Surgical Site Infection Surveillance in Northern Ireland

Generic Protocol

Last updated 6 November 2014

Version 2014.1

Contents

Section 1 – Surgical Site Infection Surveillance

1.1 Purpose of the Protocol

To provide information, definitions and instructions for hospitals that participate in surgical site infection (SSI) surveillance following surgery to ensure standardisation of data collection, analysis and reporting procedures.

This protocol is based on the National Health Safety Network (NHSN) Patient Safety Component Manual, Centers for Disease Control and Prevention (CDC) in the United States.[1] The information contained has been adapted for Northern Ireland Health and Social Care personnel as our local system has evolved.

The protocol is intended for use by: infection control and prevention staff, clinical staff, hospital epidemiologists, and other personnel who are involved in surveillance activities in Northern Ireland acute care hospitals.

1.2 Background

While advances have been made in infection control practices including: improved operating room ventilation, sterilisation methods, barriers, surgical technique and availability of antimicrobial prophylaxis; SSIs remain a substantial cause of morbidity and associated mortality. The 2012 point prevalence study (PPS) in Northern Ireland found that SSIs accounted for 19% of all healthcare-associated infections among hospitalised patients.[2] SSIs remain a substantial cause of morbidity, prolonged hospitalisation and death. SSI is associated with a mortality rate of 3% and 75% of SSI-associated deaths are directly attributable to the SSI.[3]

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 dissemination of data for action. Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk.[4, 5, 6, 7]

1.3 Surgical Site Infection Surveillance in Northern Ireland

In the DHSSPSNI document "*Changing the Culture 2010" – Strategic regional action plan for the prevention and control of Healthcare-Associated Infections (HCAI) in Northern Ireland*", one of the key recommendations was to improve surveillance arrangements for HCAI and to obtain better data on the levels of HCAI within Trusts:

> *"It is envisaged that Infection Prevention and Control Teams, on behalf of Trust Chief Executives, will be responsible for sending data to the PHA on a regular basis. The PHA will be responsible for the collation and analysis of regional data on behalf of the DHSSPS."*

1.4 Public Health Agency and Surgical Site Infection Surveillance

The Public Health Agency (PHA) is committed to working in collaborative partnerships with Trusts, hospitals and key stakeholders to reduce the risk of surgical site infection. To achieve this, PHA will:

- Promote a standardised, validated approach to SSI surveillance methods.
- Provide aggregated risk-adjusted data on SSIs which enables Trusts to benchmark against aggregated Northern Ireland and international data.
- Promote the use of evidence based information to permit timely recognition of SSIs for prevention, early intervention and cost containment.
- Improve the way surveillance results are used by individual hospitals and across Trusts.
- Promote the integration of SSI surveillance (including routine data collection) with strategic planning and continuous quality improvement systems for infection control.
- Promote participation in the development of SSI performance measure reporting.

In order to meet above objectives the PHA Surveillance Team will:

- Assist hospitals in implementing standardised, validated surveillance methods.
- Collect specified surveillance data from hospitals.
- Analyse and report risk adjusted SSI aggregated data.
- Conduct collaborative research studies to:
    - assess the importance of potential risk factors;
    - evaluate alternative surveillance and prevention strategies;
    - provide reports on deliverables to all key stakeholders.

1.4.1 Contact Details

If you have any difficulties or queries please contact a member of the Public Health Agency Surveillance Team:


(028) 95 36 3440


hcaini@hscni.net

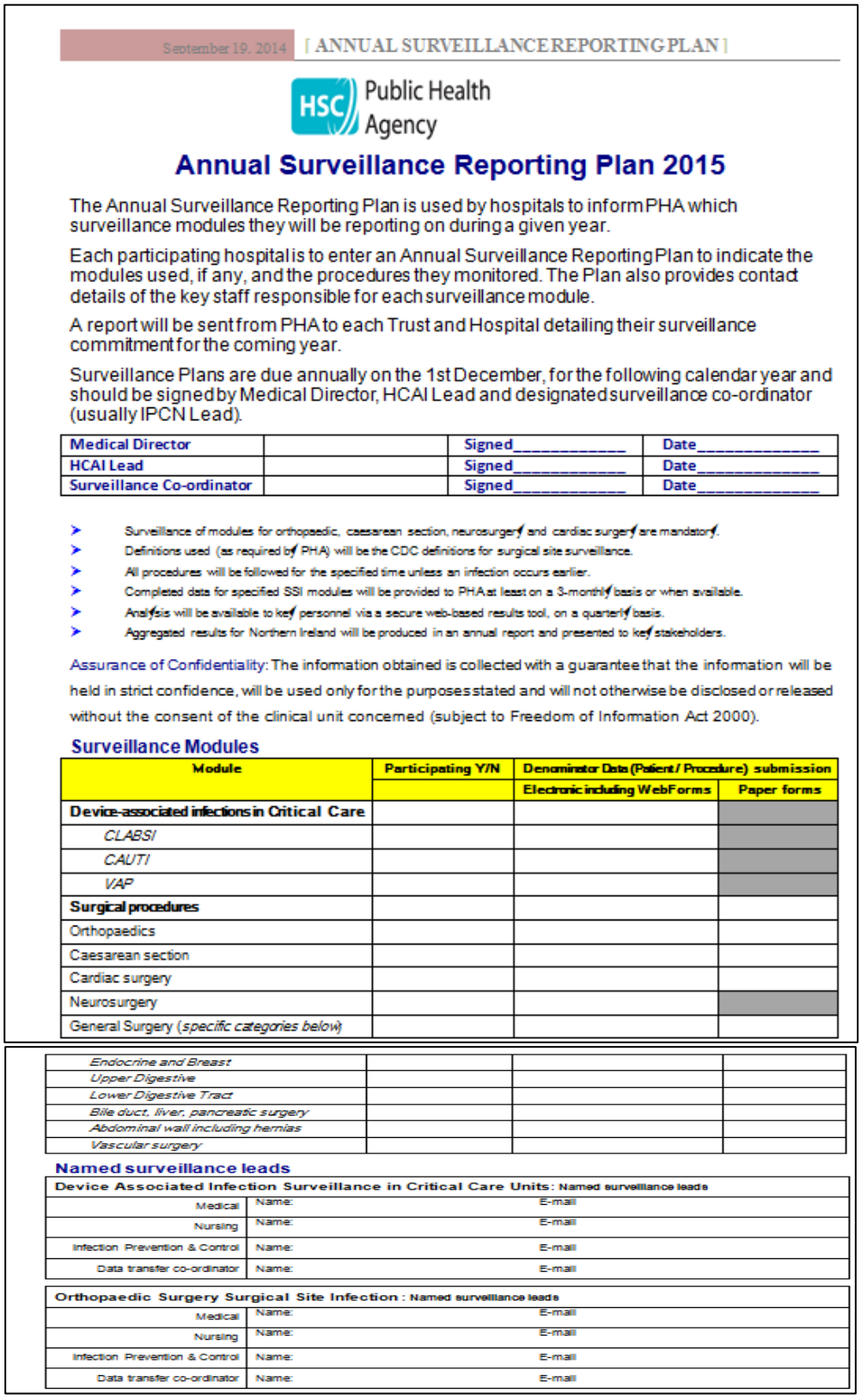
1.5 Annual surveillance reporting plan

The Annual Surgical Site Infection Surveillance Reporting Plan Form (Figure 1) is used by hospitals to inform PHA which surveillance modules are used during a given year. This allows PHA to select the data that should be included into the aggregate data pool for analysis. Each participating hospital is to enter an Annual Plan to indicate the modules used and the procedures they will monitor. Surveillance plans are due annually on 15th December, for the following calendar year. They should be reviewed and updated from the previous surveillance plan or from historic data.

Figure 1: Annual Surveillance Reporting Plan Form

Annual Surveillance reporting plan available at:

http://www.publichealth.hscni.net/directorate-public-health/health-protection/reference-documents



September 19, 2014 [ANNUAL SURVEILLANCE REPORTING PLAN]

HSC Public Health Agency

Annual Surveillance Reporting Plan 2015

The Annual Surveillance Reporting Plan is used by hospitals to inform PHA which surveillance modules they will be reporting on during a given year.

Each participating hospital is to enter an Annual Surveillance Reporting Plan to indicate the modules used, if any, and the procedures they monitored. The Plan also provides contact details of the key staff responsible for each surveillance module.

A report will be sent from PHA to each Trust and Hospital detailing their surveillance commitment for the coming year.

Surveillance Plans are due annually on the 1st December, for the following calendar year and should be signed by Medical Director, HCAI Lead and designated surveillance co-ordinator (usually IPCN Lead).

Medical Director		Signed_____	Date_____
HCAI Lead		Signed_____	Date_____
Surveillance Co-ordinator		Signed_____	Date_____

- Surveillance of modules for orthopaedic, caesarean section, neurosurgery and cardiac surgery are mandatory.
- Definitions used (as required by PHA) will be the CDC definitions for surgical site surveillance.
- All procedures will be followed for the specified time unless an infection occurs earlier.
- Completed data for specified SSI modules will be provided to PHA at least on a 3-monthly basis or when available.
- Analysis will be available to key personnel via a secure web-based results tool, on a quarterly basis.
- Aggregated results for Northern Ireland will be produced in an annual report and presented to key stakeholders.

Assurance of Confidentiality: The information obtained is collected with a guarantee that the information will be held in strict confidence, will be used only for the purposes stated and will not otherwise be disclosed or released without the consent of the clinical unit concerned (subject to Freedom of Information Act 2000).

