Orthopaedic surgery implementation guide

January 2023

Te aratohu poka kōiwi

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SSII Surgical Site Infection Improvement Programme

Te Kāwanatanga o Aotearoa
New Zealand Government

Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa

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This document has been drawn from information and resources made available by organisations with well-established surgical site infection improvement programmes in place. The national SSIIP team would like to acknowledge the following organisations as integral to the development of the guide:

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- US Centers for Disease Control and Prevention
- Welsh Healthcare Associated Infection Programme
- VICNISS Healthcare Associated Infection Surveillance System.

We thank Te Whatu Ora – Health New Zealand Counties Manukau infection prevention and control service for its decision-making algorithms and flow diagrams (**Appendix 2**), which will help to identify procedures and infections to be included in the SSIIP.

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1 Document purpose | Te whāinga

This document provides guidance for the implementation and delivery of the national Surgical Site Infection Improvement Programme (SSIIP) for orthopaedic surgery in Aotearoa New Zealand.

The guide is intended for health care professionals in Aotearoa New Zealand – specifically, infection prevention and control (IPC) teams, clinical microbiologists and infectious disease physicians, quality and safety teams, orthopaedic surgical and anaesthetic teams, and all of those involved in the SSIIP at a local level. A multidisciplinary approach is essential to ensure the programme has the appropriate expertise.

This guide supersedes the Health Quality & Safety Commission's (the Commission's) *Orthopaedic surgery implementation manual*, 2019.

2 Introduction | He kupu whakataki

Background

International evidence shows that healthcare-associated infections (HAIs) are a significant risk to patients, with surgical site infections (SSIs) identified as being among the highest proportion of these (Berríos-Torres et al 2017). Results from Aotearoa New Zealand's first national point prevalence survey of HAIs, conducted by the Commission in 2021, demonstrated that a quarter of all HAIs were attributed to an SSI (Grae et al 2022).

The consequences of SSI can be significant and include emotional and financial stress to patients and their whānau, serious illness, long-term disability and loss of life as well as prolonged hospital stays and additional interventions and treatment. The consequences for patients, as well as health services, mean that the prevention of SSIs is extremely important.

Surveillance can be defined as the ongoing systematic collection, analysis and interpretation of health data essential to the planning, implementation and evaluation of public health practice, closely integrated with the timely dissemination of that data to those who need to know. The final link of the surveillance chain is the application of the high-quality data to infection prevention.

The Commission's IPC programme aims to reduce healthcare-associated infections, including SSIs. The SSIIP is one component of the Commission's IPC programme, which uses a quality improvement approach to reducing harm by preventing SSIs.

Through its consultative process, the SSIIP promotes culture change and practice improvements that focus on the prevention of SSIs. This encourages performance improvement by highlighting practice that may require attention. The programme also provides intervention guidance on how to drive improvements that result in safer patient care.

About the SSIIP

In 2012 the Commission collaborated with Auckland and Canterbury District Health Boards to deliver a national SSIIP for district health boards (DHBs).

Drawing on the 2010 report to the Ministry of Health (NQIP 2010), the SSIIP, in collaboration with Te Whatu Ora Health New Zealand districts (districts) throughout the country, has refined the report's recommendations and implemented a consistent, evidence-based approach for collecting and reporting high-quality data on selected orthopaedic procedures.

The orthopaedic surgery workstream was established early in 2013, and all districts have participated since 1 July 2013.

Between February 2016 and June 2018, the Accident Compensation Corporation (ACC) supported the Commission's SSIIP to work to reduce the incidence and harm of HAIs. The funding was used to complete the programme in public hospitals for hip and knee arthroplasty and cardiac surgeries. In 2016, responsibility for the delivery of the programme transitioned to the Commission.

In February 2020, in response to a decline in the national SSI rate (a 25 percent reduction) and high compliance with the programmes process markers, the Commission's Board approved the option for districts to transition to light surveillance for the orthopaedic SSIIP. Light surveillance requires only 10 fields of data to be collected for all procedures, with all data collection fields completed for SSI cases.

Since 1 October 2020, districts have been able to choose to maintain full surveillance (status quo) or transition to light surveillance.

The programme is supported by the national SSIIP team. The team comprises the Commission's IPC team, Dr Arthur Morris as the SSIIP clinical lead and the National ICNet Service Hub. The National ICNet Service Hub is situated in Waitaha Canterbury district, which provides hosting, application and clinical support.

The objective of the SSIIP is to improve the quality of patient safety and care. It provides clinicians with a robust reporting system of infection rates. Such a mechanism of feedback has been shown to lead to improvements in performance (IHI 2012). National data will also mean consistency in measurements and comparison between districts.

The SSIIP seeks to:

- deliver a consistent approach to the monitoring of SSIs through the implementation of evidence-based surveillance guidelines
- provide accurate outcome measurement and reporting for SSIs through the implementation of a national monitoring system
- lead quality improvement activities through the use of high-quality data
- drive the required culture and behaviour change through reporting back to local clinical teams.

