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Pete Ricketts, Governor

# **Surgical Site Infection Outbreak Response Guideline 2018**

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## **Background**

Surgical site infections (SSIs) are infections of the relevant tissue or anatomic location that occur after a surgical procedure (Berrios-Torres 2017). The Centers for Disease Control and Prevention (CDC estimates that there are approximately 300,000 SSIs each year that affect between 2 and 5% of patients having inpatient surgery. Patients who experience SSIs are at a 2 to 11 times higher risk of death with a have a 3% mortality rate. Additionally, it is estimated that SSIs result in an additional 7 to 10 additional days in the hospital and cost between \$3,000 and \$29,000 per SSI and up to \$10 billion each year (Berríos-Torres 2009).

SSIs are defined by the National Healthcare Safety Network (NHSN) and the CDC as superficial, deep or organ space according to specific criteria (see Appendix). The commonly reported incidence of SSIs ranges from 0.5 to 18.8%. SSIs are typically characterized by continuous, localized pain that is not relieved by pain medication, drainage at the wound site, fever, and tenderness, warmth or erythema at the surgical site. Testing might reveal an elevated white blood cell count and inflammatory markers and MRI might indicate changes consistent with an infectious process (Chahoud 2014). Wound and blood cultures can assist with diagnosis and targeted treatment, however such cultures do not yield a result between 10 and 30% of the time (Rasnake 2006, Owens 2008, Abdul-Jabbar 2013). Sources of a pathogen for SSIs can include endogenous patient flora from the gastrointestinal tract, mucous membranes or skin or might be introduced from another source of infection in

the body or even from an external environmental exposure such as surgical personnel or equipment. The most frequently identified pathogens include; *Staphylococcus aureus*, coagulase-negative staphylococci, *Enterococcus* species, *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterobacter* species, *Klebsiella pneumoniae*, *Candida* species, *Klebsiella oxytoca*, and *Acinetobacter baumannii* (Berríos-Torres 2009).

Monitoring of SSIs can be challenging due to the lack of a standardized surveillance system and an increase in outpatient procedures and travelling providers. Important modifiable risk factors include appropriate antimicrobial prophylaxis, skin and bowel preparation, traffic in operative rooms, temperature, glucose and oxygen control and existing colonization. The CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) have developed tools and guidelines to help prevent and measure SSIs (Berríos-Torres 2009, CDC 2015). SSI rates, or a comparison of the number of patients with SSI over the number of operations performed can sometimes be a useful metric for assessments within a facility. Another, more generalizable metric that has been developed for measuring outcomes is the Standardized Infection Ratio (SIR) which compares the number of observed SSIs to the number of expected SSIs. The number of expected SSIs is calculated by incorporating population-level risk factor data to allow for more meaningful comparisons across facilities. These metrics can be used to assess baseline, monitor trends, and identify areas of concern that should be evaluated.

## **Surveillance**

In Nebraska, healthcare associated infections that are (HAIs) that are reported by healthcare facilities to CDC's NHSN are reportable in accordance with Title 173 ([http://dhhs.ne.gov/Pages/reg\\_t173.aspx](http://dhhs.ne.gov/Pages/reg_t173.aspx)). The Nebraska Department of Health and Human Services' (NDHHS) HAI program monitors these reports to assess trends and identify opportunities for public health interventions. Additionally, providers, administrators, infection preventionists and local health department personnel can reach out to NDHHS to request assistance as needed.

## **Investigation**

The NDHHS HAI program can be asked to provide assistance or can seek to do an investigation to evaluate a potential SSI outbreak. Investigations can be requested as the result of an inciting event or as the result of a question or trend highlighted through surveillance performed by the facility or the state. Assistance can range from consultation with HAI program personnel to an invitation to perform an on-site investigation. The following are the tools used by HAI program personnel to support and perform SSI outbreak investigations. These tools are used to gather information through chart/record review, on-site facility tour, interviews with key personnel, and ideally observation of a procedure as it is occurring (gold standard).

### *Epidemiologic Assessment*

The “CDC Healthcare Associated Infections Outbreak Toolkit” can be used for on-site chart abstraction with subsequent organization into Microsoft Excel spread sheets for easy analysis (see Appendix). Case-patient data elements that should be assessed include:

- MRSA screening and/or decolonization
- Bowel prep performed (type and timing)
- Skin prep performed (type and timing)
- Hair removal
- Patient co-morbidities
  - Smoking status
  - Diabetic
  - Hypertension
  - ASA classification
- Date of surgery
- Operating room itself (room number or location)
- Pre-op antibiotic given (type, dose and timing)
- Name of surgeon who performed procedure
- Name of anesthesiologist
- Name of any assistants, scrub techs, etc (anyone else in the room)
- Type of procedure

- Endoscopic or open
- Any equipment used
- Intraoperative temperature control of patient
- Intraoperative glucose control
- Intraoperative use of FiO<sub>2</sub>
- Use of wound protectors
- Using new instruments at closure
- Closure type
- Duration of surgery
- Temperature log for operating room
- Humidity log for operating room
- Sterilizer records
- Personnel on post-op care team (nursing, ancillary services, consulting services)
- Ward/floor
- Time to infection
- Signs/symptoms of presenting infection
- Infection type, location (superficial, deep)
- Culture done, time, result
- Antibiotics given as treatment (types, dose, timing, route, duration)
- Clinical course details (antibiotic adjusted, patient worsen, outpatient vs inpatient)
- Patient outcome (recover, back to surgery, died)

