

Missouri Healthcare-Associated Infection Reporting System (MHIRS)

Surgical Site Infection (SSI) Reporting

A. INTRODUCTION

An estimated 27 million surgical procedures are performed each year in the US.¹ According to data reported to the National Nosocomial Infections Surveillance (NNIS) system, SSIs are the third most common healthcare associated infection, accounting for 14% to 16% of all healthcare-associated infections among hospitalized patients.² From 1986 to 1996, hospitals conducting SSI surveillance in the NNIS system reported 15,523 SSIs following 593,344 operations (CDC, unpublished data).

Despite the many advances in infection control practices, SSIs still cause a substantial amount of morbidity and mortality among hospitalized patients. Among surgical patients, 38% of all reported infections were SSIs. When surgical patients with SSIs died, 77% of the deaths were reported to be related to the infection, and the majority (93%) were serious infections involving organs or spaces accessed during the operation (CDC, unpublished data).

Surveillance of SSIs with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk.^{3,4} 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.⁵ The Centers for Disease Control and Prevention's (CDC) recommendations for preventing SSIs were published in 1999.⁶

Risk adjustment is recognized as a very important component of monitoring SSIs. Every hospital has a different patient mix and it is important to calculate rates that are adjusted for procedure and intrinsic patient risk. This helps to eliminate variables that influence infection rates that facilities cannot control. The system used in Missouri to calculate risk-adjusted SSI rates is the same as that used by the CDC. On every patient undergoing the procedures outlined in Section B below, a record is generated that includes three risk factors for SSIs: wound class, duration of operation, and the American Society of Anesthesiologists' (ASA) score (a composite score for classifying patients undergoing specific procedures). Risk indices are calculated according to the number of risk factors present.

The state of Missouri requires that hospitals and ambulatory surgical centers (ASCs) electronically report numerator and denominator data for each of the following procedures:

- **Hospitals:** abdominal hysterectomy, hip prosthesis, and coronary artery bypass graft with both chest and donor site incisions
- **ASCs:** breast surgery and herniorrhaphy

Data methods and definitions used in this manual section are mainly those established by the CDC.

B. REQUIREMENTS

1. SSI surveillance will be performed on the following surgical procedures (Note: All of the ICD-9-CM codes included in the operative procedure category that are performed on patients must be included in the surveillance):

- **Hospitals:**
 - o Abdominal hysterectomy (HYST) – removal of uterus through an abdominal incision.
ICD-9-CM Codes: 68.31, 68.39, 68.41, 68.49, 68.61, 68.69

- o Hip prosthesis (HPRO) – arthroplasty of hip; includes total, partial, and revision procedures. ICD-9-CM Codes: 00.85-00.87, 00.70-00.73, 81.51-81.53
- o Coronary artery bypass graft with **both** chest and donor site incisions (CBGB) – chest procedure to perform direct revascularization of the heart; includes obtaining suitable vein from donor site for grafting. ICD-9-CM Codes: 36.10-36.14, 36.19
- **ASCs**
 - o Breast surgery (BRST) – Excision of lesion or tissue of breast including radical, modified, or quadrant resection, lumpectomy, incisional biopsy, or mammoplasty. ICD-9-CM Codes: 85.12, 85.20-85.23, 85.31-85.36, 85.41-85.48, 85.50, 85.53-85.54, 85.55, 85.6, 85.70-85.76, 85.79, 85.93-85.96 and the equivalent Current Procedural Terminology (CPT) codes
 - o Herniorrhaphy (HER) – repair of inguinal, femoral, umbilical, or anterior abdominal wall hernia; does not include repair of diaphragmatic or hiatal hernia or hernias at other body sites. ICD-9-CM Codes: 17.11-17.13, 17.21-17.24, 53.00-53.05, 53.10-53.17, 53.21, 53.29, 53.31, 53.39, 53.41-53.43, 53.49, 53.51, 53.59, 53.61-53.63, 53.69 and the equivalent CPT codes

Note: CPT codes corresponding to the ICD-9-CM codes may be found in Attachment SSI-1.