Training and support

Districts are supported by the national SSIIP team, which provides guidance and facilitates local implementation.

Training and education

- The National ICNet Service Hub provides technical training, clinical advice and ongoing support for electronic data collection – that is, the use of the ICNET SSIS forms and the National Monitor.
- The Commission's IPC team provides training, education and support for new SSI champions about the SSIIP.
- Education is incorporated into regular SSI champion meetings and the quarterly SSI investigation meetings.
- Electronic resources are available to support training and education, on request or on the Commission's website.

Clinical advice

- The Commission's clinical lead can assist with the interpretation of SSI definitions for complex cases.
- The SSIIP team can provide advice relating to inclusion and exclusion criteria for cases.
- The SSIIP team can provide guidance and advice relating to clinical quality improvement measures such as antibiotic prophylaxis and anti-staphylococcal skin decolonisation.
- The IPC team can provide quality improvement advice for local increases in SSI rates.

Technical support

- The National ICNet Service Hub provides technical support for the use of the National Monitor and the ICNET SSIS forms platforms.
- The Commission's IPC team provides technical support related to accessing the online reports (quality and safety markers (QSM) and the SSI dashboards).

3 Establishing a local SSIIP team | Te whakatū i tētahi rōpū SSIIP ki tō takiwā

Each district should have an established local SSIIP team, responsible for overseeing the programme at individual district level. The make-up of the team will vary between districts, but it must be multidisciplinary to ensure the team receives the support it needs to be sustainable. Each member of the team will provide information to enable local data to be collected efficiently.

Surveillance will primarily involve the orthopaedic and IPC teams. However, all stakeholders should be offered the opportunity to be represented. Consider including members of the following groups:

- orthopaedic surgeons
- anaesthetists
- orthopaedic surgery clinical nurse specialists/educators
- ward and operating theatre-based nurses
- IPC service
- infection services
- clinical microbiologists/infectious disease physicians
- surveillance nurses (where employed for the purpose of surveillance)
- quality managers/clinical audit staff/quality and risk team
- information technology (IT) staff/business intelligence units (BIUs)
- medical laboratory scientists from microbiology departments
- clerical and administration staff
- management.

Key roles

SSI champion

Districts are asked to nominate at least two champions for the programme staff where possible. Champions should include a member of the IPC team and a member of the surgical or clinical team involved in orthopaedic procedures. The role of champions is to:

- understand and promote the benefits of the programme
- lead by example using the recommended SSI improvement approaches
- share knowledge with fellow SSI champions and contribute feedback to improve the programme (eg, through participation in SSI webinars or quarterly SSI investigation meetings)
- promote quality improvement to drive practice change.

Local SSIIP coordinator

The local SSIIP coordinator will be a member of the IPC team or a staff member with strong links to IPC (eg, a member of the quality and risk/clinical audit team). The coordinator may be the same person as the IPC SSI champion, in a combined role. The role of the coordinator is to:

- facilitate the improvement process at a local level
- ensure continuing engagement of the clinical teams and management
- provide overall coordination and liaison with the national SSIIP team
- ensure processes are in place for data collection, collation, transfer and dissemination
- provide local support for staff involved in the improvement process
- facilitate feedback on SSI to local stakeholders
- carry out validation processes to verify data
- coordinate or undertake SSI investigations into using the SSI investigation tool
- ensure the quarterly SSI investigation summary data report is submitted.

Data collector

The data collector may be a member of the IPC team or a delegate (eg, a surveillance nurse). The role of the data collector is to:

- collect and enter the data sets in accordance with the SSIIP requirements
- enter or provide the data in a format suitable for uploading onto the online data collection form
- oversee data extraction from unit databases, if required
- undertake quality checks to ensure accuracy of data.

Data transfer coordinator (if using a .csv file to upload bulk forms)

The data transfer coordinator may be an administration or BIU staff member who can upload data to the national SSI forms database for analysis. The role of the data transfer coordinator is to:

- ensure any electronic format utilised locally complies with the SSI database specifications
- ensure data is correctly uploaded onto the SSI database.

4 Process | Te tukanga

The surveillance of orthopaedic surgery cases will be on a continuous basis to ensure ongoing analysis of incidence rates can take place.

The SSIIP does not include post-discharge surveillance due to the difficulty identified with standardisation of the process. Excluding post-discharge surveillance will underestimate the true level of SSIs (as some superficial wound infections will not be included). If you wish to perform post-discharge surveillance, you may do so and use the data for local review, but it will not be included in the national rates for comparison.

This chapter describes how to collect and submit data. See also **Chapter 5: SSI case finding**. Establishing automated data extraction for denominator data will enable more efficient and accurate data collection.

Data collection

Forms for data collection are provided in both hard copy and in an online (web-based) format (ICNET SSIS data collection forms software). The paper-based version is available in **Appendix 5**. Training and education will be provided to orientate staff to the SSIIP.

Categories of procedure to be included

The programme uses the Australian Classification of Health Interventions (ACHI) (IHPA 2022) to define the procedures in scope. All ACHI codes have seven digits.

