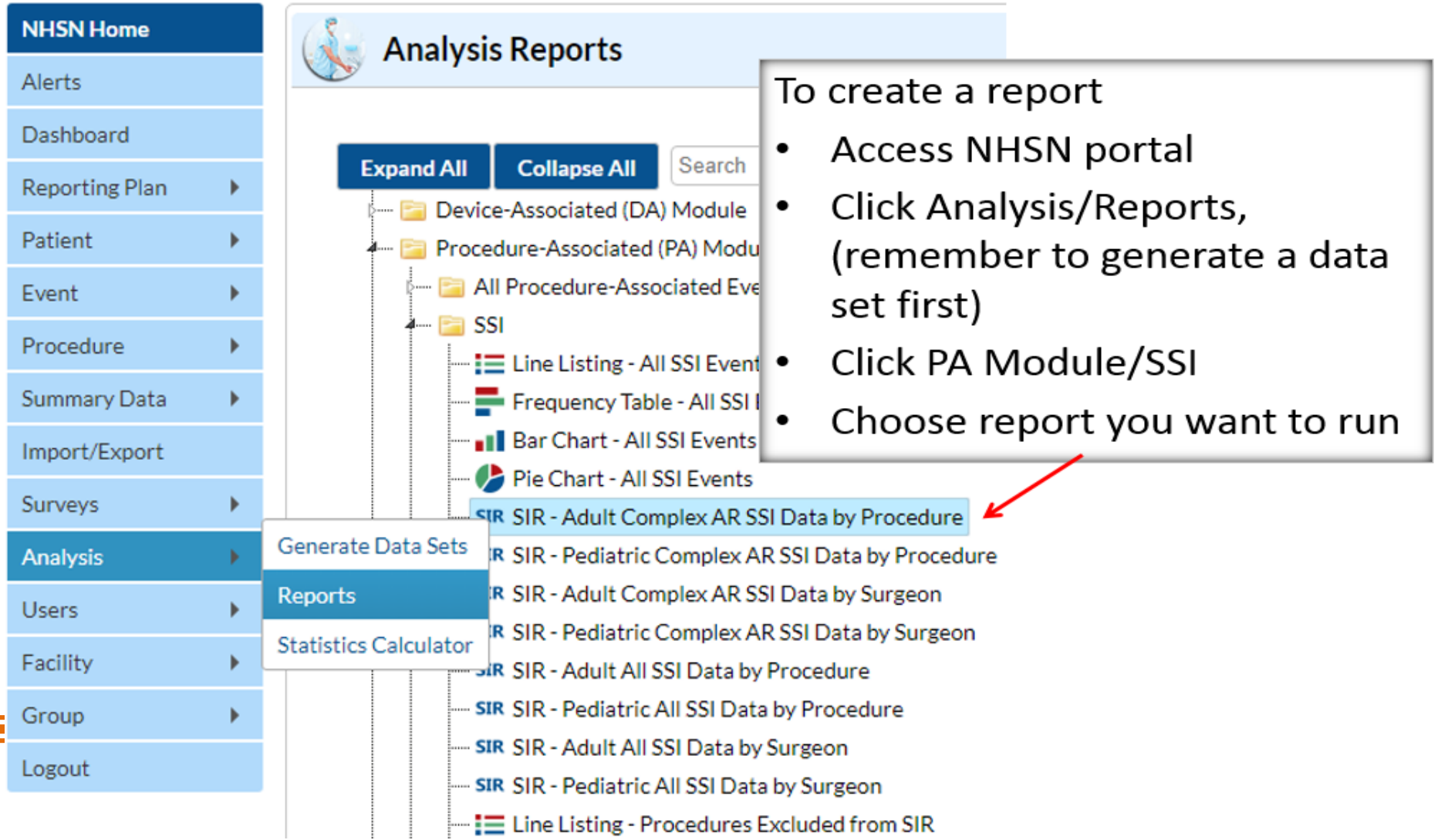
$$\text{SIR} = \frac{\text{Observed SSI}}{\text{Predicted SSI}}$$

# 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!**

# NHSN SSI Analysis Reports



# NHSN SSI SIR Report

| Summary Yr | Procedure Count | infCountAdultCmpx | numPredAdultCmpx | Complex AR Model SIR | Complex AR Model SIR p-value | Complex AR Model 95% Confidence Interval |
|---|---|---|---|---|---|---|
| 2015 | 3623 | 42 | 25.848 | 1.625 | 0.0034 | 1.186, 2.176 |
| 2016 | 3466 | 32 | 25.013 | 1.279 | 0.1723 | 0.890, 1.784 |

SIR for Facility

**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: BS2_SIR_ADULTCMPXSSIPROC summaryYr 2015 to 2016

SIR by Procedure

| Procedure Code | Summary Yr | Procedure Count | infCountAdultCmpx | numPredAdultCmpx | Complex AR Model SIR | Complex AR Model SIR p-value | Complex AR Model 95% Confidence Interval |
|---|---|---|---|---|---|---|---|
| AAA | 2015 | 11 | 0 | 0.075 | . | | |
| AAA | 2016 | 10 | 0 | 0.068 | . | | |
| AMP | 2015 | 181 | 0 | 0.674 | . | | |
| AMP | 2016 | 146 | 0 | 0.453 | . | | |
| APPY | 2015 | 177 | 4 | 1.255 | 3.189 | 0.0479 | 1.013, 7.691 |
| APPY | 2016 | 162 | 2 | 1.068 | 1.872 | 0.3825 | 0.314, 6.186 |
| COLO | 2015 | 118 | 6 | 3.358 | 1.787 | 0.1792 | 0.724, 3.716 |
| COLO | 2016 | 126 | 4 | 3.887 | 1.029 | 0.8931 | 0.327, 2.482 |
| CRAN | 2015 | 143 | 4 | 1.707 | 2.344 | 0.1242 | 0.745, 5.653 |
| CRAN | 2016 | 113 | 2 | 1.321 | 1.514 | 0.5285 | 0.254, 5.001 |
| CSEC | 2015 | 840 | 0 | 2.286 | 0.000 | 0.1017 | , 1.311 |
| CSEC | 2016 | 837 | 1 | 2.477 | 0.404 | 0.3762 | 0.020, 1.991 |
| FUSN | 2015 | 100 | 2 | 1.178 | 1.698 | 0.4452 | 0.285, 5.609 |

California Department of PublicHealth

# 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


- Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol*. 2014;35:605-27 http://www.jstor.org/stable/10.1086/676022
- Centers for Disease Control and Prevention (CDC) (PDF) (www.cdc.gov/HAI/pdfs/toolkits/SSI_toolkit021710SIBT_revised.pdf)
- CDC and HICPAC Recommendations for Prevention of SSI, 2017 (jamanetwork.com/journals/jamasurgery/fullarticle)
- Institute for Healthcare Improvement (IHI) (www.ihi.org/Engage/Memberships/MentorHospitalRegistry/Pages/InfectionPreventionSSI.aspx)
- Surgical Care Improvement Project (SCIP) (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/)

## Questions?

For more information,

please contact

HAIProgram@cdph.ca.gov

Include “ACH IP Training Course” in the subject line

## Post Test

Now that you have completed this module,

Click on the “Post Test” link when it pops up

To Return to

Learning Stream

and take the post test

*If the Post Test link does not pop up, you will be sent a link via e-mail*

California Department of PublicHealth