

# Surgical Site Infection Event (SSI)

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### Introduction:

In 2014, a total of 14.2 million operative procedures were performed in the inpatient setting in United States hospitals<sup>1</sup>. The CDC healthcare-associated infection (HAI) prevalence survey found that there were an estimated 110,800 surgical site infections (SSIs) associated with inpatient surgeries in 2015<sup>2</sup>. Based on the 2019 HAI data results published in the NHSN’s HAI Progress Report, about a 7% decrease in the standardized infection ratio (SIR) related to all NHSN operative procedure categories combined was reported between 2015 and 2019. About a 9% decrease in SIR related to the Surgical Care Improvement Project (SCIP) NHSN operative procedure categories was reported between 2015 and 2019<sup>3</sup>.

While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis, SSIs remain a substantial cause of morbidity, prolonged

hospitalization, and death. SSI is associated with a mortality rate of 3%, and 75% of SSI-associated deaths are directly attributable to the SSI<sup>4</sup>. SSI is the most costly HAI type with an estimated annual cost of \$3.3 billion, and is associated with nearly 1 million additional inpatient-days annually<sup>5,6</sup>.

Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk<sup>7-10</sup>. A successful surveillance program includes the use of epidemiologically-sound infection definitions and effective surveillance methods, stratification of SSI rates according to risk factors associated with SSI development, and data feedback<sup>8,9</sup>. The most recent CDC and Healthcare Infection Control Practices Advisory Committee Guideline for the Prevention of Surgical Site Infection was published in 2017; this guideline provides evidence-based strategies for SSI prevention<sup>10</sup>.

### Settings:

Surveillance of surgical patients will occur in any inpatient facility and/or hospital outpatient procedure department (HOPD) where the selected NHSN operative procedure(s) are performed.

**Note:** Ambulatory Surgery Centers (ASCs) should use the Outpatient Procedure Component (OPC) to perform SSI surveillance.

### Requirements:

- Perform surveillance for SSI following at least one NHSN operative procedure category (that is included in [ICD-10-PCS](#) and/or [CPT](#) NHSN operative procedure code mapping) as indicated in the *Patient Safety Monthly Reporting Plan* ([CDC 57.106](#)).
- Collect SSI event (numerator) and operative procedure (denominator) data on all procedures included in the selected operative procedure categories indicated on the facility's monthly reporting plan.
- A procedure must meet the NHSN definition of an operative procedure in order to be included in SSI surveillance. All procedures included in the NHSN monthly surveillance plan are followed for superficial incisional, deep incisional, and organ/space SSI events and the type of SSI reported must reflect the deepest tissue level where SSI criteria is met during the surveillance period.
- SSI events where infection present at the time of surgery (PATOS) = YES are reported to NHSN.
- An SSI event is attributed to the facility in which the NHSN operative procedure is performed.

**Note:** Facilities that have identified potential SSI events that are attributable to procedures performed at a different facility should provide details of the potential events to the facility where the procedure was originally performed.

## Surveillance Methods:

SSI monitoring requires active, patient-based, prospective surveillance. Concurrent and post-discharge surveillance methods should be used to detect SSIs following inpatient operative procedures and post-discharge surveillance for outpatient operative procedures.

For example, these methods include:

- Review of medical records or surgery clinic patient records
  - Admission, readmission, ED, and OR logs
  - Patient charts for signs and symptoms of SSI
    - Acceptable documentation includes patient-reported signs or symptoms within the SSI surveillance period, documented in the medical record by a healthcare professional.
  - Lab, imaging, other diagnostic test reports
  - Clinician/healthcare professional notes
  - ICD-10-CM Infection Diagnosis Codes to prompt further review
- Visit the ICU and wards – talk to primary care staff
- Surgeon surveys by mail or telephone
- Patient surveys by mail or telephone (though patients may have a difficult time assessing their infections).

Any combination of these methods (or other methods identified by the facility) with the capacity to identify all SSIs is acceptable for use; however, NHSN criteria for SSI must be used. To minimize Infection Preventionists' (IPs) workload of collecting denominator data, operating room data may be downloaded.

(See file specifications at:

<https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/ImportingProcedureData.pdf>).

## Operative Procedure Codes:

Operative procedure codes are used in health care settings as a way to communicate uniform information. This wide use of operative procedure codes allows NHSN to incorporate the operative procedure codes as a means to standardize NHSN SSI surveillance reporting. The operative procedure codes are required to determine the correct NHSN operative procedure category to be reported.

NHSN uses the following operative procedure coding systems:

- *International Classification of Diseases, 10<sup>th</sup> Revision Clinical Modifications/Procedure Coding System* (ICD-10-CM/PCS), as defined by the ICD-10 Coordination and Maintenance Committee of the National Center for Health Statistics and the Centers for Medicare and Medicaid Services (CMS).

- *Current Procedural Terminology* (CPT), as defined by the American Medical Association (AMA).

The mapping for [ICD-10-PCS](#) and [CPT](#) NHSN operative procedures is found in the “[Supporting Materials](#)” section of the SSI Protocol on the NHSN website. The mapping documents include a general definition for each NHSN operative procedure category as well as a description for each individual operative procedure code. Entering the operative procedure code into the NHSN application remains optional.

**Note:** The former NHSN Category “OTH - other” is not mapped to ICD-10-PCS and CPT NHSN operative procedure codes. For in-plan reporting purposes, an infection associated with a procedure that is not included in one of the NHSN operative procedure categories is not considered an NHSN SSI, although the infection may be investigated as a HAI.

### Definition of an NHSN Operative Procedure:

An [NHSN Operative Procedure](#) is a procedure:

- that is included in the [ICD-10-PCS](#) and/or [CPT](#) NHSN operative procedure code mapping  
**And**
- takes place during an operation where at least one incision (including laparoscopic approach and cranial Burr holes) is made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure  
**And**
- takes place in an operating room (OR), 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<sup>11</sup>. This may include an operating room, C-section room, interventional radiology room, or a cardiac catheterization lab.

**Exclusions:** Otherwise eligible procedures that are assigned an ASA score of 6 are not eligible for NHSN SSI surveillance.

## SSI Event Details

The Infection Window Period (IWP), Present on Admission (POA), Healthcare-Associated Infection (HAI), and Repeat Infection Timeframe (RIT) definitions do not apply to the SSI protocol. For additional POA and PATOS details, see SSI Event Reporting Instructions #2 and #3.

### Date of event (DOE):

For an SSI, the date of event is the date when the first element used to meet the SSI infection criterion occurs for the first time during the SSI surveillance period. The date of event must fall within the SSI surveillance period to meet SSI criteria. The type of SSI (superficial incisional, deep incisional, or organ/space) reported and the date of event assigned must reflect the deepest tissue level where SSI criteria are met during the surveillance period. Synonym: infection date.

All elements required to meet an SSI criterion usually occur within a 7-10 day timeframe with no more than 2-3 days between elements. The elements must be relational to each other, meaning you should ensure the elements all associate to the SSI, and this can only happen if elements occur in a relatively tight timeframe. Each case differs based on the individual elements occurring and the type of SSI.