Surveillance Modules

Module	Participating Y/N	Denominator Data (Patient / Procedure) submission	
		Electronic including WebForms	Paper forms
Device-associated infections in Critical Care			
CLABSI			
CAUTI			
VAP			
Surgical procedures			
Orthopaedics			
Caesarean section			
Cardiac surgery			
Neurosurgery			
General Surgery (*specific categories below*)			
Endocrine and Breast			
Upper Digestive			
Lower Digestive Tract			
Bile duct, liver, pancreatic surgery			
Abdominal wall including hernias			
Vascular surgery			

Named surveillance leads

Device Associated Infection Surveillance in Critical Care Units: Named surveillance leads		
Medical	Name:	E-mail
Nursing	Name:	E-mail
Infection Prevention & Control	Name:	E-mail
Data transfer co-ordinator	Name:	E-mail

Orthopaedic Surgery Surgical Site Infection: Named surveillance leads		
Medical	Name:	E-mail
Nursing	Name:	E-mail
Infection Prevention & Control	Name:	E-mail
Data transfer co-ordinator	Name:	E-mail

Section 2 – Methodology

This section describes the active, prospective methods of data collection that hospitals participating in the surveillance should use to enable them to compare their incidence of surgical site infection (SSI) with other participating hospitals. The surveillance is procedure-based with data collected at an individual level on all eligible procedures with a risk of acquiring SSI, with active follow-up to identify those that develop SSI.

2.1 The aims of an SSI surveillance programme

A key aim of this surveillance is to enable participating hospitals to compare their rates of SSI following surgical procedures, against a benchmark, i.e. pooled mean rate of all contributing hospitals. For this comparison to be valid the data collection methods used by hospitals must be similar and it requires active and prospective methods of surveillance.

Active surveillance is where designated, trained personnel use a variety of methods to identify cases of infection. Prospective surveillance is the application of methods to detect surgical site infection from the time of exposure (the surgical procedure). This method is more likely to identify cases of infection than retrospective review of case-records.

2.2 Setting up surveillance

A surveillance programme is required to establish the cumulative incidence rates of SSI, both nationally and locally. Benchmarks of SSI can be a driver for effecting change but require effort and coordination to develop.[8] Evidence demonstrates reductions in SSI rates in hospitals participating in benchmarking projects.[9, 10, 11] The evidence also suggests that actively feeding back data to clinicians contributes to reductions in rates of infection.[12]

Surveillance primarily involves clinical staff, including infection control teams. However, there are two key roles, which ensure effective surveillance:

Key role 1: Local SSI surveillance co-ordinator

The local co-ordinator will be a member of the infection control team or another member of staff with strong links with infection control, for example a member of the clinical effectiveness team. His/her key functions are anticipated to be strategic at this local level and include:

- Facilitating the surveillance process.
- Engaging with the clinical teams to ensure their continued involvement to drive forward SSI reduction in their surgical procedures.
- Provide overall co-ordination and liaison with PHA and ensuring mechanisms are in place for data collection, collation, transfer and dissemination.
- Provide local training for staff involved in the surveillance process to ensure the consistent application of SSI definitions and data collection.
- Active feedback of SSI data to local stakeholders.

Key role 2: Data transfer co-ordinator

The data transfer co-ordinator's key functions are to:

- Ensure that any electronic data collection system complies with the required denominator data (procedure) specifications
- Ensures denominator data (procedure) are forwarded to PHA in a timely manner
- Ensure numerator data (surgical site infections) are correctly entered on the web based reporting system.

2.3 Denominator and Numerator Data

During 2014, the PHA SSI surveillance programme was amended to streamline the surveillance process and include the option for healthcare providers to conduct surveillance using fewer resources. Data collection was split into two areas: denominator data and numerator data. This provides Trusts with the option of submitting denominator data (procedure data) from sources that already collect the required data ('light' surveillance) or retaining the standard method of collecting data on a paper form.

Denominator data (Patient/procedure data):

Denominator data includes patient demographic information and information about the operative procedure, including the date and type of procedure. All the data fields must be completed as specified. For further explanation of required data fields see Instructions for Completion of Denominator (Patient/Procedure).

Hospitals/Trusts can submit denominator data in one of two ways (Figure 2):

1. 'Standard surveillance' patient-based procedure data is collected on a paper form
2. 'Light surveillance' patient-based procedure data is supplied to PHA from electronic operation databases, e.g. Theatre Management System (TMS)

The Annual Surveillance Plan should indicate the format of denominator data submission.

Numerator Data (Surgical Site Infection data):

All patients having any of the procedures included in the selected operative procedure group(s) are monitored for signs of SSI until discharge from the acute hospital. A Surgical Site Infection WebForm on a secure website is completed for each procedure with an SSI.

The Instructions for Completion of SSI Data WebForms includes brief instructions for collection and entry of each data element. The SSI Infection data includes the date of SSI, specific criteria met for identifying the SSI, when/how the SSI was detected, and the organisms isolated from cultures. For more information on how to register and obtain access to WebForms please refer to Web Based Data Collection Forms (WebForms) User Guide available at: http://www.publichealth.hscni.net/directorate-public-health/health-protection/reference-documents

2.4 Data submission

Data are collated by set quarters throughout the year and data should be submitted at the designated periods (Table 1).

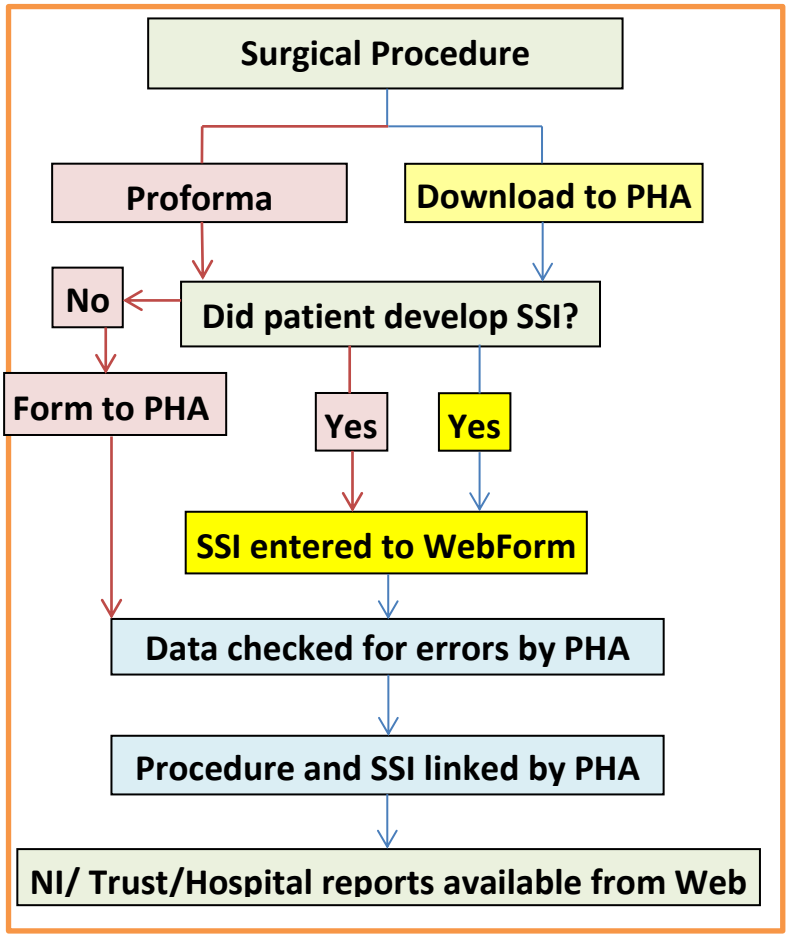
Table 1: Reporting periods and expected dates

Surveillance period	Cut-off date for receipt of data	Reconciliation line listing to hospitals	Data approved by hospitals	Reports posted on website
Q 1 – Jan to Mar	15 May	15 June	30 June	15 July
Q 2 – Apr to Jun	15 August	15 September	30 September	15 October
Q 3 – Jul to Sep	15 November	15 December	31 December	15 January
Q 4 – Oct to December	15 February	15 March	31 March	15 April

Notes:

- For inclusion in a quarter, procedures must be performed during that quarter.
- Data should be transferred to PHA within 60 days of the end of the period.
- PHA will contact designated person in Trust two weeks before the cut-off date
- Hospitals submitting electronic downloads must submit batch data in a suitable format
- Data transferred more than 60 days after the end of the quarter will not be included in the 'current quarter' report but will appear in subsequent reports. As a consequence quarterly reports are not definitive and the quarterly SSI rates are subject to change.

Figure 2: PHA Data handling



2.5 Quality assurance

A quality assurance protocol is in place within PHA and will be followed on receipt of denominator and numerator data (Figure 5).

- Records will be checked by PHA surveillance team for completeness and inaccurate data may be referred back to the Trust. It is important that queries raised by PHA are expedited at Trust level so that publication deadlines are met.
- Validity checking of denominator data will be performed using SPSS.
- Numerator data (SSI data) are entered using WebForms; these have built-in validation rules and cannot be submitted until rules are met.

2.6 Data sharing and publication

At the end of each calendar year, SSI data are made available to the European Centre for Disease Prevention and Control (ECDC). Sharing data provides an important opportunity to explore variation in infection rates between European countries and to improve our understanding of how these infections may be prevented. Only a limited part of the dataset is used and patient, surgeon or hospital identifiable information is not included.

SSI rates for individual hospitals are not published or shared by the PHA. Each hospital however is provided with access to their own rates, corresponding Trust rate (if appropriate) and Northern Ireland aggregate rates. Aggregate (pooled) SSI surveillance data are analysed and presented at scientific meetings and published in peer-review journals by the PHA.

Section 3 – Procedures

3.1 Procedure definitions

Operative Procedure: must be included in Appendix 1 - Operative Procedure Groups

And

- Take place during an operation where at least one incision (including laparoscopic approach) is made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure.

And

- Take place in an operating room, defined as a patient care area that meets criteria for an operating room when it was constructed or renovated. This may include an operating room, C-section room, interventional radiology room, or cardiac catheterisation lab.

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

NCEPOD Classification of Intervention: This classification came into effect in December 2004, and replaced the categories of Emergency, Urgent, Scheduled and Elective. [13] The classifications are:

IMMEDIATE – Immediate life, limb or organ-saving intervention –resuscitation simultaneous with intervention. Normally within minutes of decision to operate.