Category	ACHI code	Procedure	Description
Hip procedures	49318 00	Total arthroplasty of hip, unilateral	Total joint replacement of hip Includes: • bone graft • procurement of graft material through same incision
	49319 00	Total arthroplasty of hip, bilateral	Total joint replacement of hip Includes: • bone graft • procurement of graft material through same or separate incision
Hip revision procedures	49324 00	Revision of total arthroplasty of hip	Partial revision of total hip replacement; revision of total joint replacement of hip Includes: removal of prothesis Excludes: that with allograft or bone graft
	49327 00	Revision of total arthroplasty of hip with bone graft to acetabulum	As per procedure description Includes: procurement of bone graft
	49330 00	Revision of total arthroplasty of hip with bone graft to femur	As per procedure description Includes: procurement of bone graft
	49333 00	Revision of total arthroplasty of hip with bone graft to acetabulum and femur	As per procedure description Includes: procurement of bone graft
	49339 00	Revision of total arthroplasty of hip with anatomic-specific allograft to acetabulum	As per procedure description
	49342 00	Revision of total arthroplasty of hip with anatomic-specific allograft to femur	As per procedure description
	49345 00	Revision of total arthroplasty of hip with anatomic-specific allograft to acetabulum and femur	As per procedure description

Category	ACHI code	Procedure	Description
Knee procedures	49517 00	Hemiarthroplasty of knee	Partial joint replacement of knee Unicompartmental knee replacement
	4951800	Total arthroplasty of knee, unilateral	Total joint replacement of knee, unilateral Includes: patella resurfacing Excludes: revision of total arthroplasty of knee
	4951900	Total arthroplasty of knee, bilateral	Total joint replacement of knee, bilateral Includes: patella resurfacing Excludes: revision of total arthroplasty of knee
	49521 00	Total arthroplasty of knee with bone graft to femur, unilateral	As per procedure description
	49521 01	Total arthroplasty of knee with bone graft to femur, bilateral	As per procedure description
	49521 02	Total arthroplasty of knee with bone graft to tibia, unilateral	As per procedure description
	49521 03	Total arthroplasty of knee with bone graft to tibia, bilateral	As per procedure description
	49524 00	Total arthroplasty of knee with bone graft to femur and tibia, unilateral	As per procedure description
	49524 01	Total arthroplasty of knee with bone graft to femur and tibia, bilateral	As per procedure description

Category	ACHI code	Procedure	Description
Knee revision procedures	49527 00	Revision of total arthroplasty of knee	Revision of total joint replacement of knee Includes: removal of prosthesis Excludes: • that with bone graft or allograft • patella resurfacing only
	49530 00	Revision of total arthroplasty of knee with bone graft to femur	As per procedure description
	49530 01	Revision of total arthroplasty of knee with bone graft to tibia	As per procedure description
	49533 00	Revision of total arthroplasty of knee with bone graft to femur and tibia	As per procedure description
	49554 00	Revision of total arthroplasty of knee with anatomic-specific allograft	As per procedure description Includes: that of tibia or femur

Data entry

All data is entered into the online SSIIP database – the ICNET SSIS data collection forms software (SSIS forms). This database is where all the surveillance data is collected and completed prior to upload to the National Monitor.

There are several methods to populate the data fields within SSIS forms.

- Manually populate some or all data.
- Upload a .csv file containing data.
- For districts that are able to upload directly from local ICNet, extract most data by integrating with district feeder systems, mainly patient administration, theatre and laboratory.

ICNet Support will provide training and support to participants on using the system and completing the online forms. All delegated SSIIP staff in districts will be given a user account to access the database, linked to their district and hospital/facility. User access is requested by completing an access form, which is available from the district's SSI champion and approved through ICNet Support.

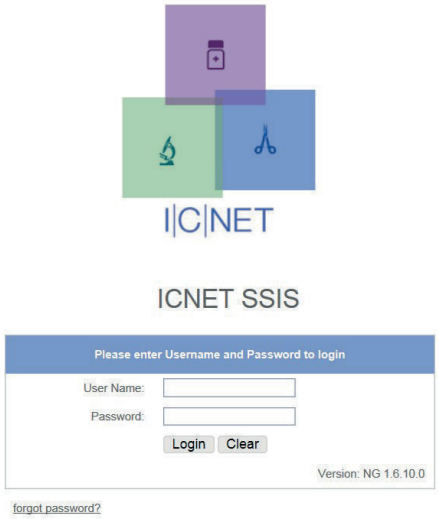
If you have any trouble logging into SSIS forms or entering data, please email **ICNetSupport@cdistrict.health.nz**. For ongoing support with the National Monitor and ICNet, also email ICNet Support.

For all other enquiries, email the SSIIP team: **SSIIP@hqsc.govt.nz**.

