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OPERATIONAL DEFINITION

MEASUREMENT: Surgical Site Infections (SSIs)

I. Description and Rationale

This measure answers the question: How often is a patient harmed due to surgical site infection following selected surgeries?

The current version of the National Healthcare Safety Network (NHSN) Manual: Patient Safety Component Protocol will serve as the official reference guide for definitions and criteria for reporting surgical site infections.
http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf

Rationale for focus on selected surgeries: In pediatrics, SSI rates tend to be highest among spinal fusion, neurosurgical shunt, and cardiothoracic surgeries.

IIa. Population Definition

The patient population for this measure includes all patients undergoing the included procedures, including inpatient and observational stay patients.

Three surgery categories are considered for this measurement:

- Spinal fusion surgeries as defined by NHSN (FUSN).
  - Procedures such as growing construct placements and adjustments should be included if a facility routinely uses CPT or ICD-10 codes included in the FUSN category for such procedures.
- Neurosurgical shunt surgeries as defined by NHSN (VSHN)
  - Procedures such as third ventriculostomy and external ventricular drain placement are included even though technically these are not shunt procedures.
  - The CPT code 44055 (correction of malrotation) should be used only if the procedure involves a ventricular shunt.
- Cardiothoracic surgeries as defined by NHSN (CARD)

ICD-10 and CPT codes for each of the above categories are available on the NHSN website in the Supporting Materials section (http://www.cdc.gov/nhsn/acute-care-hospital/ssi/) and SPS share point site

Inclusion criteria
All patients who experience one of the above surgical procedures.

Exclusion criteria
Patients with physician/advanced practice nurse/physician assistant documentation of an active infection at the time of the surgical procedure.
- Detailed criteria for an infection at time of surgery (PATOS) is available in the NHSN Manual (link above).
- Signs/symptoms of infection can include but not be limited to: fever, redness/tenderness, elevated white blood cell count, positive culture.

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IIb. Surgical Site Infection Definitions:

- **Superficial Incisional SSI**
  Infection occurs within 30 days of the operative procedure (procedure date is day 1) **AND** involves only skin and subcutaneous tissue of the incision **AND** patient has at least one of the following:

  a. purulent drainage from the superficial incision.
  b. organisms 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).
  c. superficial incision that is deliberately opened by a surgeon, attending physician or other designee and culture or non-culture based testing is not performed,
     AND
     patient has at least one of the following signs or symptoms: pain or tenderness; localized swelling; erythema; or heat.
  d. diagnosis of a superficial incisional SSI by the surgeon or attending physician or other designee.

  Note: The following do not meet the superficial SSI definition: Diagnosis or treatment of cellulitis (redness/warmth/swelling) by itself; stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration); localized stab wound or pin site infection

- **Deep Incisional SSI**
  Infection occurs within 90 days **AND** involves deep soft tissues (e.g., fascial and muscle layers) of the incision **AND** patient has at least one of the following:

  a. purulent drainage from the deep incision.
  b. a deep incision spontaneously dehisces or is deliberately opened by a surgeon, attending physician, or other designee
     and
     organism is identified by culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment or culture or non-culture based microbiologic testing method is not performed
     and
     the patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture or non-culture-based test that has a negative finding does not meet this criterion.
  c. an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.

- **Organ/Space SSI**
  Infection occurs within 90 days after the operative procedure **AND** infection involves any part of the body deeper than the fascial/muscle layers that is opened or manipulated during the operative procedure **AND** patient has at least one of the following:

  a. Purulent drainage from a drain that is placed in the organ/space (for example, closed suction drainage system, open drain, T-tube drain, CT guided drainage)
  b. organisms are 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
  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.

  And

  Meets at least one criterion for a specific organ/space infection site (listed in Table 3, NHSN Manual, http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf)

III. Data Source(s)

Each hospital will report data using its own collection methods based on the ICD-10 procedure or CPT codes listed by NHSN or other methods that reliably collect the procedures included in the NHSN categories.

IV. Sampling and Data Collection Plan

SSI rate is reported separately for each of the following surgical procedure categories: Spinal fusions, neurosurgical shunt surgeries, and cardiothoracic procedures.

SSIs are assigned to the month when the attributable surgical procedure(s) was performed.

Due to challenges communicating information across hospitals, should the attributable procedure be performed at a hospital other than the hospital where the SSI was identified, the following guidelines apply:

- Hospital performing attributable procedure: add procedure to the denominator, even if unable to add the related SSI to the numerator (due to lack of awareness that the SSI has occurred); add SSI to the numerator if aware that the SSI has been identified by another hospital.
- Hospital identifying the SSI: exclude SSI from the numerator since the attributable procedure was performed at a different hospital. (Note: hospital identifying the SSI should contact the infection control department of the hospital that performed the attributable procedure to report the identified SSI; all communication of patient information should comply with legal, legislative, and regulatory requirements.)