### Secondary BSI Attribution Period for SSI:

The secondary BSI attribution period for SSI is a 17-day period that includes the date of SSI event, 3 days prior, and 13 days after. For detailed instructions on determining whether identification of organisms from a blood specimen represents a secondary BSI, refer to the Secondary BSI Guide (Appendix B of the [BSI Event Protocol](#)).

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## Denominator for Procedure Details

Additional guidance can be found within the Instructions for [Completion of Denominator for Procedure Form](#) (CDC 57.121).

### ASA physical status:

Assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Physical Status Classification System<sup>12</sup>. Patient is assigned an ASA score of 1-6 at time of surgery.

**Note:** Do NOT report procedures with an ASA physical status of 6 (a declared brain-dead patient whose organs are being removed for donor purposes) to NHSN.

### Diabetes:

The NHSN SSI surveillance definition of diabetes indicates that the patient has a diagnosis of diabetes requiring management with insulin or a non-insulin anti-diabetic agent. This includes:

- Patients with "insulin resistance" who are on management with anti-diabetic agents.
- Patients with gestational diabetes.
- Patients who are noncompliant with their diabetes medications.

The ICD-10-CM diagnosis codes that reflect the diagnosis of diabetes are also acceptable for use to answer YES to the diabetes field question on the denominator for procedure entry if they are documented during the admission where the procedure is performed. These codes are found on the NHSN website in the SSI section under "[Supporting Materials](#)".

The NHSN definition of diabetes excludes patients with no diagnosis of diabetes. The definition also excludes patients who receive insulin for perioperative control of hyperglycemia but have no diagnosis of diabetes.

### Duration of operative procedure:

The interval in hours and minutes between the Procedure/Surgery Start Time and the Procedure/Surgery Finish Time, as defined by the Association of Anesthesia Clinical Directors (AACD)<sup>13</sup>:

- Procedure/Surgery Start Time (PST): Time when the procedure is begun (for example, incision for a surgical procedure).
- Procedure/Surgery Finish (PF): Time when all instrument and sponge counts are completed and verified as correct, all postoperative radiologic studies to be done in the OR are completed, all dressings and drains are secured, and the physicians/surgeons have completed all procedure-related activities on the patient.

### Emergency operative procedure:

A procedure that is documented per the facility's protocol to be an Emergency or Urgent procedure.

### General anesthesia:

The administration of drugs or gases that enter the general circulation and affect the central nervous system to render the patient pain free, amnesic, unconscious, and often paralyzed with relaxed muscles. This does not include conscious sedation.

### Height:

The patient's most recent height documented in the medical record in feet (ft.) and inches (in.), or meters (m).

### NHSN Inpatient Operative Procedure:

An NHSN operative procedure performed on a patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

### NHSN Outpatient Operative Procedure:

An NHSN operative procedure performed on a patient whose date of admission to the healthcare facility and date of discharge are the same calendar day.

### Non-primary Closure:

The closure of the surgical wound in a way which leaves the skin level completely open following the surgery. Closure of any portion of the skin represents primary closure (see Primary Closure definition below). For surgeries with non-primary closure, the deep tissue layers may be closed by some means (with the skin level left open), or the deep and superficial layers may both be left completely open. Wounds with non-primary closure may or may not be described as "packed" with gauze or other material, and may or may not be covered with plastic, "wound vacs," or other synthetic devices or materials.

Examples:

- Laparotomy in which the incision was closed to the level of the deep tissue layers, sometimes called "fascial layers" or "deep fascia," but the skin level was left open.
- The abdomen is left completely open after the surgery (an "open abdomen").

### Primary Closure:

The closure of the skin level during the original surgery, regardless of the presence of wires, wicks, drains, or other devices or objects extruding through the incision. This category includes surgeries where the skin is closed by some means. Thus, if any portion of the incision is closed at the skin level, by any manner, a designation of primary closure should be assigned to the surgery.

**Note:** If a procedure has multiple incision/laparoscopic trocar sites and any of the incisions are closed primarily then the procedure technique is recorded as primary closed.

### Scope:

An instrument used to reach and visualize the site of the operative procedure. In the context of an NHSN operative procedure, use of a scope involves creation of several small incisions to perform or assist in the performance of an operation rather than use of a traditional larger incision (specifically, open approach).

ICD-10-PCS codes can be helpful in answering this scope question. The fifth character indicates the approach to reach the procedure site:

ICD-10 5th Character	Approach	NHSN Scope Designation
0	Open	NO
3	Percutaneous (Included only in CRAN and VSHN categories- procedures with BURR holes)	NO
4	Percutaneous endoscopic	YES
7	Via natural or artificial opening	NO
8	Via natural or artificial opening with endoscopic	NO
F	Via natural or artificial opening with percutaneous endoscopic assistance	YES

**Note:** If a procedure is coded as **open and scope** then the procedure should be reported to NHSN as **Scope = NO**. The **open** designation is considered a higher risk procedure.

For CPT codes, the scope question can be answered based on the procedure code description. Using HYST code 58570 as an example, the procedure code description indicates Laparoscopy, surgical, with total hysterectomy. Laparoscopy is **Scope = YES**.

HYST	58570	Laparoscopy, surgical, with total hysterectomy, for uterus 250 g or less
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### Trauma:

Blunt or penetrating injury occurring prior to the start of the procedure. Complex trauma cases may require multiple trips to the OR during the same admission to repair the initial trauma. In such cases, trauma = Yes.

### Weight:

The patient's most recent weight documented in the medical record in pounds (lbs.) or kilograms (kg) prior to or otherwise closest to the procedure.

### Wound class:

An assessment of the degree of contamination of a surgical wound at the time of the operation. Wound class should be assigned by a person involved in the surgical procedure (for example, surgeon, circulating nurse, etc.). The wound class must be applied according to the wound class schema that is adopted within each organization. The four wound classifications available include Clean, Clean-Contaminated, Contaminated, and Dirty/Infected.

Based on feedback from external experts in the field of surgery, there are a group of NHSN procedures that can never be recorded as clean. These operative procedure categories are APPY, BILLI, CHOL, COLO, REC, SB, and VHYS. Therefore, for these procedures in the application clean is not an option on the drop-down menu.

All other operative procedure categories can be entered as clean procedures within the NHSN application. For example, CSEC, HYST, or OVRY can be a clean wound class if documented as such.