URGENT – Intervention for acute onset or clinical deterioration of potentially life-threatening conditions, for those conditions that may threaten the survival of limb or organ, for fixation of many fractures and for relief of pain or other distressing symptoms. Normally within hours of decision to operate.

EXPEDITED – Patient requiring early treatment where the condition is not an immediate threat to life, limb or organ survival. Normally within days of decision to operate.

ELECTIVE – Intervention planned or booked in advance of routine admission to hospital. Timing to suit patient, hospital and staff.

Procedure group: are combinations of clinically similar operative procedures that allow comparison of SSI rates in groups of patients undergoing similar operative procedures. For a complete list of procedure groups (See Appendix 1) and for associated OPCS4 codes go to http://www.publichealth.hscni.net/directorate-public-health/health-protection/reference-documents

Surgery start time: time of skin incision

Surgery finish time: Time when all instrument and sponge counts are completed and verified, all postoperative radiological studies in the operating room are completed, all dressings and drains are secured, and surgeons have completed all procedure-related activities on the patient.

NOTE: Surgery start time and Surgery finish time are used to calculate duration of procedure.

General anaesthesia: 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 paralysed with relaxed muscles.

Laparoscope: An instrument used to visualise the interior of a body cavity or organ. In the context of a PHA operative procedure, use of a laparoscope involves creation of several small incisions to perform or assist in the performance of an operation rather than use of a traditional larger incision (i.e. open approach). Robotic assistance is considered equivalent to use of a laparoscope for SSI surveillance.

Primary Closure: Defined as 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. This category includes surgeries where the skin is closed by some means, including incisions that are described as "loosely closed" at the skin level. 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.

Non-Primary Closure: Defined as closure that is other than primary, includes surgery in which the superficial layers are left completely open during the original surgery. For surgery 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. An example of a surgery with non-primary closure would be a laparotomy in which the incision was closed to the level of the deep tissue layers, sometimes called "fascial layers" or "deep fascia," but the superficial layers are left open. Another example would be an "open abdomen" case in which the abdomen is left completely open after the surgery. If the deep fascial levels of an incision are left open but the skin is closed, this is considered a non-primary closure since the incision was not closed at all tissue levels. Wounds that are "closed secondarily" at some later date, or described as "healing by secondary intention" should be classified as non-primary closure.

NOTE: Assign the surgical wound closure that applies when the patient leaves the operating room from the principal operative procedure. This instruction should be followed in scenarios where a patient leaves the operating room with non-primary closure, but returns to the operating room for a subsequent procedure that results in primary closure.

ASA score: Assessment by the anaesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Classification of Physical Status. Patient is assigned one of the following which may be used as one element of SSI risk adjustment:

1. Normally healthy patient
2. Patient with mild systemic disease
3. Patient with severe systemic disease
4. Patient with severe systemic disease that is a constant threat to life
5. Moribund patient who is not expected to survive without the operation

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, e.g., surgeon, theatre nurse etc. Wounds are divided into four classes:

***Clean*:** 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 non-penetrating (blunt) trauma should be included in this category if they meet the criteria.

***Clean-Contaminated*:** 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.

***Contaminated*:** 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, non-purulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g. dry gangrene) are included in this category.

***Dirty or Infected*:** Includes old traumatic wounds with retained devitalised 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.

Section 4 – Surgical Site Infections (SSI)

4.1 Definition of SSI

Surgical site infection (SSI) can be defined as being present when pathogenic organisms multiply in a wound giving rise to local signs and symptoms, for example heat, redness, pain and swelling, and (in more serious cases) with systemic signs of fever or a raised white blood cell count. Infection in the surgical wound may prevent healing taking place so that the wound edges separate or it may cause an abscess to form in the deeper tissues. There are three levels of SSI:

- Superficial incisional
- Deep incisional
- Organ/Space SSI

The date of infection SSI is the date when the last element used to meet the SSI infection criterion occurred. The diagnosis of SSI should not influence the decision to treat.

4.2 SSI criteria

Surgical Site Infection (SSI): must meet the criteria for either superficial incisional, deep incisional, or organ/space SSI (Tables 2 – 4). The type of SSI reported should reflect the deepest tissue layer involved (Figure 3).

Figure 3: Levels of surgical site infection

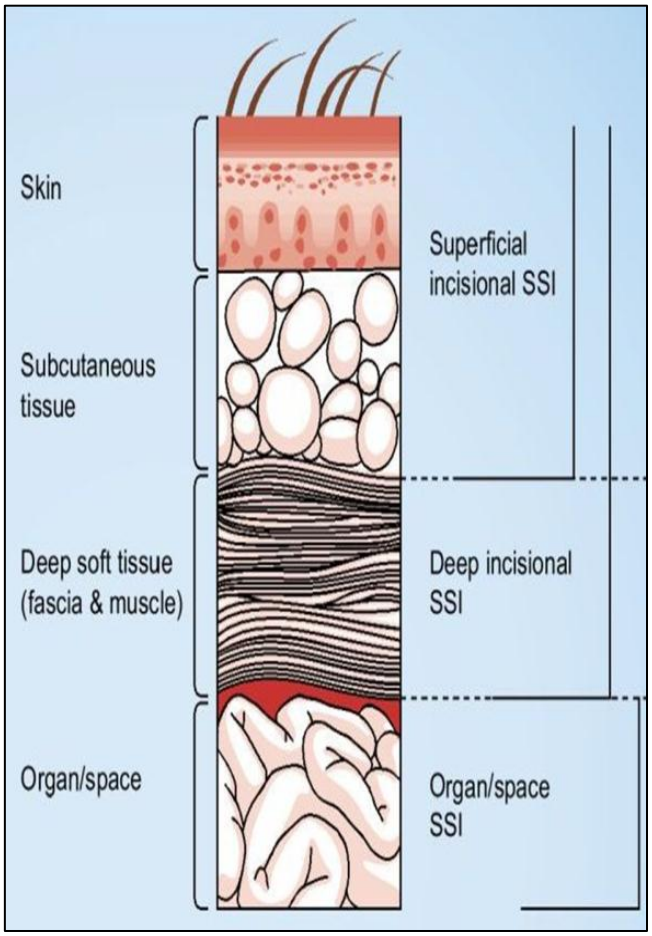


Table 2: Criteria for Superficial Surgical Site Infections (SSI)

Superficial Incisional SSI: must meet the following criterion:

Infection occurs within **30 days** after any operative procedure (day 1 = procedure date)

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 isolated from an aseptically-obtained culture of fluid or tissue from the superficial incision.

(c) superficial incision that is deliberately opened by a surgeon, other clinician or other designated, e.g. nurse practitioner and is culture positive or not cultured and patient has at least one of the following signs or symptoms: pain or tenderness; localised swelling; redness; or heat.
A culture negative finding does not meet criteria (c).

(d) diagnosis of a superficial incisional SSI by a surgeon, other clinician or other designated, e.g. nurse practitioner

Comments:

- If a coronary artery bypass graft (CBGB) patient has infections at both chest and donor site enter as two separate infections
- Do not report the following as an SSI:
  - Stitch abscess alone (minimal inflammation and discharge confined to suture sites).
  - Localised stab wound or pin site infection
  - Diagnosis of "Cellulitis" by itself does not meet criterion D for superficial incisional SSI.

Table 3: Criteria for Deep Surgical Site Infections

Deep Incisional SSI: must meet the following criterion:

Infection occurs within **30 or 90 days (as a minimum of follow-up)** after the operative procedure according to the list in Table 6

And

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

And

patient has at least one of the following:

(a) purulent drainage from the deep incision.

(b) a deep incision that spontaneously dehisces or is deliberately opened by a surgeon, other clinician or other designated, e.g. nurse practitioner; **and** is culture- positive or not cultured **and** patient has at least one of the following signs or symptoms: fever (>38°C); localised pain or tenderness.
A culture-negative finding does not meet Criteria (b).

(c) an abscess or other evidence of infection involving the deep incision that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test.

Table 4: Criteria for Organ/Space Surgical Site Infections

Organ / Space SSI: must meet the following criterion:

Infection occurs within 30 or 90 days (as a minimum of follow-up) after the operative procedure according to the list in Table 6

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:

(a) purulent drainage from a drain that is placed into the organ/space

(b) organisms isolated from an aseptically-obtained culture of fluid or tissue in the organ/space

(c) an abscess or other evidence of infection involving the organ/space that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test

And

meets at least one criterion for a specific organ/space infection site listed in Table 5

Comments:

- Because an organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure the criterion for infection at these body sites must be met in addition to the organ/space SSI criteria (Appendix 2). For example, an appendicectomy with subsequent sub diaphragmatic abscess would be reported as an organ/space SSI at the intraabdominal specific site when both organ/space SSI and intraabdominal site (IAB) specific criteria are met. Table 5 lists the specific sites that must be used to differentiate organ/space SSI.
- If a patient has an infection in the organ/space being operated on, subsequent continuation of this infection type during the remainder of the surveillance period is considered an organ/space SSI, if organ/space SSI and site-specific infection criteria are met.
- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as mediastinitis rather than osteomyelitis
- If meningitis and a brain abscess are present together after operation, report infection as 'intracranial, brain abscess or dura'. Similarly, if meningitis and spinal abscess are present together after an operation, report as spinal abscess.
- Report cerebral spinal fluid (CSF) shunt infection as an SSI meningitis if it occurs within 90 days of placement; if later or after manipulation/access, it is not considered an SSI and is not reportable.