An additional epidemiologic evaluation can be performed to examine surgical procedures as well as microbiologic records for any concerning patterns. These assessment can provide insight into whether there is a specific person, location, surgical procedure, specimen collection method or laboratory procedure that is associated with the SSIs. Relevant data elements for this assessment include:

Surgery Line List (to include all surgical procedures performed for the time period of interest)

- Surgeon who performed the procedure
- Date of procedure
- Location of procedure (operating room)

- Name of procedure
- SSI case (yes or no)

Microbiology Line List (to include all microbiologic isolates collected for the time period of interest)

- Date of collection
- Specimen source
- Culture results
- SSI case (yes or no)

Lastly, an observation of surgical procedures can be performed as they occur and should include assessment of:

- Surgical hand scrub
- Skin prep technique
- Skin prep allowed to dry before draping
- How long instruments are open before start of case
- Number of times the operating room door opens and for how long
- Proper attire used
- Hair covered
- Use of cell phones

### **Outcome**

Following an investigation into a potential SSI outbreak, NDHHS HAI personnel will provide a report in an SBAR (Situation, Background, Assessment, Recommendations) format. The assessment summary will include any information obtained through on-site tours, interviews, chart abstraction, and data analysis. The report will also include specific action items and outline a timeline for a follow-up plan (see the Appendix for a sample facility investigation outbreak report).

## **References**

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## Appendix

## Surgical Site Infection Criteria

Type	Date	Involvement	Evidence of Infection	Signs/Symptoms
<b>Superficial incisional SSI</b>	Within 30 days	Involves only skin and subcutaneous tissue of the incision	Patient has at least <b>one</b> 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 (e.g., 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.	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.
<b>Deep incisional SSI</b>	Within 30 or 90 days	Involves deep soft tissues of the incision (e.g., fascial and muscle layers)	Patient has at least <b>one</b> of the following: a. purulent drainage from the deep incision. b. a deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, attending physician** or other designee and organism is identified by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST) or culture or non-culture based microbiologic testing method is not performed	Patient has at least <b>one</b> 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
<b>Organ Space</b>	Within 30 or 90 days	Involves any part of the body deeper than the fascial/muscle layers, that is opened or manipulated during the operative procedure	Patient has at least <b>one</b> of the following: a. purulent drainage from a drain that is placed into the organ/space(for example, closed suction drainage system, open drain, T-tubedrain, 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 (forexample, not Active Surveillance Culture/Testing (ASC/AST)). 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.	Meets at least <b>one</b> criterion for a specific organ/space infection site. These criteria are found in the Surveillance Definitions for Specific Types of Infections chapter (reference below).

\* <https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscscscurrent.pdf>

## **Definition of an NHSN Operative Procedure**

An NHSN Operative Procedure is a procedure:

- that is included in the ICD-10-PCS 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.

# Sample Line Lists

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	A	B	C	D	E
1	<b>Surgical Procedure Line List</b> This document can be used to develop a line list of all procedures (by date, type, surgeon, and SSI). This allows for evaluation of potential associations with a specific person or procedure that can be further explored. Ideal time frame is one year. At minimum, need all procedures for given surgeon but ALL procedures by ALL surgeons at the facility allows for better comparison.				
2	<b>Date of Procedure</b>	<b>Location (operating room)</b>	<b>Name of Procedure</b>	<b>Surgeon</b>	<b>SSI Case (yes or no)</b>
3					
4					

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	A	B	C	D	E	F	G	
1	<b>Case-Patient Line List</b> This document can be used to track relevant details for case-patients who have been identified as having a surgical site infection. These factors can be analyzed for potential association with SSI development.							
2	<b>Patient Last Name</b>	<b>Patient First Name</b>	<b>Patient DOB</b>	<b>Patient Age</b>	<b>Procedure performed</b>	<b>Procedure Date</b>	<b>Duration of Procedure (with start and end times)</b>	<b>Prophylactic Antibiotics given during</b>
3								
4								

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1	<b>Microbiology Line List</b> This document can be used to develop a line list of all microbiology results (by date, specimen type, culture result, and SSI status). This can help to evaluate whether there is a pattern of the same organism on the same dates that might be related to an underlying collection or laboratory processing activity or personnel.			
2	<b>Date of Collection</b>	<b>Specimen Source</b>	<b>Culture Result</b>	<b>SSI Case (yes or no)</b>
3				

# Sample Facility Investigation Outbreak Report

## **Situation**

Description of the initial complaint/event

## **Background**

Brief summary of relevant scientific information and setting of complaint/event

## **Assessment**

Date and description of visit/interview/on-site assessment

### *Tour*

Description of facility, blueprints, environmental findings

### *Descriptive Epidemiology*

Summary of relevant methods and findings with epi curves

### *Case Chart Review*

Summary of clinical chart review

### *Statistical Analysis*

Summary of analysis findings

## **Recommendations**

Summary of findings and presentation of most likely conclusion based on supporting evidence

Recommendations for interventions, plan for surveillance/follow-up

## **Recommendations Summary**

Clear tasks with responsible personnel, expected outcomes and timelines

\* Developed by C. Pedati for NDHHS 2018