Table 1. Surgical Site Infection Criteria

Criterion	Surgical Site Infection (SSI)
	<p><b>Superficial incisional SSI</b> Must meet the following criteria:</p>
	<p>Date of event occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date)</p> <p><b>AND</b> involves only skin and subcutaneous tissue of the incision</p> <p><b>AND</b> patient has at least <b><i>one</i></b> of the following:</p> <ul style="list-style-type: none"> <li>a. purulent drainage from the superficial incision.</li> <li>b. organism(s) identified from an aseptically-obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).</li> <li>c. superficial incision that is deliberately opened by a surgeon, physician* or physician designee and culture or non-culture based testing of the superficial incision or subcutaneous tissue is not performed</li> </ul> <p><b>AND</b> patient has at least one of the following signs or symptoms: localized pain or tenderness; localized swelling; erythema; or heat.</p> <ul style="list-style-type: none"> <li>d. diagnosis of a superficial incisional SSI by a physician* or physician designee.</li> </ul> <p>* The term physician for the purpose of application of the NHSN SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician’s designee (nurse practitioner or physician’s assistant).</p>

<b>Superficial Incisional SSI</b>	
<b>Comments</b>	<p>There are two specific types of superficial incisional SSIs:</p> <ol style="list-style-type: none"> <li>1. Superficial Incisional Primary (SIP) – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (for example, C-section incision or chest incision for CBGB)</li> <li>2. Superficial Incisional Secondary (SIS) – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (for example, donor site incision for CBGB)</li> </ol>
<b>Reporting Instructions for Superficial SSI</b>	<p><b><u>The following do not qualify as criteria for meeting the NHSN definition of superficial incisional SSI:</u></b></p> <ul style="list-style-type: none"> <li>• Diagnosis/treatment of cellulitis (redness/warmth/swelling), by itself, does not meet criterion “d” for superficial incisional SSI. Conversely, an incision that is draining or that has organisms identified by culture or non-culture based testing is not considered a cellulitis.</li> <li>• A stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration).</li> <li>• For an NHSN operative procedure, a laparoscopic trocar site is considered a surgical incision and not a stab wound.</li> <li>• A localized stab wound or pin site infection is not considered an SSI; depending on the depth, these infections might be considered either a skin (SKIN) or soft tissue (ST) infection.</li> </ul>

	<p><b>Deep incisional SSI</b> Must meet the following criteria:</p>
	<p>The date of event occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in <a href="#">Table 2</a></p> <p><b>AND</b></p> <p>involves deep soft tissues of the incision (for example, fascial and muscle layers)</p> <p><b>AND</b></p> <p>patient has at least <b><i>one</i></b> of the following:</p> <ul style="list-style-type: none"> <li>a. purulent drainage from the deep incision.</li> <li>b. a deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, physician* or physician designee</li> </ul> <p><b>AND</b></p> <p>organism(s) identified from the deep soft tissues of the incision by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)) or culture or non-culture based microbiologic testing method is not performed. A culture or non-culture based test from the deep soft tissues of the incision that has a negative finding does not meet this criterion.</p> <p><b>AND</b></p> <p>patient has at least <b><i>one</i></b> of the following signs or symptoms: fever (&gt;38°C); localized pain or tenderness.</p> <ul style="list-style-type: none"> <li>c. an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.</li> </ul> <p>* The term physician for the purpose of application of the NHSN SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician’s designee (nurse practitioner or physician’s assistant).</p>

Comments	Deep incisional SSI
	<p>There are two specific types of deep incisional SSIs:</p> <ol style="list-style-type: none"> <li>1. Deep Incisional Primary (DIP) – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (for example, C-section incision or chest incision for CBGB)</li> <li>2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (for example, donor site incision for CBGB)</li> </ol>

	<p><b>Organ/Space SSI</b> Must meet the following criteria:</p>
	<p>Date of event occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in <a href="#">Table 2</a></p> <p><b>AND</b></p> <p>involves any part of the body deeper than the fascial/muscle layers that is opened or manipulated during the operative procedure</p> <p><b>AND</b></p> <p>patient has at least <b><i>one</i></b> of the following:</p> <ul style="list-style-type: none"> <li>a. purulent drainage from a drain that is placed into the organ/space (for example, closed suction drainage system, open drain, T-tube drain, CT-guided drainage).</li> <li>b. organism(s) identified from fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).</li> <li>c. an abscess or other evidence of infection involving the organ/space that is detected on gross anatomical or histopathologic exam, or imaging test evidence suggestive of infection.</li> </ul> <p><b>AND</b></p> <p>meets at least <b><i>one</i></b> criterion for a specific organ/space infection site listed in <a href="#">Table 3</a>. These criteria are found in the Surveillance Definitions for Specific Types of Infections (<a href="#">Chapter 17</a>)</p>

Table 2. Surveillance Periods for SSI Following Selected NHSN Operative Procedure Categories. Day 1 = the date of the procedure.

30-day Surveillance			
Category	Operative Procedure	Category	Operative Procedure
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory laparotomy
90-day Surveillance			
Category	Operative Procedure		
BRST	Breast surgery		
CARD	Cardiac surgery		
CBGB	Coronary artery bypass graft with both chest and donor site incisions		
CBGC	Coronary artery bypass graft with chest incision only		
CRAN	Craniotomy		
FUSN	Spinal fusion		
FX	Open reduction of fracture		
HER	Herniorrhaphy		
HPRO	Hip prosthesis		
KPRO	Knee prosthesis		
PACE	Pacemaker surgery		
PVBY	Peripheral vascular bypass surgery		
VSHN	Ventricular shunt		

**Notes:**

- Superficial incisional SSIs are only followed for a 30-day period for all procedure types.
- Secondary incisional SSIs are only followed for a 30-day period regardless of the surveillance period for the primary site.

Table 3. Specific Sites of an Organ/Space SSI

Category	Specific Site	Category	Specific Site
BONE	Osteomyelitis	MED	Mediastinitis
BRST	Breast abscess or mastitis	MEN	Meningitis or ventriculitis
CARD	Myocarditis or pericarditis	ORAL	Oral cavity infection (mouth, tongue, or gums)
DISC	Disc space infection	OREP	Deep pelvic tissue infection or other infection of the male or female reproductive tract
EAR	Ear, mastoid infection	PJI	Periprosthetic joint infection
EMET	Endometritis	SA	Spinal abscess/infection
ENDO	Endocarditis	SINU	Sinusitis
GIT	Gastrointestinal (GI) tract infection	UR	Upper respiratory tract, pharyngitis, laryngitis, epiglottitis
IAB	Intraabdominal infection, not specified elsewhere	USI	Urinary System Infection
IC	Intracranial infection	VASC	Arterial or venous infection
JNT	Joint or bursa infection	VCUF	Vaginal cuff infection
LUNG	Other infection of the lower respiratory tract		

(Criteria for these sites can be found in Chapter 17 ([Surveillance Definitions for Specific Types of Infections](#)))

**Note:** [Appendix](#) contains a list of all NHSN operative procedure categories and the site-specific SSIs that may be attributable to each category.



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## SSI Numerator (SSI Event) Reporting

### Numerator Data:

All patients having any of the procedures included in the selected NHSN operative procedure category(s) are monitored for SSI. The [Surgical Site Infection \(SSI\)](#) form is completed for each SSI. If no SSI events are identified during the surveillance month, check the “Report No Events” field in the Missing PA Events tab of the Incomplete/Missing List.

