Surgical Site Infection Surveillance

Last updated 2017

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

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

- Capture of sufficient risk factor data for each **procedure** performed
- Consistent use of standard surveillance methods and definitions to **identify SSI**
- Application of **risk adjustment** methods that calculate an SSI probability for each surgical patient

Surgical Procedure Definition

NHSN operative procedures

- 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*

NHSN Patient Safety Manual: Chapter 9

Procedure Risk Factor Data

Collect these risk factor data for <u>each</u> 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.)

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

Clean - Contaminated

Operation entering respiratory, alimentary, genital, or urinary tracts

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

Operation involving biliary tract, appendix, vagina, and oropharynx

Contaminated

Operation following open, fresh, accidental wounds

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

Includes operation where acute, non-purulent inflammation encountered

Dirty

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

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

Duration of Operative Procedure

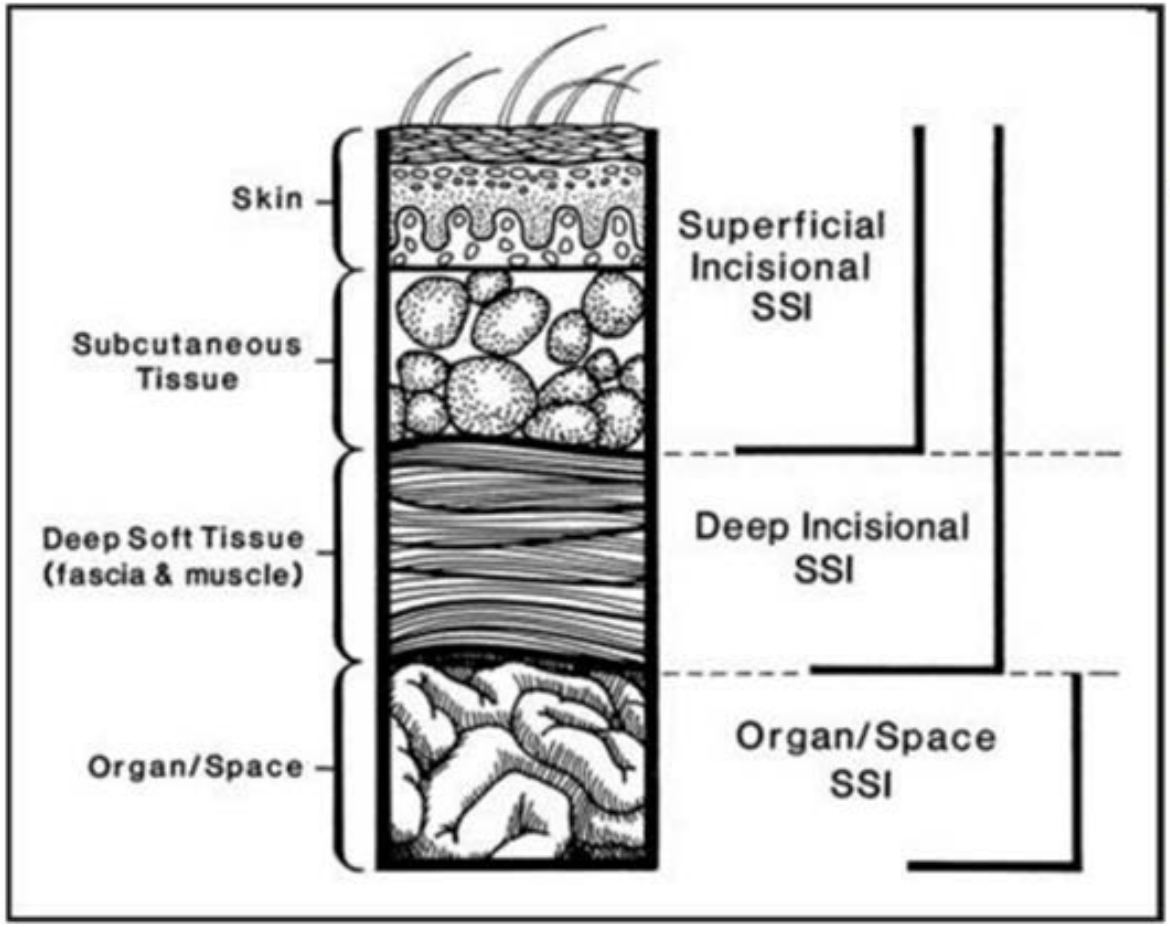
- Interval between the surgery start time (incision) and the surgical procedure finish (PF) time
  - Defined by Association of Anesthesia Clinical Directors (AACD)
  - Reported as hours and minutes
- PF time:
  - All instrument and sponge counts are completed and verified correct **AND**
  - All in OR 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 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