V. Calculation

For each of the 3 categories under surveillance (spinal fusions, neurosurgical shunt surgeries, and cardiothoracic procedures) the following numbers should be prospectively tracked and reported each month:

Numerator: Number of SSIs related to designated surgical procedures.

Denominator: Number of designated surgical procedures during the applicable reporting period.

(Numerator/Denominator) x 100
(Note: reported as SSIs per 100 procedures.)

VI. Data Quality Audit Procedures

Hospitals should develop internal procedures for auditing data quality.

VII. Notes

As the minimum required scope of surveillance is limited to hospital-based encounters (e.g. inpatient, ED/urgent care, hospital-based outpatient clinics), there is a possibility of missing SSIs identified in community-based settings.

Data is not adjusted for differences in case mix, volumes, or patient severity across reporting hospitals. NHSN SSI risk-adjustment methodologies will not be utilized until validated for pediatric populations and unless they can provide meaningful data to prevent SSI and harm.

VIII. Experts/Resources

www.cdc.gov/nhsn

http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf?agree=yes&next=Accept

X. Revision History

Version	Primary Author(s)	Description of Version	Date Completed
Draft	Karen Zieker	Initial Draft	30-Mar-2012
V1	Jason Oliver	Change in Surgical Site Definitions	Summer 2012
V2	Sharyl Wooton	Changed length of time from day of surgery to infection from one year to 90 days in order to align with NHSN definition changes in 1/2013.	09-July-2013
V3	Karen Zieker	Changed length of time from 1 year to 90 days in order to align with NHSN definition changes in 1/2013. The original correction was missed for CSF shunt infections in the text.	28-July 2014
V4	Sharyl Wooton	Removed surgery population exclusion which said "chest must be fully closed in the OR during the index procedure. Cases in which there is delayed closure of the chest will be excluded." to align with NHSN definition changes. Updated language and definitions to match NHSN 2014 definitions.	23-Oct 2014
V5	Josh Schaffzin	Removed sub classification of neurosurgical shunt procedures and of	
V6	Josh Schaffzin	Updated language to match January 2018 NHSN definition	13-Aug-2018

Frequently Asked Questions

Should refusion procedures be included?

Yes. ICD-10 codes cannot distinguish between the two, so both fusions and refusions are included in the NHSN FUSN category.

Should EVD placement following shunt removal be included?

Maybe. If the removal and EVD placement is for infection, no. If the removal and EVD placement is for another indication (eg hemorrhage), yes.
Since these procedures occur during the same trip to the operating room, they should be counted as one procedure for the denominator.

Why are common pediatric surgeries at high risk of SSI not included in our reporting (eg, spinal growing rod placement or adjustment)?

In order to evaluate the network as a whole and for facilities to compare their local rates with the network, there needs to be a standard definition for included and excluded procedures. Currently, SPS is aligning its reporting with NHSN categories FUSN, VSHN, and CARD. We continue to explore opportunities to modify definitions to address pediatric-specific procedures.

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SPS PREVENTION BUNDLE

Surgical Site Infections (SSI)

Table of Contents

I. Background & Team

SSI (surgical site infection) is the 4th largest contributor to harm caused across the SPS network. In 2011, approximately 33 children were harmed each month as a result of SSI across the Phase I SPS hospitals (n=33). The SSI team formed in May of 2012 to develop strategies consistent with high reliability concepts to reduce harm caused by SSI, and released the first recommended bundle to the network. In 2013, Phase II hospitals (n=55) joined the network and the number of children harmed per month increased to 46.

The network strategy has been successful with a 19% SSI reduction across the network as of May 2014. Using data obtained from the SPS network as well as external evidence in the medical literature, the SSI team has identified those bundle elements within the first recommended SSI bundle that when reliably implemented are highly likely to result in decreased harm to hospitalized children.

As a result, SPS is stratifying bundle elements based on their level of evidence to assist hospitals in prioritizing their efforts at designing and implementing evidence-based bundles for SSI and the other aviator HACs:

- *Standard Element:* Strong evidence suggests that implementation of this element is associated with significant decrease in patient harm; all SPS hospitals should implement and measure reliability of this element.
- *Recommended Element*: Preliminary data and clinical expert opinion support the implementation of this element; SPS hospitals should strongly consider implementing this element.