The [Instructions for Completion of the Surgical Site Infection Form \(CDC 57.120\)](#) include brief instructions for collection and entry of each data element on the form. The [SSI form](#) includes patient demographic information and specific event details that pertain to the SSI event.

### SSI Event Reporting Instructions:

1. **Excluded organisms:** Well-known community associated organisms (organisms belonging to the following genera: *Blastomyces*, *Histoplasma*, *Coccidioides*, *Paracoccidioides*, *Cryptococcus* and *Pneumocystis*) and/or organisms associated with latent infections (for example, herpes, shingles, syphilis, or tuberculosis) are excluded from meeting SSI criteria.
2. **Attributing SSI to an NHSN operative procedure when there is evidence of infection at the time of the primary surgery:** The Present on Admission (POA) definition does not apply to the SSI protocol. If evidence of infection is present at the time of the procedure and the patient meets SSI criteria within the SSI surveillance period following the procedure, an SSI is attributed to the procedure (for guidance on PATOS determination, see PATOS reporting instruction below).
3. **Infection present at time of surgery (PATOS):** PATOS is a YES/NO field on the SSI event form. PATOS denotes that there is evidence of infection visualized (seen) during the surgical procedure to which the SSI is attributed. The evidence of infection must be noted intraoperatively and documented within the narrative portion of the operative note or report of surgery.

The patient does not have to meet the NHSN definition of an SSI at the time of the procedure, but there must be documentation that there is evidence of infection present at the time of surgery.

- a) Only select PATOS = YES if it applies to the depth of the SSI that is being attributed to the procedure. Example:
  - If a patient has evidence of an intraabdominal infection documented intraoperatively at the time of surgery and then later returns with an organ/space SSI the PATOS field would be selected as a YES.

- If a patient has evidence of an intraabdominal infection documented intraoperatively at the time of surgery and then later returns with a superficial or deep incisional SSI the PATOS field would be selected as a NO.
- b) Examples that indicate evidence of infection include but are not limited to: abscess, infection, purulence/pus, phlegmon, or “feculent peritonitis” documented in the operative report. An appendix that has ruptured will meet PATOS = YES, if the patient has a subsequent intraabdominal organ space SSI.
- c) The following verbiage alone without specific mention of infection does not meet the PATOS definition: colon perforation, contamination, necrosis, gangrene, fecal spillage, nicked bowel during procedure, or a note of inflammation.
- d) The use of the ending “itis” in an operative note/report of surgery does not automatically meet PATOS, as it may only reflect inflammation which is not infectious in nature (for example, diverticulitis, peritonitis, and appendicitis).
- e) Identification of an organism alone using culture or non-culture based microbiologic testing method or on a pathology report from a surgical specimen does not = PATOS (specifically, a positive culture/path report without surgical documentation of infection is not PATOS = YES).
- f) Wound class cannot be used for PATOS determination.
- g) Trauma resulting in a contaminated case does not necessarily meet the PATOS requirement. For example, a fresh gunshot wound to the abdomen may be a trauma with a high wound class but there would not be time for infection to develop.

**Examples of PATOS application:**

1. Patient is admitted with an acute abdomen. The patient is sent to the OR for an exploratory laparotomy (XLAP) where there is a finding of an abscess due to ruptured appendix and an appendix surgery (APPY) is performed. Patient returns two weeks later and meets criteria for an organ/space IAB SSI. The PATOS field would be selected as YES since an abscess was noted at time of surgery in the same tissue level as the subsequent SSI.
2. Patient is admitted with a ruptured diverticulum and a colon surgery (COLO) is performed. In the OR note the surgeon documents that there are multiple abscesses in the intraabdominal cavity. Patient returns three weeks later and meets criteria for a superficial incisional SSI. The PATOS field would be selected as NO since there was no documentation of evidence of infection of the superficial tissues at time of the COLO surgery.

3. During an unplanned cesarean section (CSEC) the surgeon nicks the bowel and there is contamination of the intraabdominal cavity. One week later the patient returns and meets criteria for an organ/space OREP SSI. The PATOS field would be selected as NO since there was no documentation of evidence of infection at the time of the CSEC. The colon nick was a complication but there was no infection present at time of surgery.
4. Patient undergoes a foot amputation (AMP) due to “dry-gangrene” of the foot from chronic ischemia. The patient returns two weeks later and meets criteria for a deep incisional SSI. The PATOS field would be selected as NO since there was no documentation of evidence of infection at time of the AMP. The word gangrene is not sufficient to qualify for infection.

**Note:** For more information about PATOS, see Quick Learn titled [“Surgical Site Infection \(SSI\) Event PATOS – Infection Present at Time of Surgery”](#)

4. **Multiple tissue levels are involved in the infection:** The type of SSI (superficial incisional, deep incisional, or organ/space) reported must reflect the deepest tissue level where SSI criteria is met during the surveillance period.
  - Report infection that involves the organ/space as an organ/space SSI, whether or not it also involves the superficial or deep incision sites.
  - Report infection that involves the superficial and deep incisional sites as a deep incisional SSI.
  - If an SSI started as a deep incisional SSI on day 10 of the SSI surveillance period and then a week later (day 17 of the SSI surveillance period) meets criteria for an organ space SSI, the date of event would be the date of the organ/ space SSI.
5. **Attributing SSI to a NHSN procedure when several are performed on different dates:** If a patient has several NHSN operative procedures performed on different dates, attribute the SSI to the most recently performed NHSN operative procedure.

**Note:** For multiple NHSN operative procedures performed within a 24 hour period, see [Denominator Reporting Instruction #9](#).

6. **Attributing SSI to NHSN procedures that involve multiple primary incision sites:** If multiple primary incision sites of the same NHSN operative procedure become infected, only report as a single SSI, and assign the type of SSI (superficial incisional, deep incisional, or organ/space) that represents the deepest tissue level where SSI criteria is met at any of the involved primary incision sites during the surveillance period. Examples:

- If one laparoscopic incision meets criteria for a superficial incisional SSI and another meets criteria for a deep incisional SSI, only report one deep incisional SSI.
  - If one or more laparoscopic incision sites meet criteria for superficial incisional SSI but the patient also has an organ/space SSI related to the laparoscopic procedure, only report one organ/space SSI.
  - If an operative procedure is limited to a single breast and involves multiple incisions in that breast that become infected, only report a single SSI.
  - In a colostomy formation or reversal (take down) procedure, the stoma and other abdominal incision sites are considered primary incisions. If both the stoma and another abdominal incision site develop superficial incisional SSI, report only as one SSI (SIP).
7. **Attributing SSI to NHSN procedures that have secondary incision sites:** Certain procedures can involve secondary incisions (specifically the following, BRST, CBGB, CEA, FUSN, PVBY, REC, and VSHN). The surveillance period for all secondary incision sites is 30 days, regardless of the required deep incisional or organ/space SSI surveillance period for the primary incision site(s) ([Table 2](#)). Procedures meeting this designation are reported as only one operative procedure. For example:
- A saphenous vein harvest incision site in a CBGB procedure is considered the secondary incision site. One CBGB procedure is reported, the saphenous vein harvest site is monitored for 30 days after surgery for SSI, and the chest incision is monitored for 90 days after surgery for SSI. If the patient develops an SSI of the leg site (such as a superficial incisional SSI) and an SSI of the chest site (such as a deep incisional SSI) two SSIs are reported.
  - A tissue harvest site (for example, Transverse Rectus Abdominis Myocutaneous [TRAM] flap) in a BRST procedure is considered the secondary incision site. One BRST procedure is reported, and if the secondary incision site gets infected, report as either SIS or DIS as appropriate.
8. **SSI detected at another facility:** It is required that if an SSI is detected at a facility other than the one in which the operation was performed, the IP of the index facility will be provided with enough detail so the infection can be reported to NHSN. When reporting the SSI, the index facility should indicate that Detected = RO (Readmission to facility other than where procedure was performed).
9. **SSI attribution after multiple types of NHSN procedures are performed during a single trip to the OR:** If more than one NHSN operative procedure category was performed through a single incision/laparoscopic sites during a single trip to the operating room, attribute the SSI to the procedure that is thought to be associated with the infection. If it is not clear, as is