Table 5: Specific Sites of an Organ/Space SSI

Code	Site	Code	Site
BONE	Osteomyelitis	IAB	Intraabdominal, not specified
JNT	Joint or Bursa	GIT	GI tract
PJI	Periprosthetic Joint Infection HPRO and KPRO only	VAS	Arterial or venous infection
DISC	Disc space	EME	Endometritis
SA	Spinal abscess without meningitis	VCU	Vaginal cuff
BRST	Breast abscess or mastitis	HEP	Hepatitis
MED	Mediastinitis	OUTI	Other infections of the urinary tract

NOTE: Criteria for these specific sites can be found in Appendix 2

4.3 SSI surveillance follow-up period

As of 2014, procedures should be monitored for signs of infection for a minimum of 30 or 90 days depending on the procedure group (Table 6). However, some deep-seated infections may present after the 30 or 90 days surveillance period, these infections should still be reported.

NOTE: All Superficial SSIs are only followed for a 30-day period for all procedure types and should be identified within that period. Superficial SSIs should not be reported more than 30 days after procedure (Day 1= procedure date).

Table 6: Minimum Surveillance Period for Deep Incisional or Organ/Space SSI following selected Operative Procedure Groups

30-day Surveillance Operative Procedure Groups	
Abdominal aortic aneurysm repair	Laminectomy
Limb amputation	Liver transplant
Appendix surgery	Neck surgery
Shunt for dialysis	Kidney surgery
Bile duct, liver or pancreatic surgery	Ovarian surgery
Carotid endarterectomy	Prostate surgery
Gallbladder surgery	Rectal surgery
Colon surgery	Small bowel surgery
Caesarean section	Spleen surgery
Gastric surgery	Thoracic surgery
Heart transplant	Thyroid and/or parathyroid surgery
Abdominal hysterectomy	Vaginal hysterectomy
Kidney transplant	Exploratory Laparotomy
90-day surveillance Operative Procedure Groups	
Breast surgery	
Cardiac surgery	
Coronary artery bypass graft with both chest and donor site incisions (CBGB)	
Coronary artery bypass graft with chest incision only (CBGC)	
Craniotomy	
Spinal fusion or refusion of spine	
Open reduction of fracture	
Herniorrhaphy	
Hip prosthesis	
Knee prosthesis	
Pacemaker surgery	
Peripheral vascular bypass surgery	
Ventricular shunt	

NOTE: Superficial incisional SSIs are only followed for a 30-day period for all procedure types.

4.4 Methods for finding cases of SSI

SSI monitoring requires active, patient-based, prospective surveillance to detect SSIs following operative procedures. This requires suitably trained staff seeking out infections by screening a variety of data sources, such as: laboratory, pharmacy, patient charts, including history, nurses/physicians notes, temperature charts, etc. Any combination of these methods is acceptable however PHA criteria for SSI must be used. (Table 7)

This active surveillance provides high quality data, ensures SSIs are not missed and information is comparable over time and place.

Every procedure included in the surveillance should be actively and systematically followed up from the time of surgery to discharge or on readmission to establish whether they develop signs and symptoms that meet the definition of SSI. (SSI definitions: Tables 2 – 4; Appendix 2). Notes on any signs or symptoms of SSI should be recorded at each review as this is required to confirm how the SSI was defined.

The identification of SSIs that meet the definitions of infection can be helped by:

- Encourage medical and nursing staff to clearly document clinical symptoms of SSI they observe in case notes and on laboratory request forms.
- Encourage medical staff to write a diagnosis of SSI in the case notes.
- Develop clear guidance for staff on when a wound swab should be taken: there should be signs of infection, e.g. discharging pus, redness, swelling, heat, pain.
- Microbiology results should be interpreted in conjunction with clinical information. A positive microbiology report is not a clear indication of infection.
- Retrospective chart review should be used only when patients are discharged before all information can be gathered or on readmission due to SSI.

Table 7: Methods of surveillance to identify surgical site infections

1. Follow-up of patients during the inpatient stay (required)

From the day after surgery until the patient is discharged from hospital designated staff trained to undertake the surveillance should actively and systematically monitor each patient for signs of infection using the following methods:

a) Liaise with ward staff and review medical and nursing records, temperature and treatment charts **at least three times a week** to identify signs and symptoms that may indicate an SSI.

b) Regularly review microbiology reports to find any positive surgical site cultures from orthopaedic patients and check with the ward (i) why the cultures were taken and (ii) if there are clinical signs of infection.

Information obtained from this systematic review should be used to determine whether any of the criteria defining a surgical site infection have been met (see Section 3).

2. Detecting SSI in patients readmitted to hospital (required)

Systems must be in place to identify patients included in the surveillance that are subsequently readmitted with SSI. These must meet the criteria for SSI and be reported as 'SSI detected at readmission'. These are likely to include the more severe deep and organ/space SSI.

The following measures should be used to ensure that patients included in the surveillance that are readmitted are identified:

- **Wards most likely to receive patients readmitted with SSI:** patients with SSI may not be readmitted to the same ward they were discharged from. Wards that could accept such readmissions should be identified and contacted regularly to ask about patients readmitted with SSI. The staff working on them should be made aware of the surveillance and asked to document clinical signs of SSI and report them to designated surveillance personnel.
- **Patient Administration Systems:** establish systems to alert designated surveillance staff if a patient included in the surveillance is readmitted.
- **Medical notes:** could be flagged to prompt reporting to designated surveillance staff if the patient is readmitted with an SSI.
- **A&E:** staff working in A&E should be made aware of the surveillance and asked to document clinical signs of SSI and report them to designated surveillance personnel. Reminder notices could be placed in the A&E triage area to remind staff to report possible SSI.
- **Bed managers:** should be made aware of the surveillance and asked to inform designated surveillance staff about any patient readmitted following surgery.
- **Patients admitted to hospital with an SSI that resulted from an operation performed in another hospital** – the surveillance coordinator should liaise with surveillance staff at the hospital in which the procedure took place so that they can report the infection to PHA.

Section 5 – Data Reporting Instructions

The following section defines all variables that are reported as part of the SSI surveillance.

- Most data items are required; some are conditionally required depending on the response of other questions, e.g. If X=Yes, then answer question Y.
- Infection data are only required for those patients that develop an SSI that meets the case definitions described in Section 4.
- Every effort should be made to ensure all data are accurate and complete to enable inter-hospital comparisons and facilitate interpretation of results.
- Required format for all data items is shown, e.g. DD/MM/YY

5.1 Data reporting levels:

The Surgical Site Infection Protocol Dataset contains two levels:

1. The first level '**Denominator data**' includes variables referring to the hospital/unit, patient, operation and risk factors [Patient/Operation]. (Table 9)

2. Second level '**Numerator**' includes variables about and operations, surgical site infections, pathogens and outcome [SSI]. (Table 10)

5.2 Levels of data requirement

Variables are classified according to two levels of requirement:

• **Required:** data will be rejected if this variable is missing (previously called mandatory)

• **Conditionally Required:** dependent on response to related questions e.g. 'Yes' to microorganism isolated then the supplementary question 'Pathogen' is required. Data will be rejected if this variable is missing.

5.3 Light Surveillance Denominator Data Minimum dataset

Table 8 below lists core dataset variables requires for 'light' SSI surveillance. The items highlighted in **bold red** are the minimum required to provide valid SSI rates with some degree of risk adjustment. The other variables should be sent to PGA if routinely collected in TMS.

Table 8: Denominator Data - Core Dataset Variables

NOTE: Please refer to the Surgical Site Infection Surveillance Protocol (Tables 9 and 10) for an instruction on each required data field.

Pre-operative	
Hospital /Code Number	**Mandatory**
H&C number	**Mandatory**
Date of hospital admission	**Mandatory**
Gender	**Mandatory**
Date of birth OR Age	**Mandatory**
Diabetes	Required
Body Mass Index OR Height and Weight	Required
Duration of Labour	Required for C Section only
Consultant responsible for patient	Required
Peri-operative	
Operating Surgeon's Code	**Mandatory**
Surgeon grade	**Mandatory**
Surgeon in training/ST Level	Conditionally Required
Classification of surgery (NCEPOD)	**Mandatory**
Date of operation	**Mandatory**
Start Time	**Mandatory**
Finish Time	**Mandatory**
Closure Technique	Required
Estimated Blood Loss	Required for C Section only
OPCS code	**Mandatory**
Anaesthesia	Required
Skin preparation	Required for C section only
ASA classification	**Mandatory**
Wound contamination class	**Mandatory**
Antibiotic Prophylactic Administered	Required
If 'No' antibiotic prophylaxis administered, reason withheld	Conditionally Required

Antibiotic Prophylactic administrations	Required
Antibiotic prophylaxis agent	Required
Timing of antibiotics OR Time prophylaxis given	Conditionally Required
Side, e.g. Left, Right	Required for Hip prosthesis(HPRO), Knee prosthesis (KPRO), Breast surgery (BRST), Herniorrhaphy (HERN)
Endoscopic procedure	Required
Anatomical site	Required for orthopaedic procedures
Procedure performed as a revision or conversion	**Mandatory for hip/knee procedures**
Trauma	Required for orthopaedic procedures
Antibiotic cement	Required for orthopaedic procedures
Approach/ Technique	Required for spinal fusion (FUSN) or refusion (RFUSN)
Spinal level	Required for spinal fusion (FUSN) or refusion (RFUSN)
Glycaemic control maintained	Required for SSI Bundle
Hair removed in hospital?	Required for SSI Bundle
Hair removal appropriately?	Required for SSI Bundle
Perioperative normothermia	Required for SSI Bundle

5.4 Denominator Data Variables

LEVEL 1: Denominator level (Patient, operation and risk factors data)

Denominator data is supplied for all procedures performed in chosen procedure categories.