2. Surveillance Method:

SSI monitoring requires active, patient-based, prospective surveillance of operative procedure-associated infections and their corresponding denominator data by a trained infection control professional (ICP). This means that the ICP should seek out infections during a patient's stay by screening a variety of data sources, such as laboratory, pharmacy, admission/discharge/transfer, radiology/imaging, and pathology databases, and patient charts, including history and physical notes, nurses/physicians notes, temperature charts, etc. Others may be trained to screen data sources for these infections, but the ICP must make the final determination. Post-discharge surveillance methods to detect SSIs following in- and outpatient operative procedures, as specified in the CDC National Healthcare Safety Network (NHSN), are highly encouraged. These methods include 1) direct examination of patients' wounds during follow-up visits to either surgery clinics or physicians' offices, 2) review of medical records or surgery clinic patient records, 3) surgeon surveys by mail or telephone, and 4) patient surveys by mail or telephone (though patients may have a difficult time assessing their infections).⁶

Patients who undergo one of the MHIRS operative procedures are monitored for the occurrence of SSIs from the date of the operative procedure until discharge. The **minimum** requirements for post-discharge surveillance of these procedures follow:

- The healthcare provider has a process to follow up for SSIs (New)

CODE	OPERATIVE PROCEDURE	SURVEILLANCE
Hyst	Abdominal Hysterectomy	30 Days
Brst	Breast Surgery	90 Days
CBGB	Coronary Artery By Pass Graph w/ Chest and Donor Site	90 Days
Her	Herniorrhaphy	90 Days
HPRO	Hip prosthesis	90 Days

- Post-discharge surveillance by hospitals includes, at a minimum, review of readmission data to identify potential SSIs.
- Post-discharge surveillance by ASCs includes, at a minimum, a process to follow up with the physician(s) who performed the surgery to identify potential SSIs.
- The healthcare provider has a system for reporting identified SSI(s) to the hospital or ASC where the original surgery was performed.

3. Reporting to DHSS

- The following information will be electronically submitted monthly to the DHSS on **each** patient undergoing the above-mentioned procedures using MHIRS at <http://www.health.mo.gov/data/mhirs/index.php>
 - o Operative procedure
 - o Patient's medical record number
 - o Procedure date
 - o ASA score
 - o Wound class
 - o Duration of surgery (hour and minutes)
 - o For hip prosthesis, indicate if it is a total primary, partial primary, total revision, or partial revision
 - o Surgical site infection (no/yes)
- Reports must be transmitted to the DHSS, via MHIRS, within 60 days of the end of the reporting month.
- If a SSI is identified after the monthly report was submitted:
 - o Access the monthly report in question,
 - o Locate the patient's information (medical record number and procedure date)
 - o Add the surgical site infection information ("yes"), and
 - o Resubmit the monthly report using MHIRS.

4. Optional Tools to Collect Data

Hospitals may use any appropriate system to capture SSI related information. The following optional forms may be used to collect the required data:

- Operative Procedure/Surgical Site Infection Monthly Report Form (Figure SSI-1 or Figure SSI-2). Please note: these forms contain both numerator and denominator data.

C. DEFINITIONS

- **ASA Classification:** An assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Physical Status Classification System.
 - Code - Patient's preoperative physical condition
 1. A normal healthy patient
 2. A patient with mild systemic disease
 3. A patient with severe systemic disease
 4. A patient with severe systemic disease that is a constant threat to life
 5. A moribund patient who is not expected to survive without the operation.
 - If the patient goes to OR more than once during the same admission, and procedures are performed through the same incision, report the highest ASA classification recorded.
- **Implant:**

A nonhuman-derived object, material, or tissue that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes. Examples include: porcine or synthetic heart valves, mechanical heart, metal rods, mesh, sternal wires, screws, cements, and other devices.
- **Inpatient:**

A patient whose date of admission to the healthcare facility and the date of discharge are **different** calendar days.
- **Incisional Closure Type: (New 1/2014)**
 - **Non-primary Closure:**
 - Is a closure that is other than primary and includes surgeries in which the superficial layers are left completely open during the original surgery and therefore cannot be classified as having primary closure. For surgeries with non-primary closure, the deep tissue layers may be closed by some means (with the superficial layers left open), or the deep and superficial layers may both be left completely open.
 - **Primary Closure:**
 - Is a closure of all tissue levels during the original surgery, regardless of the presence of wires, wicks, drains, or other devices or objects extruding through the incision.
- **Operative Procedure: (New 1/2014)**
 - An operative procedure is a procedure: 1) that is performed on a patient who is an inpatient or an outpatient; and 2) takes place during an operation where a surgeon makes at least one incision through the skin or mucous membrane, including laparoscopic approach, or reoperation via an incision that was left open during a prior operative procedure and takes place in an operating room (OR) as defined below.