often the case when the infection is an incisional SSI, use the NHSN Principal Operative Procedure Category Selection Lists ([Table 4](#)) to select the operative procedure to which the SSI should be attributed. For example, if a patient develops SSI after a single trip to the OR in which both a COLO and SB were performed, and the source of the SSI is not apparent, assign the SSI to the COLO procedure.

**10. SSI following invasive manipulation/accession of the operative site:** An SSI will not be attributed if the following 3 criteria are ALL met:

- during the post-operative period the surgical site is without evidence of infection and,
- an invasive manipulation/accession of the site is performed for diagnostic or therapeutic purposes (for example, needle aspiration, accession of ventricular shunts, accession of breast expanders) and,
- an infection subsequently develops in a tissue level which was entered during the manipulation/accession.

Tissue levels that are BELOW the deepest entered level will be eligible for SSI. For example, a superficial debridement following a COLO procedure, where the muscle/fascia and organ/space was not entered, a subsequent organ/space SSI following the debridement may be an SSI attributable to the index COLO procedure. This reporting instruction does NOT apply to closed manipulation (for example, closed reduction of a dislocated hip after an orthopedic procedure). Invasive manipulation does not include wound packing or changing of wound packing materials as part of postoperative care.

**11. Reporting instructions for post-operative infection scenarios:** An SSI that otherwise meets the NHSN definitions should be reported to NHSN without regard to post-operative accidents, falls, inappropriate showering or bathing practices, or other occurrences that may or may not be attributable to patients' intentional or unintentional postoperative actions. SSI should also be reported regardless of the presence of certain skin conditions (for example, dermatitis, blister, impetigo) that occur near an incision, and regardless of the possible occurrence of a "seeding" event from an unrelated procedure (for example, dental work). This instruction concerning various postoperative circumstances is necessary to reduce subjectivity and data collection burden.

Table 4. NHSN Principal Operative Procedure Category Selection List

(The categories with the highest risk of SSI are listed before those with lower risks.)

Priority	Category	Abdominal Operative Procedures
1	LTP	Liver transplant
2	COLO	Colon surgery
3	BILI	Bile duct, liver or pancreatic surgery
4	SB	Small bowel surgery
5	REC	Rectal surgery
6	KTP	Kidney transplant
7	GAST	Gastric surgery
8	AAA	Abdominal aortic aneurysm repair
9	HYST	Abdominal hysterectomy
10	CSEC	Cesarean section
11	XLAP	Laparotomy
12	APPY	Appendix surgery
13	HER	Herniorrhaphy
14	NEPH	Kidney surgery
15	VHYS	Vaginal hysterectomy
16	SPLE	Spleen surgery
17	CHOL	Gall bladder surgery
18	OVRY	Ovarian surgery
Priority	Category	Thoracic Operative Procedures
1	HTP	Heart transplant
2	CBGB	Coronary artery bypass graft with donor incision(s)
3	CBGC	Coronary artery bypass graft, chest incision only
4	CARD	Cardiac surgery
5	THOR	Thoracic surgery
Priority	Category	Neurosurgical (Brain/Spine) Operative Procedures
1	VSHN	Ventricular shunt
2	CRAN	Craniotomy
3	FUSN	Spinal fusion
4	LAM	Laminectomy
Priority	Category	Neck Operative Procedures
1	NECK	Neck surgery
2	THYR	Thyroid and or parathyroid surgery

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## SSI Denominator for Procedure Reporting

### Denominator Data:

Denominator data are collected for each individual NHSN operative procedure category selected for monitoring on the [Patient Safety Monthly Reporting Plan](#). For all patients having any of the procedures included in the NHSN operative procedure category(s) for which SSI surveillance is being performed during the month, complete the [Denominator for Procedure](#) form. An operative procedure code is required to determine the correct NHSN operative procedure category to be reported. The [Instructions for Completion of the Denominator for Procedure Form \(57.121\)](#) include brief instructions for collection and entry of each data element on the form.

### Denominator Reporting Instructions:

1. **Closure type:** Incisional closure type does not exclude a procedure from SSI surveillance. All otherwise eligible procedures are included in the denominator reporting, regardless of closure type. Therefore, both primarily closed procedures and those that are not closed primarily must be entered into the denominator data for procedures in the facility's monthly reporting plan. If a procedure has multiple incision sites and any of the incisions are closed primarily then the procedure is entered as a primary closure. Any SSIs attributable to either primarily closed or non-primarily closed procedures must be reported.

**Note:** If a patient returns to the OR within 24 hours of the end of the first procedure, assign the surgical wound closure that applies when the patient leaves the OR from the first operative procedure.

2. **Wound class:** A high wound class is not an exclusion for denominator reporting. If the procedure meets the definition of an NHSN operative procedure it should be reported in the denominator data regardless of wound class. NHSN will use the wound class for risk adjustment, as appropriate.
3. **Different operative procedure categories performed during same trip to the OR:** If procedures in more than one NHSN operative procedure category are performed during the same trip to the operating room through the same or different incisions, a [Denominator for Procedure](#) form is reported for each NHSN operative procedure category being monitored. For example, if a CARD and CBGC are done through the same incision, a [Denominator for Procedure](#) form is reported for each. In another example, if following a motor vehicle accident, a patient has an open reduction of fracture (FX) and splenectomy (SPLE) performed during the same trip to the operating room and both procedure categories are being monitored, complete a [Denominator for Procedure](#) form for each.

**EXCEPTION:** If a patient has both a CBGC and CBGB during the same trip to the operating room, report only as a CBGB. Only report as a CBGC if there is only a chest incision. CBGB and CBGC are never reported for the same patient for the same trip to the operating room.