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 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 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*

AND

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)

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**

NHSN Patient Safety Manual: Chapter 9, SSI Table 3

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		

Find specific criteria at:

NHSN PCS Manual: Chapter 17, Surveillance Definitions for Specific Types of Infections www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf

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
- 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 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

- Engage peri-operative and unit staff to assist in SSI surveillance
  - Evaluate surgical patients during hospital stay
  - Unit rounds, antimicrobial starts, temperature, subsequent operations
- Apply post-operative diagnosis “flag” codes
- Evaluate microbiology findings but **don’t rely on wound cultures alone** to find SSI
  - Will miss 50% or more SSI
- Monitor surgical patients for readmission
- Perform post-discharge surveillance by collaborating with surgeons and outpatient clinics

Use ICD-10 Diagnosis Codes to Identify SSI

- CDPH **strongly recommends** using ICD-10 diagnosis "flag" 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

Use ICD-10 Diagnosis Codes to Identify SSI

- ICD-10 diagnosis "flag" codes identify 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 flag codes during the 30-day post-op surveillance period (90 days for 8 procedure types)
- CDPH published list of recommended codes for each procedure type on HAI Program website, www.cdph.ca.gov/HAI

https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/UseOfICD-CMDiagnosisCodesToFlagPost-operativePatientsForFurtherEvaluationOfPossibleSSI-.aspx

California Department of PublicHealth

Use ICD-10 Diagnosis Codes to Identify SSI

Example

- Codes that might indicate **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

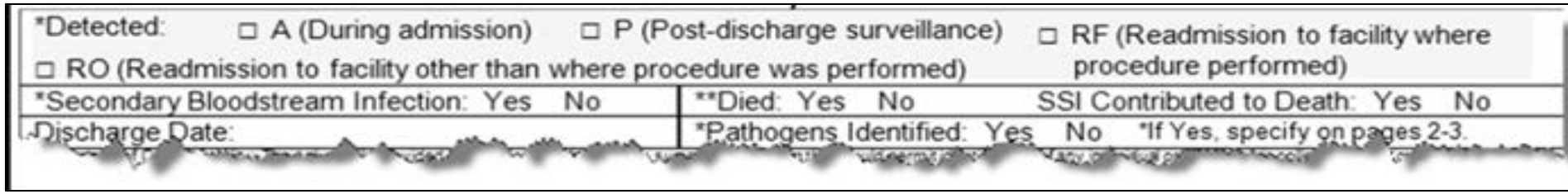
SSI Following Multiple Procedures

- 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



*Detected: ☐ A (During admission) ☐ P (Post-discharge surveillance) ☐ RF (Readmission to facility where procedure performed) ☐ RO (Readmission to facility other than where procedure was performed)		
*Secondary Bloodstream Infection: Yes No	**Died: Yes No	SSI Contributed to Death: Yes No
Discharge Date:	*Pathogens Identified: Yes No *If Yes, specify on pages 2-3.	