Full surveillance data entry process

Log in to ICNET SSIS

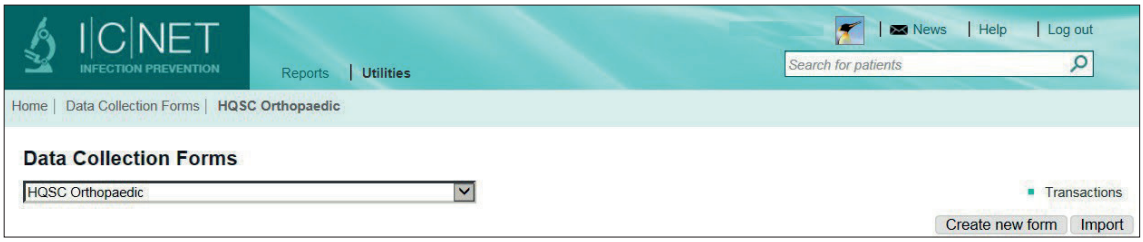
Once you have successfully logged in, the database will be accessible for entering the patient data.



Creating forms

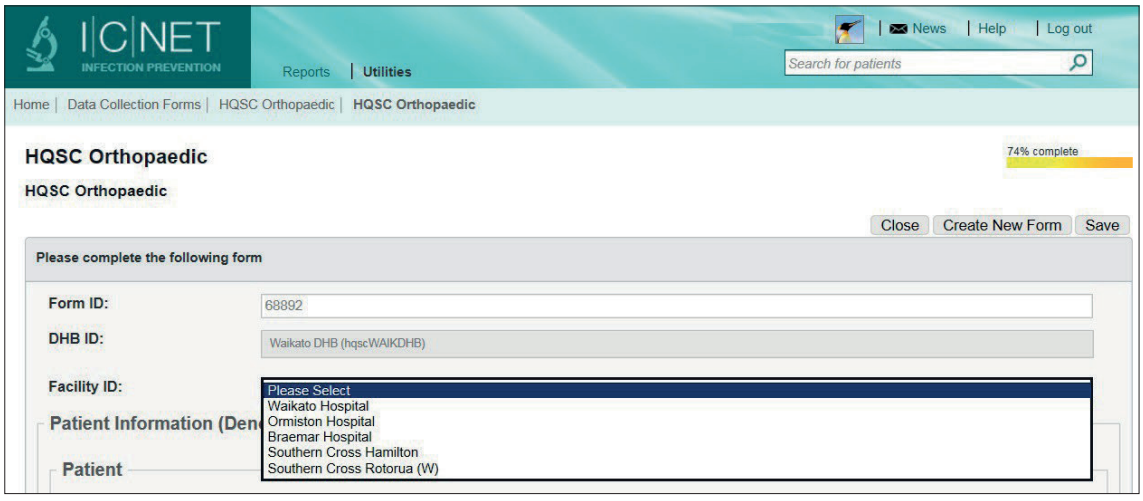
Create a new form for each procedure using the 'create new form' button. This will open up the data fields for data entry. There are a number of mandatory fields, which must be completed before the form can be uploaded as a procedure case.

Once a form has been created, it can be 're-opened' at any stage to enter additional information about the case, for example, re-admission or SSI details.



Once opened, a form will automatically be allocated a record number (Form ID). This can be recorded on any hard copy version of the form you may hold as a cross-reference.

When a new form is created, your district will be auto-populated (linked to your login) and you will then need to select the hospital where the patient underwent the procedure.



Fields that require data to be completed are highlighted in pink when they remain empty and the form is saved.

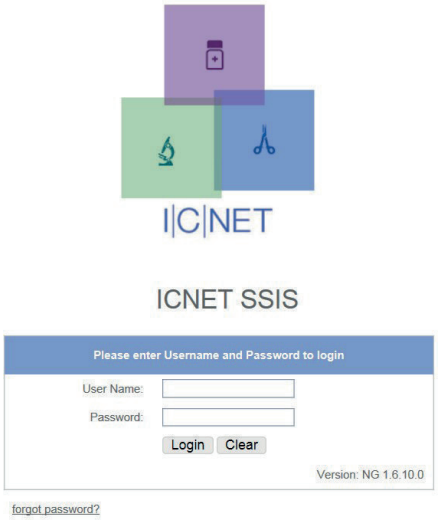
Some data fields have additional 'logic' fields to complete when certain information is entered. For example, if a revision procedure code is selected, a further question will appear below asking whether the revision has occurred as a result of infection.

Light surveillance data entry process

Log in to ICNET SSIS

Data for light surveillance is uploaded from a .csv file. The .csv is usually created in conjunction with the district's BIU and uploaded by the BIU or the SSIIP team member.

Once in ICNET SSIS, click on the 'import' button on the top right of the screen to upload the file. Further instructions and assistance can be accessed by emailing **ICNetSupport@cdhb.health.nz**.



Saving data entry

Save data using the 'save' button on the top right of the screen each time you enter data. If you close the form without first saving it, your data will be lost.

If you have multiple data entries to complete, use the 'save' button and then go to 'create new form'.

Deleting forms

If a partially completed form is no longer needed and is still in the 'active' folder, you can re-allocate the form by overwriting the data with another patient's data.