Table 9: LEVEL 1: Denominator level (Patient, operation and risk factors data)

Variable label	Description	Value list
Hospital (hospital ID)	Assigned hospital code name/number – must remain identical in different surveillance periods/years.	Use code assigned to hospital or hospital name
H&C number (HC)	Unique identifier for each patient. This is the numeric patient identifier assigned by the hospital.	10 digit numeric
Date of hospital admission (Addate)	Date patient was admitted to hospital in order to undergo the operation under surveillance	Date (DD/MM/YYYY)
Gender (gender)	Gender of the patient who undergoes the operation. Intersex should be coded as 'other'	• Male • Female • Other
Date of birth (DOB) OR Age (Age)	Patient's date of birth OR Age corresponds to age at date of operation	Date (DD/MM/YYYY) Number (0–120). If less than 1, enter 0. Code 999 if unknown.
Consultant responsible for patient (CPU)	Name/code of consultant responsible for patient.	Unique consultant code. A look up table of codes for existing and new consultants should be sent to PHA
Date of operation (procdate)	Date operation under surveillance was carried out	Date (DD/MM/YYYY)
Diabetes (Diabetes)	'Yes' if the patient has a diagnosis of diabetes requiring management with insulin or a non-insulin anti-diabetic agent; otherwise 'No'	Yes, No, Unknown
Body Mass Index (BMI) OR Height (cms) (height) Weight (kg) (weight)	Patient's most recent BMI prior to, or otherwise closest to, the procedure. Patient's most recent height in centimetres (cm) prior to, or otherwise closest to, the procedure Height in centimetres to nearest whole number. Patient's most recent weight in kilograms (kg) prior to, or otherwise closest to, the procedure. Enter patient	Number (10-80), enter 999 if unknown Number (125–220), enter 999 if unknown. Number (5-200), enter 999

	weight to nearest kilogram.	if unknown.
Variable label	**Description**	**Value list**
C Section only Duration of Labour (Labhour)	Number of hours the patient laboured in the hospital from beginning of active labour to delivery of the infant, expressed in hours.	Number (1–72), Enter 99 if unknown Enter 00 if not in established labour
Operating Surgeon's Code (oper_sur)	Enter name/ code of the surgeon who performed the majority of the operative procedure.	Unique surgeon code A look up table of codes for existing and new consultants to be provided to PHA
Surgeon grade (clintype)	Select grade of surgeon from *Note: If more than one surgeon, record the grade of surgeon who performed the major part of the surgery*	• Consultant • Non-consultant staff grade/FTSA • Specialist registrar • Surgeon in training/ST
Surgeon in training/ST Level (level)	If Surgeon grade is 'Surgeon in training/ST', enter level of training in years	Numeric 1-8
Classification of surgery (NCEPOD)	Select the appropriate NCEPOD classification from the list:	• Immediate • Urgent • Expedited • Elective
Anaesthesia (anaes)	Highest level of anaesthesia administered e.g. if a patient had a an epidural and then a general, code general; alternatively if a patient had a local and then a regional code regional	• General • Regional (including epidural/spinal) • Local
Skin preparation (skinprep)	'Yes' if patient's skin has been prepared with 2% chlorhexidine gluconate in 70% isopropyl alcohol solution and allowed to air dry (if the patient has a sensitivity providone-iodine application is used); otherwise select 'No'	Yes No
Start Time (timeinci)	Time when surgery began i.e. skin incision,	HH:MM - 24-hour clock.
Finish Time (timeclos)	Time when surgery ended Surgery is finished when all instrument and sponge counts are completed and verified as correct, all postoperative radiologic studies to be done in the operating room are completed, all dressings and drains are secured, and the surgeons have completed all procedure-related activities on the patient.	HH:MM - 24-hour clock.

Variable label	Description	Value list
OPCS code (opcs)	OPCS 4.5 code of the primary operative procedure under surveillance according to protocol.	Use 4-digit code or 3-digit code if 4-digit code not available
Endoscopic procedure (Endoscope)	Entire operation was performed using endoscope/laparoscope/robotic approach. Select No if the incision was extended to allow hand assistance or was fully converted to an open approach.	Yes No
HPRO/KPRO/BRST/ HERN only Side (side)	Laterality of procedure. Required field if procedure was a hip replacement (HPRO), knee replacement (KPRO), breast surgery (BRST) or hernia surgery (HERN). If more than one procedure was performed through different incisions each procedure requires separate record.	• Left • Right • Bilateral/2incisions
Ortho only Anatomical site (site)	Anatomical site of orthopaedic procedure	Record anatomical site, e.g. hip, knee, shoulder.
Ortho only Revision or conversion (revision)	'Yes' if procedure was performed as a revision of a previous replacement and conversion otherwise select 'No'	Yes No
Ortho only Trauma (Trauma)	Operative procedure was performed because of blunt or penetrating traumatic injury to the patient. Example of a blunt trauma is a fracture resulting from a fall.	Yes, No, Unknown Enter 9 if unknown
Ortho only *Antibiotic cement (cement)*	'Yes' if antibiotic loaded cement was used during the procedure code; otherwise code 'No'	Yes No
FUSN/RFUSN Only: Approach/ Technique (Approach)	Required field if procedure was a spinal fusion (FUSN) or refusion (RFUSN) Select appropriate surgical approach or technique	• Anterior • Posterior • Anterior and Posterior • Trans oral • Unknown (enter 9)
FUSN/RFUSN Only: Level (Spinelevel)	Conditionally required: If procedure was a spinal fusion (FUSN) or refusion (RFUSN) Select appropriate level. If more than one level is fused, report category in which most vertebrae was fused.	• Atlas-Axis • Atlas-Axis/Cervical • Cervical • Cervical/Dorsal/ Dorsolumbar • Dorsal/dorsolumbar • Lumbar/Lumbosacral • Unknown

Variable label	Description	Value list
ASA classification (ASA)	Physical status classification (American Society of Anesthesiology) at time of operative procedure	1, 2, 3, 4, 5 or 9 if unknown
Wound contamination class (WoundClass)	The wound contamination class as described in the surveillance protocol	• Clean • Clean-contaminated • Contaminated • Dirty or infected
Antibiotic Prophylactic Administered (prophylaxis)	Prophylactic antibiotics were given for the operative procedure (with the intent of preventing infections at the surgical site). Does not include antibiotics given as a course leading up to the procedure.	Yes No
If 'No', reason withheld (prop_none)	'Yes' if patient was already on a treatment course of antibiotics appropriate for prophylaxis or prophylactic antibiotics to be given after old prosthesis removed for culture in patient having joint prosthesis; otherwise select 'No'	Yes, No or 9 if unknown
Antibiotic prophylaxis administrations (Dosage)	The number of administrations (doses) of antibiotic prophylaxis given to maintain activity throughout the operation:	One administration Two or more administrations
Antibiotic prophylaxis agent (antiprop)	Generic name of all prophylactic antibiotics administered.	Select from list provided
Timing of antibiotics (antitim) OR Time prophylaxis	Record the time the antibiotic administration (infusion/stat dose) commenced. OR Enter time each antibiotic administration given	• More than 1 hour prior to incision • Within 1 hour prior to incision • After incision • Immediately after cord clamping (C-sec only) HH:MM - 24-hour clock.
Closure Technique (Closure)	Skin closure technique used. Primary Closure is defined as 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. If primary, indicate the type of closure. Non-Primary Closure is defined as closure that is other than primary.	• Primary - Continuous sutures - Interrupted sutures - Staples - Glue • Non-Primary
C Section only Blood Loss (blood)	Estimated patient's blood loss during the Caesarean section in millilitres (mls)	100-3000 mls

SSI Bundle questions - Optional		
SSI Bundle only *Was glycaemic control maintained (dia_glyc)*	Conditionally required if 'Yes' to Diabetes. 'Yes' if glycaemic control was maintained i.e. < 11mmol/l; otherwise select 'No' (This tight blood glucose control is not yet considered relevant in non-diabetic patients).	Yes No
SSI Bundle only *Was hair removed in hospital? (hair_rem)*	'Yes' if pubic hair was removed in hospital before procedure otherwise select 'No'	Yes No
SSI Bundle only *Was hair removal appropriately? (hair_app)*	Conditionally required if 'Yes' to hair removed in hospital. 'Yes' if hair is removed using clippers with a disposable head (not by shaving) and timed as close to the operating procedure as possible; otherwise select 'No'.	Yes No
SSI Bundle only *Perioperative normothermia (normoth)*	'Yes' if patients body temperature was maintained above 36^{o}C in the perioperative period: Otherwise select 'No'	Yes No

5.5 Denominator Data Reporting Instructions:

1. Closure type. As of July 2014, incisional closure is NO LONGER a part of the operative procedure definition; all otherwise eligible procedures are included in the denominator reporting, regardless of closure type. The closure technique is entered for each denominator for procedure.

2. Different procedure groups performed during same trip to the operating room. If procedures in more than one operative procedure group are performed during the same trip to the operating room through the same or different incisions, a Procedure (Denominator) record is completed for each operative procedure group being monitored. For example, if a cardiac surgery procedure and a CABG are done through the same incision, a Surgical Site Procedure (Denominator) record is reported for each.

3. Duration of the procedure when more than one operative procedure group is done through the same incision. If surgery includes more than one operative procedure group 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 skin incision to primary closure. For example, if a coronary artery bypass graft chest (CBGC) and a cardiac procedure (CARD) are performed on a patient during the same trip to the operating room, the time from skin incision (start time) to surgery finish time is reported for both operative procedures

4. Same operative procedure group but different OPCS codes during same trip to the operating room. If procedures of different OPCS codes from the same operative procedure group are performed through the same incision, record only one procedure for that category. For example, a facility is performing surveillance for cardiac procedure (CARD) procedures. A patient undergoes a replacement of both the mitral and tricuspid valves during the same trip to the operating room. Complete one Procedure (Denominator) record because these procedures fall in the same operative procedure group. For a complete list of procedure groups (See Appendix 1) and for associated OPCS4 codes go to:

http://www.publichealth.hscni.net/directorate-public-health/health-protection/reference-documents

5. More than one operative procedure through same incision within 24 hours. If a patient goes to the operating room more than once during the same admission and another procedure of the same or different procedure group is performed through the same incision within 24 hours of the finish time of the original operative incision, report only one Procedure (Denominator) record for the original procedure, combining the durations for both procedures. For example, a patient has a coronary artery bypass graft with both chest and donor site incisions (CBGB) lasting 4 hours. He returns to the operating room six hours later to correct a bleeding vessel. The surgeon reopens the initial incision, makes the repairs, and recloses in 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.