NOTE: As of 2014, incisional closure is NO LONGER a part of the NHSN operative procedure definition; all otherwise eligible procedures are included, regardless of closure type.

Principle Operative Procedure Selection Lists

The following lists are derived from the NHSN Operative Procedure Categories. The operative procedures with the highest risk of surgical site infection are listed before those with a lower risk.

Priority	Abdominal Operations
1	Small bowel surgery
2	Kidney transplant
3	Liver transplant
4	Biliary surgery
5	Rectal surgery
6	Colon surgery
7	Gastric surgery
8	Cesarean section
9	Spleen surgery
10	Appendectomy
11	Abdominal hysterectomy
12	Ovarian surgery
13	Hernia repair
14	Cholecystectomy
15	Abdominal aortic aneurysm repair
16	Kidney surgery
17	Laparotomy
Priority	Thoracic Operations
1	Heart transplant
2	Coronary artery bypass graft and donor site
3	Coronary artery bypass graft, chest only
4	Cardiac surgery
5	Thoracic surgery
Priority	Neurosurgical (Spine) Operations
1	Spinal refusion
2	Spinal fusion
3	Laminectomy
Priority	Neurosurgical (Brain) Operations
1	Ventricular shunt
2	Craniotomy
Priority	Neck Operations
1	Operations on the neck
2	Thyroid surgeries

- **Operating Room (OR):**

An OR is a patient care area that meets the American Institute of Architects (AIA) criteria for an operating room. This may include an operating room, C-Section room, interventional radiology room or a cardiac catheterization lab.

- **Operation Duration:**

Intervals in hours and minutes between the skin incision and skin closure. (Prior to CY2014)

(Beginning with 1/2014) Procedure/Surgery Start Time (PST): Time when the procedure is begun (e.g., 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.
- Do not record the anesthesia time as the duration of the operation.

- **Outpatient:**

A patient whose date of admission to the healthcare facility and the date of discharge are the **same** day.

- **Risk Stratification**

Numerous factors contribute to the SSI risk, including the type of operation, the duration of the operation, the degree of wound contamination, and the underlying disease condition of the patient. Before infection rates can be meaningfully compared within a hospital or between hospitals, the influence of the risk factors must be considered. The SSI risk index accounts for several important risk factors and is used in adjusting SSI rates in surgical patients.

Basic SSI Risk Index is a score used to predict a surgical patient’s risk of acquiring an SSI. The risk index score, ranging from 0 to 3, is the number of risk factors present among the following:

- an operation lasting longer than the duration cut point hours, where the duration cut point depends upon the operation being performed.⁷ (Score = 1 risk factor)
Current duration cut point values can be found in the NNIS report at <http://www.cdc.gov/ncidod/dhqp/pdf/nnis/2004NNISreport.pdf>
- an operation classified as contaminated (Class 3) or dirty-infected (Class 4).⁸ (Score = 1 risk factor)
- a patient with an American Society of Anesthesiologists’ (ASA) physical status classification score of 3, 4, or 5.⁹ (Score 1 = risk factor)

The patient's SSI risk category is the number of these risk factors present at the time of operation as illustrated in the following table:

Determining the SSI Risk Index Category in 3 Sample Patients

Elements of the NHSN SSI Risk Index	Patient 1	Patient 2	Patient 3
Operation longer than the duration cut point	Yes (1 risk factor)	No (0 risk factors)	Yes (1 risk factor)
Wound Class	Dirty-infected (1 risk factor)	Clean (0 risk factors)	Clean-Contaminated (0 risk factors)
ASA Score	4 (1 risk factor)	0 (0 risk factors)	1 (0 risk factors)
SSI Risk Index by Category	3	0	1

- **Surgical Site Infection (general and specific)**

(Note: The following definitions are to be used in determining if an SSI is present. You must report the presence of an SSI related to a MHIRS operative procedure, however, you will not report the infection site.)