If you no longer need a form that you have already 'sent' to the National Monitor or the form has been sent in error, the form can be deleted, but only by an ICNet administrator. In this case, email the SSIS forms administrator (**ICNetSupport@cdhb.health.nz**) with the Form ID and ask for the form to be deleted.

Completion of data entry for each case

When a new form is opened, it will show that it is already partially complete, even though you have not yet entered any data. This is due to the optional data fields that are contained in the form from the outset. As you enter data, the percentage completed will rise until all mandatory fields are completed. The percentage indicator at the top of the form then changes to green and indicates it is 100 percent complete. A case may be 'completed' on the online form for the following reasons:

- all surgery data complete – infection data to be added later following case review*
- no wound infection reported up to 30 days post-procedure
- no wound infection reported up to 90 days post-procedure.**

* This allows a district to utilise the reporting in the National Monitor rather than waiting until the quarterly report is published.

** When a case is completed at 30 days, it will remain in the system and can be re-opened should the patient be re-admitted with an SSI within 90 days of the procedure date. For this reason, districts must have mechanisms to check for re-admissions 90 days after the procedure.

We recommend completing the surgery (denominator) data in the data collection form for each procedure at 30 days and then amending this only if subsequent infection is reported at 90 days. Data correction is manual for all districts.

Denominator data

The denominator is the population for surveillance. For the orthopaedic surgery SSIIP, the denominator is the number of eligible procedures performed. The denominator is not the number of patients, as one patient may have two procedures at the time of surgery – for example, bilateral total arthroplasty of knee.

Include all patients who undergo procedures funded by the district in this surveillance (including outsourced procedures in private surgical hospitals). **Appendix 2** provides a useful algorithm and flow chart to assist in deciding on which procedures to include. All procedures within each category in the table are to be included.

Ensure that all eligible procedures are included in the surveillance. Data sources to check may include:

- patient management systems that provide details of surgical procedures and re-admissions
- operating theatre records that provide the details/number of hip and knee replacements performed
- emergency theatre records.

Local BIU teams can assist with this data capture, including procedures outsourced to private hospitals.

For procedures performed privately, the district should inform the facility of the data required for the SSIIP and make arrangements for sourcing this data.

Cases where two forms are required for the same patient

Complete two data collection forms for a patient having bilateral procedures – that is, if two incisions are performed (one on each side of the patient during the same procedure).

If a patient undergoes revision surgery and a new prosthesis is inserted at the same site within 30 days of the original surgery for reasons other than infection, the surveillance form relating to the initial operation should be finalised and sent to the National Monitor and a new form commenced for the new episode of surgery. However, if the later surgery is due to infection, this is excluded from the national programme.

More than one operative procedure through the same incision within 24 hours

If a patient goes to the operating theatre more than once during the same admission for another procedure of the same or different procedure category, performed through the same incision within 24 hours, report only one procedure form for the original procedure but combine the durations for both, based on the procedure start times and finish times for both procedures – that is, change the timing on form.

- If the wound class has changed, report the higher wound class.
- If the American Society of Anaesthesiologists (ASA) score has changed, report the higher ASA score.

Patient deaths

If the patient dies in the operating room, do not complete a data collection form because this procedure is excluded from the denominator.

If the patient dies after the procedure and the date of death is within 90 days of the procedure, complete a data collection form because these procedures are included in the denominator. Enter the date of death on the form.

Exclusions

Exclude a revision that occurs due to a current deep or organ/space infection or if there is a history of previous deep or organ/space infection at any time in the past.

Note: Previous or current superficial infection does **not** warrant exclusion.

Hip hemiarthroplasty procedures are not included.

Denominator data set – full surveillance

Complete demographic and surgical denominator data for all patients. Only complete the infection data (numerator) for those patients that develop SSI that meets the **case definitions**.

Wherever possible, source this information from the patient administration system, the patient's record and theatre records.

This section defines each question in the surveillance data set.

Demographic data	
Form ID (Pre-populates)	Unique identifier – can be referenced in emails to the SSIIP if enquiring about a form.
District ID (Pre-populates)	This will be the recognised abbreviation for the district.
Facility ID (Hospital)	The participating district will designate hospital(s) from which patients will be entered. The codes used for this will be pre-populated in the online form and are those that are used nationally for New Zealand hospitals.
Patient NHI	National Health Index number consisting of alphanumeric format (AAA1234). Double-check the NHI number to be sure data is accurate.
Gender	Male/Female/Unknown
Date of birth	DD/MM/YYYY Double-check the date of birth to be sure data is accurate.

Primary admission/discharge data Note: Where a date is required, a calendar format will appear for ease of date entry.	
Date of admission	DD/MM/YYYY The admission date is the date that the patient is admitted to the district facility, not simply the date of admission to the operating hospital. If they are admitted to one hospital and then transferred to the operating hospital, the date of initial admission should be recorded.
Date of discharge	DD/MM/YYYY The discharge date should be the date the patient finally leaves the district health care facility; the day that they go home. If they transfer from the operating hospital to another health care facility (eg, district rehabilitation facility), then they are still considered an inpatient and the discharge date is the date they leave the district facility (and not the date they leave the operating hospital). However, in some cases where automated imports populate the data collection form and the date of discharge is the date of discharge from the operating hospital, then this is acceptable.
Date of death (if applicable)	DD/MM/YYYY If the patient is still alive, this is a null field. If the patient dies in the operating room, do not complete a data collection form. This procedure is excluded from surveillance.