4. **Duration of the procedure when more than one category of NHSN operative procedure is performed through the same incision:** If more than one NHSN operative procedure category is performed through the same incision during the same trip to the operating room, record the combined duration of all procedures, which is the time from procedure/surgery start time to procedure/surgery finish time. For example, if a CBGC and a CARD are performed on a patient during the same trip to the operating room, the time from start time to finish time is reported for both operative procedures.
5. **Duration of operative procedures if patient has two different NHSN operative procedures performed via separate incisions on the same trip to the OR:** Try to determine the correct duration for each separate procedure (if this is documented); otherwise, take the time for both procedures and split it evenly between the two.
6. **Same operative procedure category but different ICD-10-PCS or CPT codes during same trip to the OR:** If procedures of different ICD-10-PCS or CPT codes from the same NHSN operative procedure category are performed through the same incision/laparoscopic sites, record only one procedure for that category. For example, a facility is performing surveillance for CARD procedures. A patient undergoes a replacement of both the mitral and tricuspid valves during the same trip to the operating room. Complete one CARD [Denominator for Procedure](#) form because both procedures are in the same operative procedure category (CARD).
7. **For revision HPRO and KPRO procedures:** If total or partial revision HPRO or KPRO is performed, determine if any of the ICD-10-PCS/CM diagnosis or procedure codes indicating infection (see link below) were assigned to the index joint in the 90 days prior to and including the index HPRO or KPRO revision. If any of the specified codes are assigned to the procedure, indicate on the [Denominator for Procedure](#) form that the revision was associated with 'prior infection at index joint' = YES. The 'prior infection at index joint' variable only applies to *revision* HPRO and KPRO. The cases designated 'prior infection at index joint' = YES should be validated before the procedure is submitted to NHSN. This validation is necessary to ensure the code is aligned with the index joint revision. The ICD-10-PCS/CM code mapping guidance is found on the NHSN website in the SSI section under "[Supporting Materials](#)."
8. **Same NHSN operative procedure category via separate incisions:** For operative procedures that can be performed via separate incisions during same trip to operating room (specifically the following, AMP, BRST, CEA, FUSN, FX, HER, HPRO, KPRO, LAM, NEPH, OVRY, PVBY), separate [Denominator for Procedure](#) forms are completed. To document the duration of the procedures, indicate the procedure/surgery start time to procedure/surgery finish time for



each procedure separately or, alternatively, take the total time for the procedures and split it evenly between procedures.

**Notes:**

- A COLO procedure with a colostomy formation is entered as one COLO procedure.
  - Laparoscopic hernia repairs are considered one procedure, regardless of the number of hernias that are repaired in that trip to the OR. In most cases there will be only one incision time documented for this procedure. If more than one time is documented, total the durations. Open (specifically, non-laparoscopic) hernia repairs are reported as one procedure for each hernia repaired via a separate incision, (specifically, if two incisions are made to repair two defects, then two procedures will be reported). It is anticipated that separate incision times will be recorded for these procedures. If not, take the total time for both procedures and split it evenly between the two.
9. **More than one operative procedure through same incision/surgical space within 24 hours:** When a patient has more than one operative procedure via the same incision or into the same surgical space and the second procedure start time is within 24 hours of the first procedure finish time, report only one [Denominator for Procedure](#) form for the original procedure, combining the durations for both procedures based on the procedure start times and finish times for both procedures. For example, a patient has a CBGB lasting 4 hours. He returns to the OR six hours later for another operative procedure via the same incision (for example, CARD). The second operation has duration of 1.5 hours. Record the operative procedure as one CBGB and the duration of operation as 5 hour 30 minutes. If the wound class has changed, report the higher wound class. If the ASA class has changed, report the higher ASA class. Do not report the CARD procedure in your denominator data.
- Note:** When the patient returns to the OR within 24 hours of the end of the first procedure assign the surgical wound closure technique that applies when the patient leaves the OR from the first operative procedure.
10. **Patient expires in the OR:** If a patient expires in the operating room, do not complete a [Denominator for Procedure](#) form. This operative procedure is excluded from the denominator.

11. **HYST or VHYS:** For the purpose of NHSN SSI reporting, hysterectomy procedure codes that involve an incision made into the abdomen, including trocar insertion, are listed in the abdominal hysterectomy (HYST) category. The correct CPT hysterectomy procedure codes should be assigned by a medical record coder using current guidelines and conventions. Hysterectomy procedures should be designated as an HYST or VHYS, based on the approach of the procedure (5th character of the ICD-10 operative procedure code) that the facility's medical coder assigns to the hysterectomy procedure.

Procedure	ICD-10 5 <sup>th</sup> Character	Approach
HYST	0	Open
	4	Percutaneous endoscopic
	F	Via natural or artificial opening with percutaneous endoscopic assistance
VHYS	7	Via natural or artificial opening
	8	Via natural or artificial opening with endoscopic

## Data Analyses

Once surveillance data are collected for procedure and surgical site infections (SSIs) and entered into NHSN, they can be analyzed/visualized in various ways including descriptive analysis reports for both denominator and numerator data and the Standardized Infection Ratio (SIR) reports.

### Types of SSI Analyses Reports

#### Descriptive analysis reports

Descriptive analysis options of numerator and denominator data are available in the NHSN application, such as line listings, frequency tables, and bar and pie charts.

A line list, frequency table, and rate table are also available to analyze pathogens and antimicrobial susceptibility data reported for each SSI. Quick reference guides on these reports can be found at the bottom of this page: <https://www.cdc.gov/nhsn/ps-analysis-resources/reference-guides.html>

#### SSI Rate Reports

SSI rates per 100 operative procedures are calculated by dividing the number of SSIs by the number of specific operative procedures and multiplying the results by 100. SSIs will be included in the numerator of a rate based on the date of procedure, not the date of event. Using the advanced analysis feature of the NHSN application, SSI rate calculations can be performed separately for the different types of operative procedures and stratified by the basic risk index. The universal exclusion criteria and SIR inclusion criteria do not apply in the calculation of the SSI rate. The SSI rate includes PATOS events, outpatient procedures and excludes procedures with non-primary closure techniques. More information regarding the basic risk index calculation can be found in the paper: <https://www.cdc.gov/nhsn/pdfs/datastat/2009NHSNReport.pdf>

#### SSI SIR Reports

The Standardized Infection Ratio (SIR) is calculated by dividing the number of observed infections by the number of predicted infections. The SIR will be calculated only if the number of predicted HAIs (“numPred” in the NHSN application) is  $\geq 1$  to help enforce a minimum precision criterion.

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Predicted (P) HAIs}}$$

The number of predicted infections is calculated using SSI probabilities estimated from multivariate logistic regression models constructed from NHSN data during a baseline time period, which represents a standard population’s SSI experience<sup>3</sup>. The procedures/SSI occurring in adults are modeled separately from those occurring in pediatrics.

The SSI SIR can be generated for individual procedures for different summary time periods. While the SSI SIR can be calculated for single procedure categories and for specific surgeons, the measure also allows you to summarize your data across multiple procedure categories while adjusting for differences in the estimated probability of infection among the patients included across the procedure categories. For example, you will be able to obtain one SSI SIR adjusting for all procedures reported. Alternatively, you can obtain one SSI SIR for all COLO only within your facility.