6. Bilateral procedures. For operative procedures that can be performed bilaterally during same trip to operating room e.g. knee prosthesis (KPRO), breast surgery (BRST), one procedure (Denominator) record is completed. To document duration of the bilateral procedure, indicate the incision start time to finish time for the entire procedure if performed concurrently. If performed sequentially and there are two procedure durations submit the longest duration.

7. Open hernia repairs. If more than one open (i.e. non-laparoscopic) hernia repair is performed via separate incisions during the same visit to the operating room (i.e. two incisions are made to repair two defects, e.g. umbilical and femoral hernia) complete one denominator procedure record. To document duration of these procedures, indicate the incision start time to finish time for the entire procedure if performed concurrently. If performed sequentially and there are two procedure durations submit the longest duration.

8. Laparoscopic hernia repairs. Laparoscopic hernia repairs are considered one procedure, regardless of the number of hernias that are repaired in that trip to the operating room. In most cases there will be only one incision time documented for this procedure. If more than one time is documented, report the total of the durations.

9. Patient dies in the operating room. If a patient dies in the operating room, do not complete a Procedure (Denominator) record. This operative procedure is excluded from the denominator.

10. A Single operative procedure with multiple incisions. Some operative procedures have more than one incision (e.g. coronary artery bypass graft both (CBGB); colostomy reversals; spinal fusion or refusion with anterior and posterior approaches). Complete only one Surgical Site Procedure (Denominator) record for such procedures. Record the duration as time from skin incision to surgery finish.

11. Incidental appendectomy. An appendectomy should be reported regardless of whether it is incidental.

5.6 Numerator Data Variables

LEVEL 2: Numerator level (SSI)

'Numerator level' includes variables on surgical site infections, patients, operations, pathogens and outcome. A numerator record is to be completed for each surgical site infection using WebForms (with the current exceptions of caesarean sections and cardiac surgery procedures) http://10.210.65.188/webforms/

NOTE: Variable labels are not used for numerator data as data is automatically uploaded from WebForms.

Table 10: LEVEL 2: Numerator level (SSI, Patient and Operation data)

Variable name	Description	Value list
Facility where index procedure performed	Facility where index procedure was performed. Index procedure is procedure that led to infection. Unique identifier for each hospital – should remain identical in different surveillance periods/years.	Choose from pick list
H&C number	Unique identifier for each patient. This is the numeric patient identifier assigned by the hospital.	Numeric only
Gender	Gender of the patient who develops SSI. Intersex should be coded as 'other'	Male Female Other
Date of birth	Patient's date of birth	Date (DD/MM/YYYY)
Date of operation	Date operation was carried out	Date (DD/MM/YYYY)
Procedure site	The primary operative procedure site under surveillance. These are the major categories of surgery under surveillance.	Pick from list
Procedure groups	Procedure groups are combinations of clinically similar operative procedures that allow comparison of SSI rates in groups of patients undergoing similar operative procedures.	See Annex
OPCS code	OPCS 4.5 code of the primary operative procedure under surveillance according to SSI surveillance protocol. Use 4-digit code or 3-digit code if 4-digit code not available.	On PHA/Health protection website
Anatomical site Orthopaedic only	Anatomical site of orthopaedic procedure	Pick from list
Infection detected	When SSI was first detected	• During in-patient stay for operation • Readmission to the facility where the operation was

		performed. • Admission to other facility • Post-discharge (other than readmission)
Facility admitted to with SSI *Conditionally required*	If SSI was identified due to readmission to facility other than where the operation was performed: Indicate the facility the patient was readmitted to with SSI.	Select from Picklist
Treated with antibiotics	Enter 'Yes' if SSI was treated with antibiotics; otherwise select No,	Yes, No
Returned to theatre	Patient returned to theatre to treat SSI.	Yes, No
Isolate	Indicate if microorganisms were isolated from SSI site; otherwise select No.	Yes, No
Pathogen(s) *Conditionally required if 'Isolate' is Yes*	Up to two pathogens may be reported. If multiple pathogens are identified, enter the pathogen judged to be the most important cause of infection as 1 and the next as 2 (usually this order will be indicated on the laboratory report). If the species is not given on the lab report or is not found on the organism list, then select the "spp" choice for the genus.	See Annex
Date infection confirmed	Date of SSI is the date when the last element used to meet the CDC/NHSN site-specific infection criterion occurred. Date of superficial SSI must be within 30 days of the date of procedure.	Date (DD/MM/YYYY)
Infection type	The appropriate level of SSI	• Superficial incisional • Deep incisional • Organ/space: (Indicate specific site from list)
Organ/space site	Select organ/space site where infection is identified. Because an organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure the criterion for infection at these body sites must be met in addition to the organ/space SSI criteria.	Picklist
Criteria used to identify SSI	Specify each of the elements of the definition that were used to identify the specific type of SSI. Specific organ/space event types have their own unique criteria which must be met	See SSI definitions

Outcome	Discharged from facility. If a patient is an in-patient in the facility at 30/90-days post-operation select end of surveillance period.	Discharge from unit End of surveillance Died
Date of discharge from hospital	Date the patient was discharged from hospital where they underwent the operation or date of in-hospital death or date of last follow-up in-hospital if discharge date is unknown.	Date (DD/MM/YYYY)
Submission	Grade of healthcare professional that checked and submitted WebForm.	Surgeon IPCN Senior Nurse Other Physician

5.7 Numerator Data (Surgical Site Infection data) Reporting Instructions:

1. Multiple tissue levels are involved in the infection. The type of SSI (superficial incisional, deep incisional, or organ/space) reported should reflect the deepest tissue layer involved in the infection:

a. Report infection that involves the organ/space as an organ/space SSI, whether or not it also involves the superficial or deep incision sites.

b. Report infection that involves the superficial and deep incisional sites as a deep incisional SSI.

2. Attributing SSI to a procedure when several are performed on different dates. If a patient has several operative procedures performed on different dates prior to an infection, attribute the infection to the operation that was performed most closely in time prior to the infection date, unless there is evidence that the infection was associated with a different operation.

3. Attributing SSI to procedures that involve multiple incision sites. If multiple incision sites of the same operative procedure become infected, only report as a single SSI, and assign the type of SSI (superficial, deep or organ space) that represents the deepest tissue level involved at any of the infected sites. For example:

a. 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.

b. 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.

c. 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.

d. In a colostomy formation or reversal (take down) procedure, if both the stoma and another abdominal incision site develop superficial incisional SSI, report only as one SSI.

EXCEPTION: If a coronary artery bypass graft (CABG) patient has infections at both the chest and donor sites enter as two separate infection episodes.

4. Attributing SSI to procedures that have secondary incision sites. The SSI surveillance periods for any secondary incision site are 30 days, regardless of the required deep incisional or organ/space SSI surveillance period for the primary incision site (Table 3). For example, a saphenous vein harvest incision in a coronary artery bypass graft – both chest and donor site (CBGB) procedure is considered the secondary incision. CBGB procedure is reported, the saphenous vein harvest site is monitored for 30 days after surgery and the chest incision is monitored for 90 days for SSI.

5. SSI detected at another facility. If an SSI is detected at a facility other than the one in which the operation was done, notify the Infection Prevention & Control Professional (IPCN) of the index facility with enough detail so the infection can be reported to PHA. When reporting the SSI, the index facility should indicate that SSI Detected = Readmission to other facility.

6. SSI following invasive manipulation/accession of the operative site. If during the post-operative period the surgical site has an invasive manipulation/accession for diagnostic or therapeutic purposes (e.g., needle aspiration), and following this manipulation/accession an SSI develops, the infection is not attributed to the operation. This reporting instruction does NOT apply to closed manipulation (e.g. closed reduction of a dislocated hip after orthopaedic procedure). Invasive manipulation does not include wound packing, or changing wound packing materials as part of postoperative care.

7. Reporting instructions for specific post-operative infection scenarios. As of October 2014, an SSI that otherwise meets the definitions should be reported to PHA 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. Also, SSI should also be reported regardless of the presence of certain skin conditions (e.g. dermatitis, blister, impetigo) that occur near an incision, and regardless of the possible occurrence of a "seeding" event from an unrelated procedure (e.g. dental work). This instruction is necessary to reduce subjectivity and data collection burden.

8. SSI attribution after surgical procedure involving more than one operative procedure group. If a surgical procedure from more than one operative procedure group was performed through a single incision 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 'Table 11: Procedure Infection Hierarchy' 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 operating room in which both a colon surgery (COLO) and small bowel (SB) were performed, and the source of the SSI is not apparent, assign the SSI to the COLO procedure.

The following lists are derived from the operative procedures listed in Appendix 1. The categories with the highest risk of SSI are listed before those with lower risks.

Table 11: Procedure Infection Hierarchy

Priority	Abdominal Operations
1	Liver transplant
2	Colon surgery
3	Bile duct, liver or pancreatic surgery
4	Small bowel surgery
5	Rectal surgery
6	Kidney transplant
7	Gastric surgery
8	Abdominal aortic aneurysm repair
9	Abdominal hysterectomy
10	Caesarean section
11	Laparotomy
12	Appendix surgery
13	Herniorrhaphy
14	Kidney surgery
15	Vaginal Hysterectomy
16	Spleen surgery
17	Gall bladder surgery
18	Ovarian surgery
Priority	**Thoracic Operations**
1	Heart transplant
2	Coronary artery bypass graft with donor incision(s)
3	Coronary artery bypass graft, chest incision only
4	Cardiac surgery
5	Thoracic surgery
Priority	**Neurosurgical (Brain/Spine) Operations**
1	Ventricular shunt
2	Refusion of spine
3	Craniotomy
4	Spinal fusion
5	Laminectomy
Priority	**Neck Operations**
1	Neck surgery
2	Thyroid and or parathyroid surgery

Section 6 – Data Analyses and access to results

On-going analysis and timely dissemination of results to relevant clinical and other staff is essential if surveillance is to be part of effective infection prevention and control tool.