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

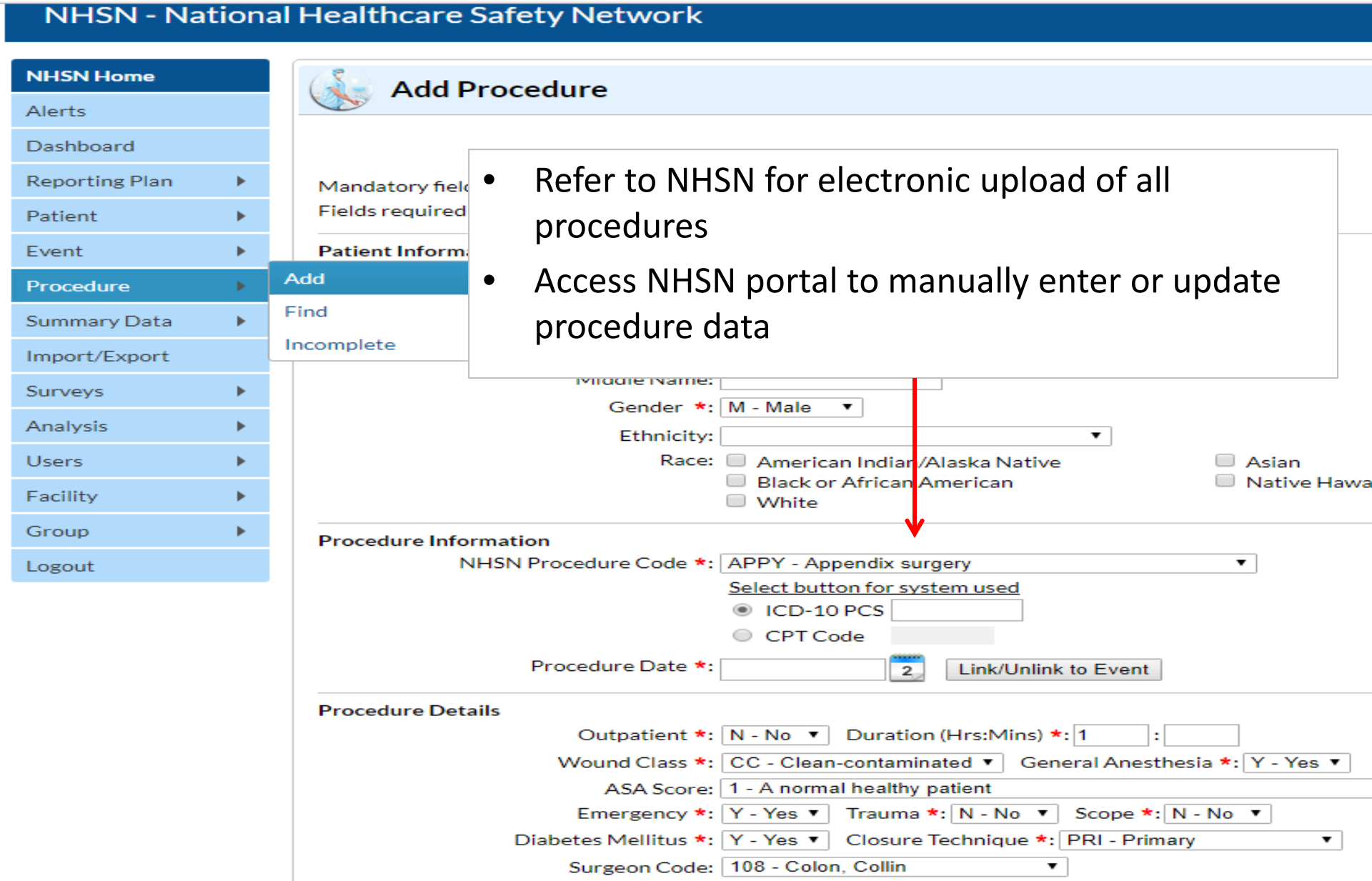
You must analyze your data to review progress!