1. **Surgical Site Infection (Superficial incisional)** must meet the following criterion:

Infection occurs within 30 days after the operative procedure
and
 involves only skin and subcutaneous tissue of the incision

and

patient has at least **one** of the following:

- o purulent drainage from the superficial incision.
- o organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
- o at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon, and is culture-positive or not cultured. A culture-negative finding does not meet this criterion.
- o diagnosis of superficial incisional SSI by the surgeon or attending physician.
NOTE: There are two specific types of superficial surgical incisional SSIs:
 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 (e.g., C-section incision or chest incision for CBGB)
 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 (e.g., donor site [leg] incision for CBGB)

NOTE:

- Do not report a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) as an infection.
- “Cellulitis”, by itself, does not meet the criteria for Superficial Incisional SSI.

2. Surgical Site Infection (deep incisional) must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within **90 days** if implant is in place and the infection appears to be related to the operative procedure

and

involves deep soft tissues (e.g., fascial and muscle layers) of the incision

and

patient has at least **one** of the following:

- o purulent drainage from the deep incision but not from the organ/space component of the surgical site.
- o a deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or not cultured when the patient has at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$), or localized pain or tenderness. A culture-negative finding does not meet this criterion.
- o an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
- o diagnosis of a deep incisional SSI by a surgeon or attending physician.

NOTE: There are two specific types of deep surgical incisional SSIs:

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 (e.g., C-section incision or chest incision for CBGB)

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 (e.g., donor site [leg] incision for CBGB)
3. **Surgical Site Infection (organ/space)** involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. An organ/space SSI must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant is left in place or **90 days** if implant is in place and the infection appears to be related to the operative procedure
and

infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure
and

patient has at least **one** of the following:

- o Purulent drainage from a drain that is placed through a stab wound into the organ/space
 - o Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
 - o An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
 - o Diagnosis of an organ/space SSI by a surgeon or attending physician.
- **Wound Class:**
An assessment of the likelihood and degree of contamination of a surgical wound at the time of operation. The wound class system used in MHIRS is an adaptation of the American College of Surgeons wound classification schema.⁶ Wounds are divided into four classes:
 - o Clean (Class 1): An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.
 - o Clean-Contaminated (Class 2): Operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.
 - o Contaminated (Class 3): Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.
 - o Dirty or Infected (Class 4): Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

D. PROTOCOL

The requirements for the SSI surveillance component for **each** of the operative procedures in MHIRS include:

- All patients are monitored for signs of SSI.
- The healthcare provider has a process to follow up for SSIs for thirty (30) days after procedures not involving an implant, and for **90 days** for procedures involving an implant.
- Post-discharge surveillance by hospitals includes, at a minimum, review of readmission data to identify potential SSIs.
- Post-discharge surveillance by ASCs includes, at a minimum, a process to follow up with the physician(s) who performed the surgery to identify potential SSIs.
- SSIs are reported to the facility where the original surgery was performed.
- Numerator and denominator information are collected on all patients undergoing monitored procedures.
- A separate monthly report file will be submitted for **each** type of procedure monitored.

1. Numerator Data

- a. All patients undergoing the selected MHIRS procedures are monitored for signs of SSI.
- b. SSI criteria: see definitions for SSIs to determine if the criterion for an SSI has been met. You must report the presence of an SSI related to a MHIRS operative procedure, however, you will **not** report the specific infection site (e.g., superficial, deep or organ space). When submitting numerator data the site of the SSI does not have to be reported; the reporter will report either “no” or “yes” for the data element “Surgical Site Infection”.
- c. If a patient has several operative procedures prior to a surgical site infection, assign the infection to the operation that was performed most closely in time prior to the surgical site infection date, unless there is evidence that the infection is associated with a different operation.
- d. If more than one operative procedure was done through a single incision, attempt to determine the procedure that is thought to be associated with the surgical site infection. Example: A patient has an abdominal hysterectomy and an appendectomy; if it is thought that the surgical site infection is related to the hysterectomy, the infection should be reported as such. If it is thought that the surgical site infection is related to the appendectomy, the infection would not be reported. If it is not clear (as is often the case when the infection is a superficial incisional SSI), use the NHSN Principle Operative Procedure Selection Lists to select which operative procedure to report (e.g., The patient had an appendectomy and a herniorrhaphy, and it is not clear which procedure is related to the surgical site infection. Using the Procedure Selection List, select the procedure with the highest priority, which in this case is the appendectomy.)