### Additional Notes about SSI SIRs

1. **Closure technique:** All of the SSI SIRs that use the 2006-2008 SSI baseline data will include only those procedures that were reported with a primary closure method. All of the SSI SIRs that use the 2015 baseline data will include all procedures that were reported with primary or non-primary closure methods.
2. **Infection present at time of surgery (PATOS):** All of the SSI SIR reports that use the 2006-2008 SSI baseline will include SSIs that are reported as present at time of surgery. This means that the PATOS event is included in the numerator of the SIR and the procedure from which the event occurred is included in the denominator of the SIR. All of the SSI SIR reports that use the new 2015 SSI baseline will exclude SSIs that are reported as present at time of surgery from both the numerator and denominator. Therefore, the PATOS event is excluded in the numerator of the SIR and the procedure from which the event occurred is excluded in the denominator of the SIR.
3. **SIRs based on Procedure Date:** SSIs will be included in the numerator of an SIR based on the date of procedure, not the date of event. This is because the procedure carries the risk for the infection/SSI.

There are three main SSI SIR Models available from NHSN, each briefly described in the table below. The first two models, the All SSI SIR and the Complex A/R SSI SIR models, are available for all NHSN operative procedures/SSI occurring in both adults and pediatric patients, while the third model, the Complex 30-day SSI SIR is available for colon and abdominal hysterectomy procedures/SSI occurring in adults only. Please see the NHSN SIR Guide for more model specific information:

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

Table 1: Inclusion Criteria of SSI in SIR Models

All SSI SIR Model	<ul style="list-style-type: none"> <li>• Includes separate models for inpatient and hospital outpatient procedures (under the 2015 baseline)</li> <li>• Includes Superficial, Deep &amp; Organ/Space SSIs</li> <li>• Superficial &amp; Deep incisional SSIs limited to primary incisional SSIs only</li> <li>• Includes SSIs identified on admission, readmission &amp; via post-discharge surveillance</li> </ul>
Complex A/R SSI Model	<ul style="list-style-type: none"> <li>• Includes <u>only</u> Deep incisional primary SSIs &amp; Organ/Space SSIs</li> <li>• Includes <u>only</u> SSIs identified on Admission/Readmission to facility where procedure was performed</li> <li>• Includes <u>only</u> inpatient procedures</li> <li>• Used for the HAI Progress Report, published annually by CDC</li> </ul>
Complex 30-day SSI model (used for CMS IPPS)	<ul style="list-style-type: none"> <li>• Includes only in-plan, inpatient COLO and HYST procedures in adult patients (specifically, <math>\geq 18</math> years of age)</li> <li>• Includes only deep incisional primary SSIs and organ/space SSIs with an event date within 30 days of the procedure</li> <li>• Includes SSIs identified on admission, readmission &amp; via post-discharge surveillance</li> <li>• <b>Uses Diabetes, ASA score, gender, age, BMI, oncology hospital and closure technique to determine risk for COLO (under the 2015 baseline, BS2)</b> <b>Uses Diabetes, ASA score, age, BMI and oncology hospital to determine risk for HYST (under the 2015 baseline, BS2)</b></li> <li>• <b>NOTE:</b> The Complex 30-day SSI model, under the 2006-2008 baseline, BS1, uses only age and ASA to determine risk for both COLO and HYST (BS1 applies to data up to 2016)</li> <li>• Used only for CMS IPPS reporting and for public reporting on Hospital Compare</li> </ul>

For more information on how to generate a line listing report to determine SSI inclusion criteria, please see the quick reference guide: <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/ssi-events-line-list-qrg.pdf>

In addition to the SSI inclusion criteria listed above, there are a set of exclusion criteria that are applied to procedures and associated events. The “Line List of Procedures Excluded from the SIR” is an NHSN analysis report that is intended to assist users in reviewing the procedures that are excluded from the SIRs and the reasons for the exclusion. Users can use the quick reference guide, <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/line-list-procedures-excluded-sir.pdf> to generate and interpret this report. This list of exclusion criteria, also called the universal exclusion criteria, applies to procedures regardless of the SSI model. Often, the reason for

procedure exclusion from the SIRs is due to data quality issues, which can be addressed, if applicable.

**Table 2: Universal Exclusion Criteria for NHSN Operative Procedures**

<b>Universal Exclusion Criteria Variables</b>	<b>Definition of Variables</b>
exclMissingVarInd	Procedure excluded for missing risk factors used in risk adjustment of applicable procedure category for SSI models
exclMissingVarList	List of missing risk factors used in risk adjustment of applicable procedure category for SSI models
exclDurThresholdInd	Procedure excluded due to procedure duration being less than 5 minutes or exceeding the IQR5 value. Please see the list of procedure duration cutoff points in the SSI section of the SIR Guide: <a href="https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf">https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf</a>
exclAgeGT109Ind	Procedure excluded if the patient's age at time of procedure is 109 years or older
exclOutpatientInd	Procedure excluded because it was reported as an outpatient procedure; NOTE: all outpatient procedures are excluded from the inpatient SSI SIRs calculated using the 2015 baseline. There are separate SIR reports for procedures performed in Hospital Outpatient Procedure Departments (HOPD).
exclPedIndcmpx30d	Procedures performed in pediatric patients are excluded from the Complex 30-day model
exclGenderOth	Procedure excluded because patient's gender was not reported as male or female (specifically, gender = O)
exclInvalidJointRepHemi	Procedure is excluded if procedure code is KPRO or HPRO and (jntRepHemi=totrev or jntRepTot=partrev) (and procedure date is January 1, 2015-December 31, 2015).
exclBMIThresholdInd	Procedure excluded if the adult patient's BMI is less than 12 or greater than 60. In pediatric patients > 18 years if BMI is less than 10.49 or greater than 65.79**

\*\*This BMI exclusion applies to all procedures on pediatric patients, in both applicable SSI models (All SSI and Complex A/R). CDC Growth Charts are used to assess BMI in pediatric patients, calculated using height, weight, age and gender. More information can be found here:

<https://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm>

## NHSN Group Analysis:

NHSN Group Users can perform the same analysis as facility level users in NHSN. A few helpful tools in NHSN for groups are listed in the resources below. These tools are guides on how to start and join a Group; how to create a template to request data from facilities; how to determine the level of access granted by the facility following the previous steps, and how to analyze the facilities data.

### **Group Analysis Resources:**

- NHSN Group Users weblink: <https://www.cdc.gov/nhsn/group-users/index.html>
- Group User's Guide to the Membership Rights Report:  
<https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/GroupAnalysisWebinar.pdf>
- Group User's Guide to the Line Listing- Participation Alerts:  
<https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/group-alerts.pdf>

### **Additional Resources:**

- Analysis Resources:
  - <https://www.cdc.gov/nhsn/ps-analysis-resources/index.html>
  - <https://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html>
- NHSN Training: <https://www.cdc.gov/nhsn/training/index.html>

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- <sup>2</sup>Magill, S.S., et al., "Changes in Prevalence of Health Care-Associated Infection in U.S. Hospitals". *New England Journal of Medicine*, 379(18): (2018): 1732-44.
- <sup>3</sup>CDC National and State Healthcare-Associated Infections Progress Report, published October 2019, available from: <https://www.cdc.gov/hai/data/portal/progress-report.html>
- <sup>4</sup>Awad, S.S., "Adherence to surgical care improvement project measures and post-operative surgical site infections". *Surgical Infection (Larchmt)*, 13(4): (2012): 234-7.
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## APPENDIX.