SSI Risk Adjustment Models Are Procedure-Specific

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
https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf

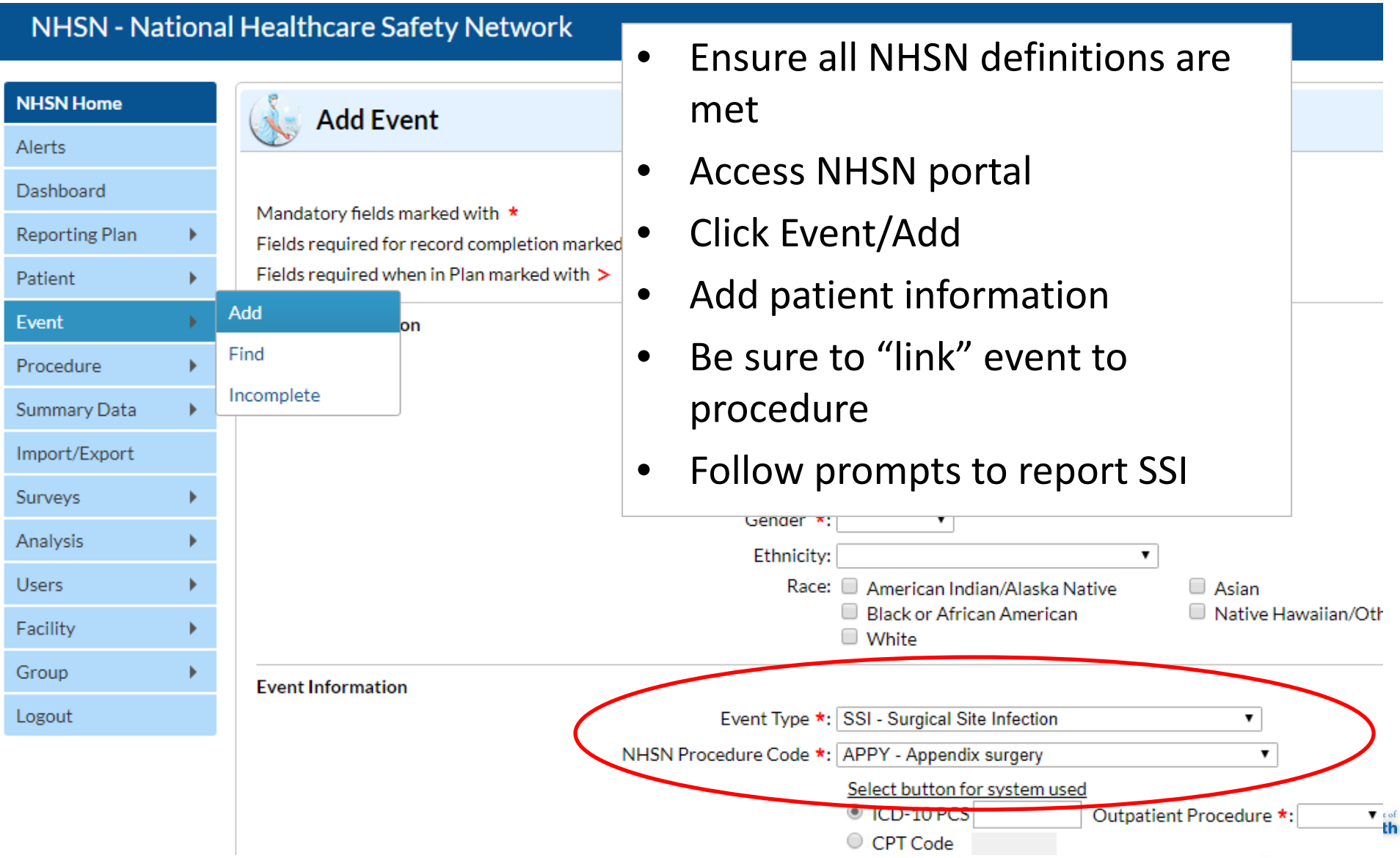
Reporting Procedures to NHSN



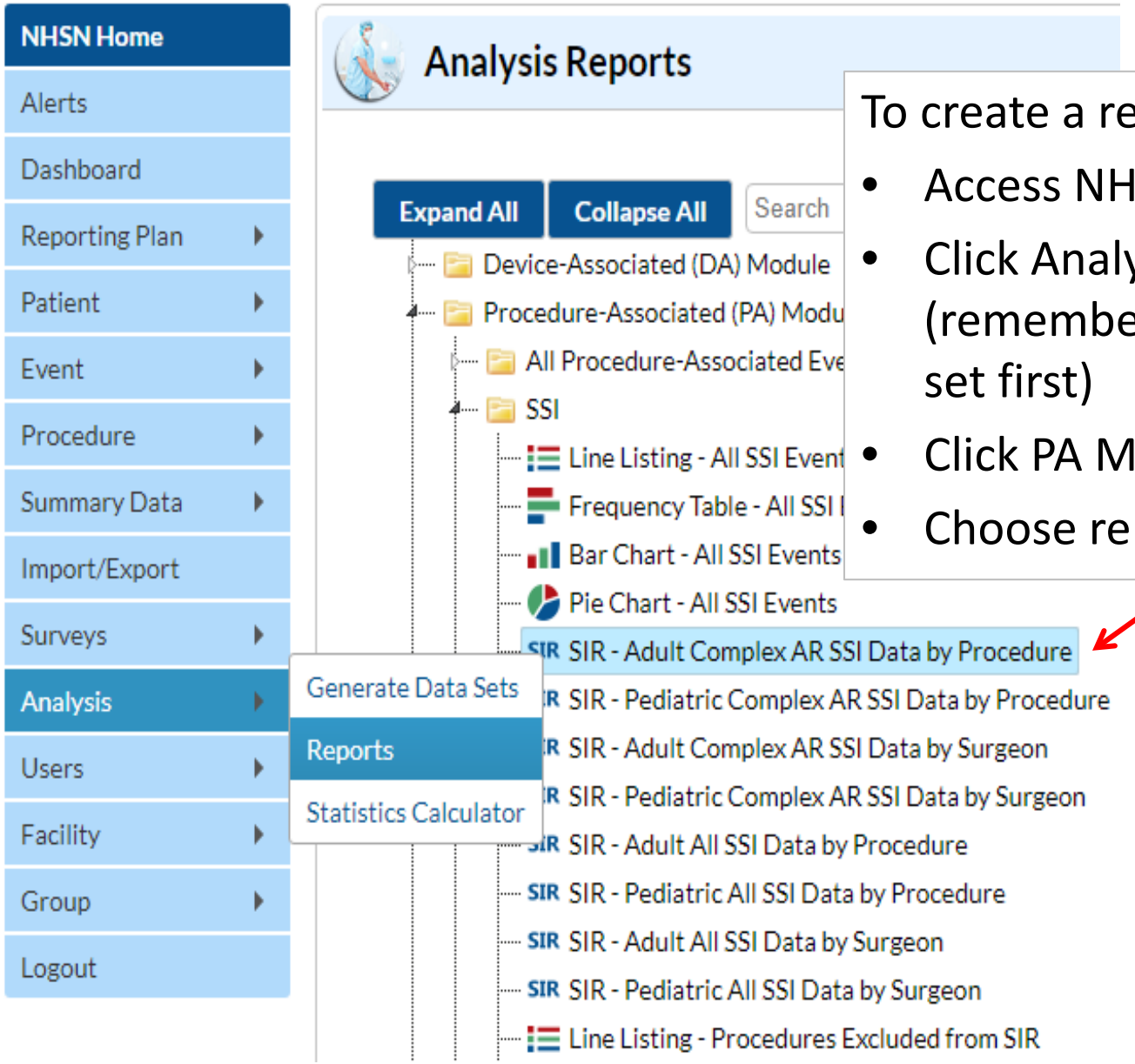
- Refer to NHSN for electronic upload of all procedures
- Access NHSN portal to manually enter or update procedure data

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



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

California Department of PublicHealth

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

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

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 patients 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) 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
- Institute for Healthcare Improvement (IHI) 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
- World Health Organization (WHO), www.who.int/patientsafety/safesurgery/en/

Questions?

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

Or email
HAIProgram@cdph.ca.gov