Participating hospitals should develop a clear strategy for actively disseminating the SSI surveillance reports and acting on the results.

6.1 Incidence of surgical site infection

The cumulative incidence of infection is the number of new infections that occur in a defined population during a given period of time. This is most accurately described as the risk of SSI but this term tends to be used interchangeably with rate. This measure is reported as the number of SSIs per 100 operations. It takes account of the fact that the same patient can develop more than one SSI related to the same procedure.

6.2 Stratification by the NHSN (NNIS) risk index

Until the mid-1980s, classification of surgical wounds as clean, clean-contaminated, contaminated, and dirty was considered to be the most important factor in predicting the risk of surgical site infection. However, the risk of surgical site infection is also associated with the susceptibility of the patient to infection, and with pre-operative and intra-operative events.[14] The SENIC project therefore developed a risk index to take account of these factors, which was subsequently modified by the National Nosocomial Infections Surveillance (NNIS) System (now called National Healthcare Safety Network), based at the Centers for Disease Control and Prevention (CDC), USA.

In the NHSN risk index, each operation is scored by the presence or absence of three risk factors at the time of surgery:

- American Society of Anesthesiologists' (ASA) pre-operative assessment score of 3, 4 or 5
- an operation classified as contaminated or dirty
- an operation lasting for more than a specific period of time

Each of the risk factors described above contributes one point to the risk index, which ranges from 0 (none of the risk factors present) to 3 (all of the risk factors present).

At present, the NHSN risk index is the most standardised method available for stratifying surgical site infection rates according to the degree of risk. These data help to identify how the incidence of SSI may be affected by differences in case-mix and form the basis for making valid comparisons within and between hospitals, between surgeons, and over time. Thus, the surveillance system described in this protocol has been designed to obtain additional risk factor information to calculate the NNIS risk index, and to estimate the effect of the individual risk factors that contributed to this index.[5]

6.3 Secure Web-based Feedback

At the end of surveillance period hospitals participating in SSI surveillance are able to generate reports from a secure web portal link. All SSI reporting timescales can be found in Section 2.4 'Data submission'. Access to the web portal is by entering the following URL into the web browser of your PC and entering a Username and Password (available from Trust Patient Safety Officer):

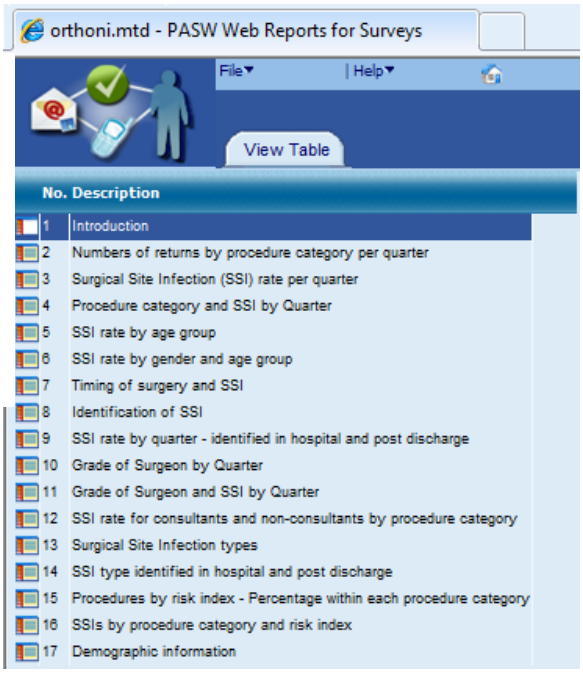
https://www.mrtables.hscni.net/SPSSMR/DimensionNet/Login/default.aspx

Summary reports for each project are divided into 3 levels:

- Northern Ireland aggregate
- Trust aggregate
- Hospital

A series of predefined tables are generated on a quarterly basis. The predefined tables contain data on key risk factors for SSI such as procedure category, age group, timing of surgery; and patient risk index.

If you require further analysis please contact a member of PHA Surveillance Team.



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Appendix 1 – Operative Procedure Groups

NOTE: A complete list of associated OPCS4 codes is found in Excel spread sheet at http://www.publichealth.hscni.net/directorate-public-health/health-protection/reference-documents

Major surgical group	Procedure category
Orthopaedic	Hip replacement
	Repair of neck of femur
	Knee replacement
	Other prosthesis
	Reduction of long bone fracture, i.e. humerus, ulna, radius, femur, tibia and fibula
	Laminectomy
	Spinal fusion/Refusion
	Spinal Surgery
	Limb amputation (X07 – X12)
	Other muscoloskeletal
	Skin graft
	Nervous system
Endocrine system and breast	Thyroid and parathyroid glands (B08 - B16)
	Other Endocrine glands (B17 - B25)
	Breast (B27 - B40, O14; T85 - T87)
Upper digestive tract (G01-G82)	Endoscopic operations on oesophagus (G14-G19)
	Operations on diaphragmatic hernia (G23-G25)
	Oesophagus including hiatus hernia (G01-G25)
	Excision of stomach (G27-G28)
	Endoscopic operations on upper gastrointestinal tract (G43-G45)
	Stomach pylorus and general upper gastrointestinal tract endoscopy (G27-G48)
	Duodenum (G49-G57)
	Jejunum (G58-G67)
	Ileum (G69-G82)
Lower digestive tract	Appendix (H01-H03)
	Colon (H04-H30)
	Rectum (H33-H46)
	Operations on haemorrhoid (H51-H53)
	Anus and perianal region (H47-H62)
Bile duct, liver, pancreatic	Liver (J01-J16)
	Gall bladder (J18-J26)
	Bile duct (J27-J52)
	Pancreas (J54-J67)
	Spleen (J69-J72)

Major surgical group	Procedure category (OPCS)
Vascular	Aorta (L16-L26)
	Carotid, cerebral and subclavian arteries (L29-L39)
	Abdominal branches of aorta (L41-L47)
	Iliac and femoral arteries (L48-L63)
	Other arteries (L65-L72)
	Veins and other blood vessels (L74-L97)
	Amputations
Abdominal wall including hernias	Operations on inguinal hernia (T19-T21)
	Operations on other abdominal hernia (T22-T27)
Urinary procedures including kidney procedures	Transplantation of kidney (M01)
	Excision of kidney (M02-M03)
	Endoscopic operations on kidney (M09-M11)
	Kidney (M01-M16)
	Endoscopic operations on ureter (M26-M30)
	Ureter (M18-M32)
	Open operations on bladder (M34-M41)
	Endoscopic operations on bladder (M42-M45)
	Bladder (M34-M49)
	Operations on outlet of female bladder (M51-M58)
	Open excision of prostate (M61)
	Endoscopic operations on outlet of male bladder (M65-M67)
	Urethra and other parts of urinary tract (M72-M83)

Appendix 2 – Specific sites of Organ/Space infections

This appendix provides further required criteria for the specific infection types that constitute organ/space surgical site infections (SSI), e.g., mediastinitis that may follow a coronary artery bypass graft, intra-abdominal abscess after colon surgery.

An **organ/space SSI** involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. Specific sites are assigned to organ/space SSI to further identify the location of the infection.

Organ/Space – Sites of infection

Code	Site	Code	Site
BONE	Osteomyelitis	IAB	Intraabdominal, not specified
JNT	Joint or Bursa	GIT	GI tract
PJI	Periprosthetic Joint Infection HPRO and KPRO only	VAS	Arterial or venous infection
DISC	Disc space	EME	Endometritis
SA	Spinal abscess without meningitis	VCU	Vaginal cuff
BRST	Breast abscess or mastitis	HEP	Hepatitis
MED	Mediastinitis	OUTI	Other infections of the urinary tract

BONE-Osteomyelitis

Osteomyelitis infection must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from bone.

Criterion 2: Patient has evidence of osteomyelitis on direct examination during a surgical operation or histopathological examination.

Criterion 3: Patient has at least two of the following signs and symptoms with no other recognised cause: fever (>38°C), localised swelling, tenderness, heat, or drainage at suspected site of bone

And

At least one of the following:

- organisms cultured from blood
- positive blood antigen test on blood (e.g. H. influenzae, S. pneumoniae)
- radiographical evidence of infection e.g., abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI), or radiolabelled scans (gallium, technetium, etc.).

JNT-Joint or bursa

Joint or bursa infections must meet the following applicable criteria:

Criterion 1: Patient has organisms cultured from joint fluid or synovial biopsy

Criterion 2: Patient has evidence of joint or bursa infection seen during a surgical operation or histopathological examination.

Criterion 3: Patient has at least two of the following signs and symptoms with no other recognised cause: joint pain, swelling, tenderness, heat, evidence of effusion or limitation of motion

And

At least one of the following;

- organisms and white blood cells seen on Gram stain of joint fluid
- positive antigen test on blood, urine or joint fluid
- cellular profile and chemistries of joint fluid compatible with infection and not explained by an underlying rheumatic disorder
- radiographical evidence of infection e.g., abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI), or radiolabelled scans (gallium, technetium, etc.).

PJI – Periprosthetic Joint Infection (following Hip prosthesis and Knee prosthesis only)

Periprosthetic Joint Infection (following Hip prosthesis [HPRO] and Knee prosthesis [KPRO] only) must meet at least *1* of the following criteria:

Criterion 1: Two positive periprosthetic (*tissue or fluid*) cultures with identical organisms

Criterion 2: A sinus tract communicating with the joint

Criterion 3: Having three of the following minor criteria:

a. Elevated serum C-reactive protein (CRP; >100 mg/L) *AND* erythrocyte sedimentation rate (ESR; >30 mm/hr.).
b. Elevated synovial fluid white blood cell (WBC; >10,000 cells/µL) count OR ++ (or greater) change on leukocyte esterase test strip of synovial fluid.
c. Elevated synovial fluid polymorphonuclear neutrophil percentage (PMN% >90%).
d. Positive histological analysis of periprosthetic tissue (>5 neutrophils (PMNs) per high power field).
e. A single positive periprosthetic (tissue or fluid) culture.