Procedure data	
Date of procedure	DD/MM/YYYY Double-check the date of procedure to be sure the data is accurate.
Procedure code/description	Select appropriate code/description from the list given. Note: Two forms are required for bilateral procedures, one for each side.
If revision, is it due to infection?	Yes/No If the revision is due to deep or organ/space infection, either past or present, do not include in the SSIIP.
Location of procedure	Left/Right
Is this procedure an emergency?	Yes/No/Unknown Non-emergency procedures are those that have been planned at a time to suit the surgeon and the patient. This includes those that may have been emergency admissions following trauma but either they have been delayed or there is time to carry out pre-operative preparation. Emergency procedures include unplanned, immediate procedures conducted as soon as possible after initial recovery from trauma/emergency admission.
Surgeon grade	First surgeon. Select from the following: Consultant/specialty registrar/locum consultant/locum registrar/other.
Surgeon code	First surgeon. Use unique surgeon code that is identifiable to the facility only. Codes are preloaded into the online form and a record must be kept in each district of those used and who they related to. This information will not be required nationally.
Antibiotic cement used	Yes/No/Unknown Note: This question relates to antibiotic cement only. Other cement may be used but we only require 'Yes' if it contains antibiotic.

Total surgical risk score data (see Appendix 4) The total surgical risk score will be automatically calculated provided the fields below are completed.	
Wound class	Choose from the following: **Clean:** An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital or uninfected urinary tracts are not entered. Almost all orthopaedic procedures will be clean operations. **Contaminated:** Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract and incisions in which acute, non-purulent inflammation is encountered. Note: This category would be rare for orthopaedic procedures. **Dirty or infected:** Includes old traumatic wounds with retained devitalised tissue and those that involve existing clinical infection or perforated viscera. This definition suggests the organisms causing postoperative infection were present in the operative field before the operation. Note: This category would be rare for orthopaedic procedures.
Operation start (knife to skin)	HH/MM, 24-hour clock Used to calculate length of operation to determine risk index. If actual knife to skin time is not recorded, use theatre start time.
Operation finish (skin closure)	HH/MM, 24-hour clock Used to calculate length of operation to determine risk index. If actual skin closure time is not recorded, use theatre finish time. Note: Where there is more than one operative procedure through the same incision within 24 hours, amend operation finish to give a combined duration. If using a .csv file to submit data, this must be altered manually.
Duration	This will be automatically calculated.
ASA score	1/2/3/4/5/Not recorded This is used to determine the total surgical risk score (see Appendix 4) and is an important item to collect. It is usually found in the operation notes. A normally healthy patient. A patient with mild systemic disease. A patient with severe systemic disease. A patient with severe systemic disease that is a constant threat to life. A moribund patient who is not expected to survive without the operation.

Anaesthetic	
Type of anaesthetic	Select from the following: • General • Regional: epidural/spinal/specific site not recorded • Local • Other • Not recorded. Note: Combinations of these are available to select on the online form.

Antibiotic prophylaxis	
Pre-operative antibiotics	
Was antibiotic prophylaxis given?	Yes/No/Unknown If 'Yes', the following fields must be completed. If 'No', continue to intra- and postoperative antibiotic section.
Name of antibiotic(s) Enter up to three antibiotics separately.	Recognised (generic) name of the antibiotic agent(s) used: • cefazolin • cefuroxime • clindamycin • flucloxacillin • gentamicin • vancomycin • other, please specify. Always record cefazolin and vancomycin if used. If cefazolin is used, always record as antibiotic 1. Compliance with the dose quality and safety marker is calculated from antibiotic 1. If antibiotic is not on the list, choose 'other' and then enter the name in the free text field that will open.
Date given	Pre-populated from date of procedure.
Time given	HH/MM, 24-hour clock, or Unknown Always enter actual time if known.
Dose	Enter the dose into the free text box.
Dose unit	Choose from Grams/Milligrams/Unknown.
When was it administered	Choose from: • Within one hour prior to incision • More than one hour prior to incision • On induction • After incision • Not recorded. If 'time given' is entered, one of the above options will automatically populate based on calculated knife to skin time. Always use the 24-hour clock for times entered.

Antibiotic prophylaxis	
Intra-operative antibiotics	
Was an additional dose of antibiotic given intraoperatively, eg, for lengthy procedure (> 4 hours)?	Yes/No/Unknown Initial antibiotics are regarded as 'pre-operative' and their timing in relation to knife to skin is recorded. Intra-operative doses are defined as those given after initial doses.
Postoperative antibiotics (within first 24 hours)	
Were antibiotics given postoperatively?	Yes/No/Unknown
(If 'Yes') Were they given for less than 24 hours?	Yes/No/Unknown Standard postoperative dosing is three doses of cefazolin given eight-hourly for orthopaedic surgery. If three doses are charted postoperatively, this is accepted as being for less than 24 hours. If this is exceeded, then the response is 'No'. Note: If antibiotics are continued for suspected infection, ie, until culture results are known, then this is regarded as 'pre-emptive treatment', not 'prolonged prophylaxis'. If antibiotics are continued for suspected infection, record as 'Yes'.