- e. If an SSI is identified after the monthly report was submitted:
 - Access the MHIRS monthly report in question,
 - Locate the patient's information (medical record number and procedure date)
 - Add the Surgical Site Infection information ("yes"), and
 - Resubmit the monthly report using MHIRS.

2. Denominator Data

- a. The following information will be collected and recorded on **all** patients undergoing the selected MHIRS operative procedures:
 - Patient's medical record number
 - Procedure date
 - ASA score
 - Wound class
 - Duration (hours & minutes)
 - For hip prosthesis indicate whether it is a total primary, partial primary, total revision, or partial revision
 - Surgical Site Infection ("no" or "yes")

- b. If a patient goes to the OR more than once during the same admission and another procedure is performed through the same incision within 24 hours of the original operative incision, report only one procedure in the denominator, combining the duration for both procedures (which is the time from skin incision to primary closure). Example: a patient has a CBGB lasting four hours. The patient returns to the OR six hours later to correct a bleeding vessel. The surgeon reopens the initial incision, makes the repairs, and re-closes in 1.5 hours. The duration of the operation is 5.5 hours. If the wound class has changed, report the higher wound class. If the ASA class has changed, report the higher ASA class.

- c. If more than one MHIRS procedure is performed during the same trip to the OR, a record is generated for each operative procedure.

- d. For bilateral operative procedures (e.g., HPRO), two separate records are completed. To document the duration of the procedure, indicate the incision time to closure time for each procedure separately or, alternatively, take the total time for both procedures and split it evenly between the two.

E. INSTRUCTIONS FOR COMPLETING THE OPTIONAL MHIRS REPORTING FORM

(Figure SSI-1 may be used for all reportable procedures. Figure SSI-2 may be used for all procedures except hip prosthesis.)

This form replicates the data entry fields in MHIRS and, if completed for each of the operative procedures, contains all of the required reporting information:

- Record the month and year for the operative procedure being reported.
- Record the operative procedure being monitored.
- Enter the patient's medical record number.
- Enter the date the procedure was performed.
- Enter the ASA score.
- Enter the wound class.
- Enter the duration of the procedure (hours and minutes).

- For hip prosthesis, indicate whether it is a total primary, partial primary, total revision, or partial revision.
- Enter “no” or “yes” for Surgical Site Infection.

¹ Centers for Disease Control and Prevention, National Center for Health Statistics. *Vital and Health Statistics, Detailed Diagnoses and Procedures, National Hospital Discharge Survey, 1994*. Vol 127. Hyattsville, Maryland: DHHS Publication; 1997.

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⁴ Haley RW, Culver DH, White JW, Morgan WM, Emori TG, Munn VP. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Epidemiol* 1985;121:182-205.

⁵ Society for Healthcare Epidemiology of America, Association for Professionals in Infection Control and Epidemiology, Centers for Disease Control and Prevention, Surgical Infection Society. Consensus paper on the surveillance of surgical wound infections. *Infect Control Hosp Epidemiol* 1992;13(10):599—605.

⁶ Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, and the Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection, 1999. *Infect Control Hosp Epidemiol* 1999;20:247-80.

⁷ Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. Surgical wound infection rates by wound class, operative procedures, and patient risk index. *Am J Med* 1991;91 (Suppl 3B):152S-157S.

⁸ Garner JS. CDC Guidelines for prevention of surgical wound infections, 1985. *Infections*, 1985. *Infect Control* 1986;7:193-200.

⁹ Anonymous. New classification of physical status. *Anesthesiology* 1963;24:111.