COMMENTS

- Identical organisms mean matching at genus and species level but they do not have to have matching antibiograms.
- A sinus tract is defined as a narrow opening or passageway underneath the skin that can extend in any direction through soft tissue and results in dead space with potential for abscess formation
- The NHSN definition of PJI is closely adapted from the Musculoskeletal Infection Society's (MSIS's) definition of PJI (*Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection. 2013*). However, the standard laboratory cut-off values in criteria 3a to 3d are provided by NHSN for HPRO and KPRO SSI surveillance purposes only. The NHSN laboratory cut-offs are not intended to guide clinicians in the actual clinical diagnosis and management of acute or chronic PJI.

DISC-Disc space infection

Vertebral disc space infection must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from vertebral disc space tissue obtained during an invasive procedure.

Criterion 2: Patient has evidence of vertebral disc space infection seen during an invasive procedure or histopathological examination.

Criterion 3: Patient has fever (>38°C) or pain at the involved vertebral disc space*
And
imaging test evidence of infection, (e.g., abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]).

** With no other recognized cause*

Criterion 4: Patient has fever (>38°C) and pain at the involved vertebral disc space*
And
positive laboratory test on blood or urine (e.g., antigen tests for *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*).

** With no other recognized cause*

SA-Spinal abscess without meningitis

An abscess of the spinal epidural or subdural space, without involvement of the cerebrospinal fluid or adjacent bone structures, must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from abscess in the spinal epidural or subdural space.

Criterion 2: Patient has an abscess in the spinal epidural or subdural space seen during an invasive procedure or at autopsy or evidence of an abscess seen during a histopathological examination.

Criterion 3: Patient has at least *1* of the following signs or symptoms: fever (>38°C), back pain*, focal tenderness*, radiculitis*, paraparesis*, or paraplegia*
And
at least *1* of the following:
a. organisms cultured from blood
b. imaging test evidence of a spinal abscess (e.g., abnormal findings on myelography, ultrasound, CT scan, MRI, or other scans [gallium, technetium, etc.]).
And
if diagnosis is made ante mortem, physician institutes appropriate antimicrobial therapy.

** With no other recognized cause*

Reporting instruction
• If meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA.

BRST-Breast abscess or mastitis

A breast abscess or mastitis must meet at least 1 of the following criteria:

Criterion 1: Patient has a positive culture of affected breast tissue or fluid obtained by invasive procedure.

Criterion 2: Patient has a breast abscess or other evidence of infection seen during an invasive procedure or histopathological examination.

Criterion 3: Patient has fever (>38°C) and local inflammation of the breast

And

physician diagnosis of breast abscess.

MED-Mediastinitis

Mediastinitis must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from mediastinal tissue or fluid obtained during an invasive procedure.

Criterion 2: Patient has evidence of mediastinitis seen during an invasive procedure or histopathological examination.

Criterion 3: Patient has at least *1* of the following signs or symptoms: fever (>38°C), chest pain*, or sternal instability*

And

at least *1* of the following:

a. purulent discharge from mediastinal area
b. organisms cultured from blood or discharge from mediastinal area
c. mediastinal widening on imaging test.

** With no other recognized cause*

Criterion 4: Patient ≤1 year of age has at least *1* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnoea*, bradycardia*, or sternal instability*

And

at least *1* of the following:

a. purulent discharge from mediastinal area
b. organisms cultured from blood or discharge from mediastinal area
c. mediastinal widening on imaging test.

** With no other recognized cause*

Reporting instruction

- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.

GIT-Gastrointestinal tract infection (oesophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least *1* of the following criteria:

Criterion 1: Patient has an abscess or other evidence of infection seen during an invasive procedure or histopathological examination.

Criterion 2: Patient has at least *2* of the following signs or symptoms compatible with infection of the organ or tissue involved: fever (>38°C), nausea*, vomiting*, abdominal pain*or tenderness*, or diarrhoea

And

at least *1* of the following:

a. organisms cultured from drainage or tissue obtained during an invasive procedure or endoscopy or from an aseptically-placed drain

b. organisms seen on Gram's or KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during an invasive procedure or endoscopy or from an aseptically-placed drain

c. organisms cultured from blood

d. evidence of pathologic findings on imaging test

e. evidence of pathologic findings on endoscopic examination (e.g., *Candida esophagitis*, *proctitis, or toxic megacolon*).

**With no other recognized cause*

IAB-Intraabdominal infection, not specified elsewhere including gallbladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, sub phrenic or sub diaphragmatic space, or other intraabdominal tissue or area not specified elsewhere

Intraabdominal infections must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from abscess and/or purulent material from intraabdominal space obtained during an invasive procedure.

Criterion 2: Patient has abscess or other evidence of intraabdominal infection seen during an invasive procedure or histopathological examination.

Criterion 3: Patient has at least *2* of the following signs or symptoms: fever (>38°C), nausea*, vomiting*, abdominal pain*, or jaundice*

And

at least *1* of the following:

a. organisms cultured from drainage from an aseptically-placed drain (e.g., closed suction drainage system, open drain, T-tube drain, CT guided drainage)

b. organisms seen on Gram's stain of drainage or tissue obtained during invasive procedure or from an aseptically-placed drain

c. organisms cultured from blood and imaging test evidence of infection (e.g., abnormal findings on ultrasound, CT scan, MRI, or radiolabel scans [gallium, technetium, etc.] or on abdominal x-ray).

** With no other recognized cause*

VASC-Arterial or venous infection

Arterial or venous infection must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from arteries or veins removed during an invasive procedure
And
blood culture not done or no organisms cultured from blood.

Criterion 2: Patient has evidence of arterial or venous infection seen during an invasive procedure or histopathological examination.

Criterion 3: Patient has at least *1* of the following signs or symptoms: fever (>38°C), pain*, erythema*, or heat at involved vascular site*
And
more than 15 colonies cultured from intravascular cannula tip using semi quantitative culture method
And
blood culture not done or no organisms cultured from blood.

** With no other recognized cause*

Criterion 4: Patient has purulent drainage at involved vascular site
And
blood culture not done or no organisms cultured from blood.

Criterion 5: Patient ≤1 year of age has at least *1* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnoea*, bradycardia*, lethargy*, or pain*, erythema*, or heat at involved vascular site*
And
more than 15 colonies cultured from intravascular cannula tip using semi quantitative culture method
And
blood culture not done or no organisms cultured from blood.

** With no other recognized cause*

EMET-Endometritis

Endometritis must meet at least *1* of the following criteria:

Criterion 1: Patient has organisms cultured from fluid (including amniotic fluid) or tissue from endometrium obtained during an invasive procedure or biopsy.

Criterion 2: Patient has at least *2* of the following signs or symptoms: fever (>38°C), abdominal pain*, uterine tenderness*, or purulent drainage from uterus*.

** With no other recognized cause*

Reporting instruction

- Report postpartum endometritis as a healthcare-associated infection unless the amniotic fluid is infected at the time of admission or the patient was admitted more than 2 days after rupture of the membrane. (Day 1 = rupture day)

VCUF-Vaginal cuff infection

Vaginal cuff infections must meet at least *1* of the following criteria:

Criterion 1: Post hysterectomy patient has purulent drainage from the vaginal cuff.

Criterion 2: Post hysterectomy patient has an abscess at the vaginal cuff.

Criterion 3: Post hysterectomy patient has pathogens cultured from fluid or tissue obtained from the vaginal cuff.

HEP-Hepatitis

Hepatitis must meet the following criterion:

Criterion: Patient has at least *2* of the following signs or symptoms: fever (>38°C), anorexia*, nausea*, vomiting*, abdominal pain*, jaundice*, or history of transfusion within the previous 3 months

And

at least *1* of the following:

a. positive laboratory test for acute hepatitis A, hepatitis B, hepatitis C, or delta hepatitis and duration of hospital stay consistent with healthcare acquisition
b. abnormal liver function tests (e.g., elevated ALT/AST, bilirubin)
c. cytomegalovirus (CMV) detected in urine or oropharyngeal secretions.

** With no other recognized cause*

Reporting instructions

- Do not report hepatitis or jaundice of non-infectious origin (alpha-1 antitrypsin deficiency, etc.).
- Do not report hepatitis or jaundice that result from exposure to hepatotoxins (alcoholic or acetaminophen- induced hepatitis, etc.).
- Do not report hepatitis or jaundice that result from biliary obstruction (cholecystitis).

OUTI-Other Urinary Tract Infection (kidney, ureter, bladder, urethra, or tissue surrounding the retroperitoneal or perinephric space)

Other infections of the urinary tract must meet at least *1* of the following criteria:

Criterion 1: Patient has microorganisms isolated from culture of fluid (other than urine) or tissue from affected site.

Criterion 2: Patient has an abscess or other evidence of infection seen on direct examination, during an invasive procedure, or during a histopathological examination.

Criterion 3: Patient has at least 2 of the following signs or symptoms: fever (>38°C), localized pain*, or localized tenderness at the involved site*

And

at least 1 of the following:

a. purulent drainage from affected site
b. microorganisms cultured from blood that are compatible with suspected site of infection
c. imaging test evidence of infection (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).

** With no other recognized cause*

Criterion 4: Patient <1 year of age has at least 1 of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnoea*, bradycardia*, lethargy*, or vomiting*

And

at least 1 of the following:

a. purulent drainage from affected site
b. microorganisms cultured from blood that are compatible with suspected site of infection
c. imaging test evidence of infection, (e.g., abnormal ultrasound, CT scans, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).

** With no other recognized cause*