Note: Pre-operative antibiotic dose and timing are quality and safety markers for the SSIIP. It is important that this information is accurately recorded.

Surgical skin preparation	
Surgical skin preparation	Select from the following: • Chlorhexidine and alcohol • Povidone-iodine and alcohol • Aqueous povidone-iodine • Aqueous chlorhexidine • Other (dropdown choices will be added for other agents. Please contact the SSIIP team to have other agents added to the dropdown menu) • Unknown.

Patient BMI	
Patient BMI	Patient height: Enter height in m if known or select 'Unknown'. Patient weight: Always enter weight if known in kg (in addition to BMI) or select 'Unknown'. BMI: Calculated from height and weight if entered, or enter BMI alone if it is known.

Pre-operative anti-staphylococcal bundle	
Did the patient receive anti-staphylococcal bundle?	No bundle protocol/Yes/No/Unknown The form is pre-populated to 'No bundle protocol'. The following questions will only open once the answer is changed to 'Yes'.
If pre-screening was performed on the patient, what was the result? (Select 'MRSA positive' if mixed result.)	Select from the following: • Not applicable (No pre-screening performed) • No *S. aureus* • MSSA positive • MRSA positive • Unknown.
Skin decolonisation – compliance	Select from the following: • Full compliance (all doses) • Partial compliance (some doses) • Not compliant (no doses) • Not applicable (skin not part of bundle) • Unknown.
Nasal decolonisation – compliance	Select from the following: • Full compliance (all doses) • Partial compliance (some doses) • Not compliant (no doses) • Not applicable (nasal not part of bundle) • Unknown.

Re-admission details	
Has the patient been re-admitted due to an SSI?	Yes/No
If 'Yes', date of re-admission for SSI?	DD/MM/YYYY

Denominator data set – light surveillance

Ten parameters are reported for all surgical procedures (denominator) if undertaking light surveillance.

Form ID	Unique identifier – pre-populates Can be referenced in emails to the SSIIP if enquiring about a form.
District ID	Pre-populates This will be the recognised abbreviation for the district.
Facility ID (Hospital)	The participating district will designate hospital(s) from which patients will be entered. The codes used for this will be pre-populated in the online form and are those that are used nationally for New Zealand hospitals.
Patient NHI	National Health Index number consisting of alphanumeric format (AAA1234) Double-check the NHI number to be sure data is accurate.
Date of birth	DD/MM/YYYY Double-check the date of birth to be sure data is accurate. These are separated into three different columns in the .csv (Date, Month and Year).
Date of admission	DD/MM/YYYY The admission date is the date that the patient is admitted to the district facility, not simply the date of admission to the operating hospital. If they are admitted to one hospital and then transferred to the operating hospital, the date of initial admission should be recorded.
Date of discharge	DD/MM/YYYY The discharge date should be the date the patient finally leaves the district health care facility; the day that they go home. If they transfer from the operating hospital to another health care facility (eg, district rehabilitation facility), then they are still considered an inpatient and the discharge date is the date they leave the district facility (and not the date they leave the operating hospital). However, in some cases where automated imports populate the data collection form and the date of discharge is the date of discharge from the operating hospital, then this is acceptable.
Date of death (if applicable)	DD/MM/YYYY If the patient is still alive, this is a null field. If the patient dies in the operating room, do not complete a data collection form. This procedure is excluded from surveillance.

Date of procedure	DD/MM/YYYY Double-check the date of procedure to be sure the data is accurate.
Procedure code/description	Select appropriate code/description from the list given. Note: Two forms are required for bilateral procedures, one for each side.

All other fields are completed as 'Unknown' with the following exceptions.

- 'Is the revision due to infection' field is left empty in the .csv.
- The 'Have SSI criteria been met for this procedure?' and 'Date of re-admission with an SSI' fields will be completed as 'No'.

If the patient subsequently develops an SSI, complete the whole form and answer every question with the updated data. ('Unknown' must be replaced with the appropriate answer.)

Numerator data

The numerator is the number of SSI events, not the number of patients with an SSI, as one person may experience the event more than once. Record all SSI data in the ICNET SSIS forms database. Open the case within SSIS forms and complete the SSI details fields as shown below.