SSI Co-Leaders

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II. Prevention Bundle Elements – Overview

SPS Standard Elements

- Preoperative Bath
- No razor
- Appropriate antibiotic timing

SPS Recommended Elements

- Appropriate skin antisepsis ('Skin Prep'IntraOp')
- Appropriate antibiotic redosing

III. Prevention Bundle Elements – Evidence Reviewed

Prevention Bundle Element	Level of Evidence *GRADE/SPS**	Evidence Cited (Numbers refer to Reference Section)
Standard Elements		
Preoperative Bath	GRADE/Scenario 1	3, Plus GRADE*
No Razor	GRADE/Scenario 1	4, 7, Plus GRADE*
Appropriate antibiotic timing	GRADE/Scenario 1	1, 5, 6, 10, 11 Plus GRADE*
Recommended Elements		
Appropriate skin antisepsis	GRADE/N/A	7, Plus GRADE*
Appropriate antibiotic redosing	GRADE/N/A	7, 12,13 Plus GRADE*

*GRADE

- See Appendix A for GRADED Evidence.

**SPS Evidence

- Scenario 1: Reliably implementing element is associated with statistically significant improvement
- Scenario 2: Failing to implement element is associated with statistically significant failure to improve along with the system,
- Scenario 3: In cases where all hospitals implement, implementing an element without measuring reliability of the element is associated with statistically significant failure to improve along with the system,

- Scenario 4: Reliably implementing element is not associated with statistically significant improvement; however, literature supports adoption of element as an SPS Standard

IV. Prevention Bundle Elements Care Descriptions

Prevention Bundle Element	Care Descriptions
Standard Elements	
Preoperative Bath	• Preoperative bath should take place. Options include; bathing with soap and water, bathing with chlorhexidine-containing solution, or wiping with a chlorhexidine-impregnated cloth, the night before and/or the morning of surgery.
No Razor	• Do not use razor for hair removal, use clipper or other non-traumatic method
Appropriate antibiotic timing	• All antibiotics except vancomycin and fluoroquinolones 0-60 minutes prior to incision • Vancomycin and fluoroquinolones 0-120 minutes prior to incision
Recommended Elements	
Appropriate skin antisepsis	• Use of alcohol containing agent if no contraindication
Appropriate antibiotic redosing	Redosing intervals: • Cefazolin- every 3 or 4 hours* • Clindamycin- every 4 or 6 hours* • Vancomycin- no redosing or every 6 hours
*The ASHP national guideline recommends cefazolin to be given every 4 hours, clindamycin every 6 hours and recommends no redosing for vancomycin. These national guidelines do have pediatric recommendations and the authors state these guidelines are mainly extrapolated data from adults and are largely expert opinion based.	

V. Measurement – Prevention Bundle Reliability

Measurement	Formula	Standards	Reporting Period
SSI Prevention Bundle	Number of audits totally compliant with SPS Prevention Bundle Elements/ Number of audits completed* x 100	• Your bundle reliability data should include **all** the SPS Standard elements • SPS strongly encourages hospitals to also include the SPS Recommended Elements. • Hospitals can choose to include additional elements. Please note that including too many (>5) elements may confuse and overwhelm care providers so proceed with caution. • Measure your bundle as ALL or None. See Reference 8 for IHI description of All on None. • Minimum of 20 audits per month. If procedures are fewer than 20, then include all procedures.	Monthly

VI. Spotlight Tools

We have asked hospitals to share their spotlight tools, and have highlighted a few in this SharePoint folder (note: this folder is password protected and can only be accessed by SPS network member hospitals). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, Patient & Family Engagement, and Failure Analysis.

VII. Spotlight Hospitals

Please click here to view the Sharing Hospitals' Innovation for Network Engagement (SHINE) report.

VIII. References

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IX. Revision History

Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	9- Nov - 2012
Version 2	Jason Newland, Kathy Ball, Lory Harte	Updating evidence, recommended approaches, measuring reliability, and references.	4- Feb -2013
Version 3	Sharyl Wooton, Erin Goodman on behalf of HAC Team	SPS Prevention Bundles – Standards and Recommendations	15-June -2014
Version 4	Sharyl Wooton, Erin Goodman on behalf of HAC Team	Updating redosing element with changes and evidence to support.	28-August -2014
Version 5	SPS Staff	Contact information updated	5-April-2017

APPENDIX A

Thank you to the following SSI Co-Leaders and Subject Matter Experts who contributed to this document: Suanne Davies, Monroe Carell Children's Hospital at Vanderbilt; Jason Newland, St. Louis Children's Hospital; Duha Al Zubeidi, Children's Mercy Kansas City; Lory Harte, Children's Mercy Kansas City, Scott Marquette, C.S. Mott Children's Hospital