## Specific event types available for SSI attribution by NHSN procedure category

Operative Procedure Category	Specific Event Type
<b>AAA - Abdominal aortic aneurysm repair</b>	DIP - Deep Incisional Primary ENDO - Endocarditis GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>AMP - Limb amputation</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary JNT - Joint or bursa SIP - Superficial Incisional Primary
<b>APPY - Appendix surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary
<b>AVSD - AV shunt for dialysis</b>	DIP - Deep Incisional Primary SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>BILI - Bile duct, liver or pancreatic surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary
<b>BRST - Breast surgery</b>	BRST - Breast abscess or mastitis DIP - Deep Incisional Primary DIS - Deep Incisional Secondary SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary
<b>CARD - Cardiac surgery</b>	BONE - Osteomyelitis CARD - Myocarditis or pericarditis DIP - Deep Incisional Primary ENDO - Endocarditis IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract MED - Mediastinitis SIP - Superficial Incisional Primary VASC - Arterial or venous infection

Operative Procedure Category	Specific Event Type
<b>CBGB - Coronary bypass with chest &amp; donor incisions</b>	BONE - Osteomyelitis CARD - Myocarditis or pericarditis DIP - Deep Incisional Primary DIS - Deep Incisional Secondary ENDO - Endocarditis IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract MED - Mediastinitis SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary VASC - Arterial or venous infection
<b>CBGC - Coronary bypass graft with chest incision</b>	BONE - Osteomyelitis CARD - Myocarditis or pericarditis DIP - Deep Incisional Primary ENDO - Endocarditis IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract MED - Mediastinitis SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>CEA - Carotid endarterectomy</b>	DIP - Deep Incisional Primary DIS - Deep Incisional Secondary SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary VASC - Arterial or venous infection
<b>CHOL - Gallbladder surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary
<b>COLO - Colon surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection

Operative Procedure Category	Specific Event Type
<b>CRAN - Craniotomy</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary IC - Intracranial infection MEN - Meningitis or ventriculitis SINU - Sinusitis SIP - Superficial Incisional Primary
<b>CSEC - Cesarean section</b>	DIP - Deep Incisional Primary EMET - Endometritis GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection
<b>FUSN - Spinal fusion</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary DIS - Deep Incisional Secondary DISC - Disc space infection IAB - Intraabdominal, not specified elsewhere IC - Intracranial infection LUNG - Other infections of the lower respiratory tract MEN - Meningitis or ventriculitis SA - Spinal abscess/infection SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary
<b>FX - Open reduction of fracture</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary JNT - Joint or bursa SIP - Superficial Incisional Primary
<b>GAST - Gastric surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract SIP - Superficial Incisional Primary
<b>HER - Herniorrhaphy</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary

Operative Procedure Category	Specific Event Type
<b>HPRO - Hip prosthesis</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary PJI - Periprosthetic joint infection SIP - Superficial Incisional Primary
<b>HTP - Heart transplant</b>	BONE - Osteomyelitis CARD - Myocarditis or pericarditis DIP - Deep Incisional Primary ENDO - Endocarditis IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract MED - Mediastinitis SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>HYST - Abdominal hysterectomy</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary VCUF - Vaginal cuff infection
<b>KPRO - Knee prosthesis</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary PJI - Periprosthetic joint infection SIP - Superficial Incisional Primary
<b>KTP - Kidney transplant</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection VASC - Arterial or venous infection
<b>LAM - Laminectomy</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary DISC - Disc space infection IAB - Intraabdominal, not specified elsewhere IC - Intracranial infection MEN - Meningitis or ventriculitis SA - Spinal abscess/infection SIP - Superficial Incisional Primary

Operative Procedure Category	Specific Event Type
<b>LTP - Liver transplant</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>NECK - Neck surgery</b>	DIP - Deep Incisional Primary EAR - Ear, mastoid infection ORAL - Oral cavity infection (mouth, tongue, or gums) SIP - Superficial Incisional Primary UR - Upper respiratory tract infection, pharyngitis, laryngitis, epiglottitis
<b>NEPH - Kidney surgery</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection
<b>OVRY - Ovarian surgery</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection
<b>PACE - Pacemaker surgery</b>	CARD - Myocarditis or pericarditis DIP - Deep Incisional Primary ENDO - Endocarditis IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary VASC - Arterial or venous infection
<b>PRST - Prostate surgery</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection

Operative Procedure Category	Specific Event Type
<b>PVBY - Peripheral vascular bypass surgery</b>	DIP - Deep Incisional Primary DIS - Deep Incisional Secondary SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary VASC - Arterial or venous infection
<b>REC - Rectal surgery</b>	DIP - Deep Incisional Primary DIS - Deep Incisional Secondary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary USI - Urinary System Infection
<b>SB - Small bowel surgery</b>	DIP - Deep Incisional Primary GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection
<b>SPLE - Spleen surgery</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere SIP - Superficial Incisional Primary
<b>THOR - Thoracic surgery</b>	BONE - Osteomyelitis BRST - Breast abscess or mastitis DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere LUNG - Other infections of the lower respiratory tract SIP - Superficial Incisional Primary
<b>THYR - Thyroid and/or parathyroid surgery</b>	DIP - Deep Incisional Primary EAR - Ear, mastoid infection GIT - Gastrointestinal tract SIP - Superficial Incisional Primary UR - Upper respiratory tract infection, pharyngitis, laryngitis, epiglottitis

Operative Procedure Category	Specific Event Type
<b>VHYS - Vaginal hysterectomy</b>	DIP - Deep Incisional Primary IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection VCUF - Vaginal cuff infection
<b>VSHN - Ventricular shunt</b>	BONE - Osteomyelitis DIP - Deep Incisional Primary DIS - Deep Incisional Secondary IAB - Intraabdominal, not specified elsewhere IC - Intracranial infection LUNG – Other infections of the lower respiratory tract MEN - Meningitis or ventriculitis SA - Spinal abscess/infection SIP - Superficial Incisional Primary SIS - Superficial Incisional Secondary
<b>XLAP - Exploratory laparotomy</b>	DIP - Deep Incisional Primary EMET - Endometritis GIT - Gastrointestinal tract IAB - Intraabdominal, not specified elsewhere OREP - Deep pelvic tissue infection or other infection of the male or female reproductive tract SIP - Superficial Incisional Primary USI - Urinary System Infection