SSI details	
Have SSI criteria been met for this procedure?	Yes/No If 'Yes', complete the numerator data section.
When was surgical site infection diagnosed?	Select from the following: • During initial admission • During re-admission up to 30 days post-procedure • During re-admission up to 90 days post-procedure.
Date of infection	DD/MM/YYYY The date of diagnosis must be entered. This will be when all criteria for SSI have been met. If date is unclear and patient has been re-admitted, enter the re-admission date.
Type of SSI	Check the flow charts (**Appendix 1**) to assist with decision-making before completing this section. Choose one of the following: • Superficial (must occur within 30 days post-procedure) • Deep incisional (must occur within 90 days post-procedure) • Organ/space (must occur within 90 days post-procedure).
Was a clinical sample taken from the wound?	Yes/No

SSI details	
Site of sample	Select from the following: • Blood • Tissue • Aspirate • Wound swab • Other. Up to three clinical samples can be entered on the online form.
Clinically significant organism identified?	Yes/No Note: Careful interpretation is needed to ensure only those isolates considered to be the cause of infection are recorded. Consultation with a medical microbiologist or infectious diseases consultant is advisable.
Details of organism	Select organism from the dropdown list. Select from the following: • *Acinetobacter baumannii* • *Candida albicans* • *Enterococcus faecalis* • *Enterococcus faecium* • *Escherichia coli* • *Klebsiella oxytoca* • *Klebsiella pneumoniae* • *Pseudomonas aeruginosa* • *Serratia marcescens* • *Staphylococcus aureus* • *Staphylococcus epidermidis* • *Streptococcus pyogenes* (Group A) • *Streptococcus agalactiae* (Group B) • Other – use the online menu to select the organism • Not specified. Note: If the SSI is due to a mixed infection, record the organisms by using the 'site of sample' boxes more than once to enter the different isolates.
Is the organism an MDRO?	Yes/No If 'Yes', indicate which of the following: • MRSA • ESBL • VRE • CRO – includes CRO, CRE, CPE, NDM • Other. Note: The patient may have multiple infections. You can select any or all of the above.
Notes	For your own reference if required. These are not reviewed by the SSIIP team.

Data submission

Data forms are submitted by uploading to the National Monitor, which is the national surveillance platform for SSIIP data. This platform is within but separate from the local ICNet infection detection and surveillance platform.

Districts using local ICNet can upload data through specific integration software from ICNet. Other districts upload using the created forms in the SSIS forms database. A minority of districts performing full surveillance extract all their data via their BIU and upload via a .csv file into the National Monitor.

Submit the data collection forms to the National Monitor monthly. This allows districts to complete validation using the standard reports and run monthly reports on compliance with the interventions, so that they can provide feedback to the local SSIIP team and inform quality improvement.

5 SSI case finding | Ngā kitenga

Identifying SSI cases

Review patient records to identify cases of SSI as close to the date of surgery as possible. To ensure comparable validity of data, those monitoring surgical site wounds must be trained in the definitions and diagnosis of SSI using the standard definitions.

Current inpatient stay following surgery

To identify patients in the selected population, the minimum requirement is to have an automated alert or manual check of the following.

1. Operating lists and liaison with staff in the operating theatre

   Operating lists will provide the details/number of hip and knee replacements performed. Some data collection for other reasons may already be in place (eg, orthopaedic joint registry), so investigation of the most efficient way to collect relevant data is required.

2. Ward-based reporting of inpatient (during their inpatient stay)

   The surveillance data collector completes an active and systematic review of patients during their inpatient stay. This should ideally involve a review of clinical case records at least once during the inpatient stay.

You will need to liaise with wards caring for the cohort of patients. Ask wards to advise the surveillance data collector if patients in the selected category develop an infection during the admission period. A notification system should be established for this if one is not already in place.

Re-admission surveillance

Hospital databases should be used to identify all patients (within a defined patient population) who have been re-admitted within 30 and 90 days of the surgical procedure. Input from local project IT or BIU staff may be required.

Wards likely to receive patients re-admitted with SSI should be identified and contacted regularly to ask about patients re-admitted with SSI.

You can use ICD-10-AM coding to assist with this as the following codes are used to indicate infection and inflammatory reaction following orthopaedic surgery.

Code	Reaction
T81.41	Wound infection following procedure
T81.42	Sepsis following a procedure
T84.5	Infection and inflammatory reaction due to internal joint prosthesis
T84.6	Infection and inflammatory reaction due to internal fixation device
T84.7	Infection and inflammatory reaction due to other internal orthopaedic prosthetic devices, implants and grafts
T85.78	Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts

Microbiology surveillance

Correct microbiology specimens

All patients with a suspected infection should have appropriate clinical specimens collected for microbiology before the administration of antibiotics. The clinical team is responsible for obtaining these and clinicians are reminded of the importance of obtaining samples.

Tissue and/or an aspirate are recommended rather than simply a swab.

Further guidance on specimen collection is provided in the *National periprosthetic joint infection sampling and culture guide* (Health Quality & Safety Commission 2018).

Positive culture of a significant organism from the procedure site

Regularly review microbiology reports to identify any positive surgical site cultures from patients in the surveillance population. Where possible, this should be by an automated process via the microbiology IT system. However, if this is not possible, review of electronic microbiology records of patients in the cohort will be necessary.

Patients who have a relevant specimen (eg, aseptically obtained culture of fluid or tissue from the incision) should then have records reviewed to determine if the culture is of significance (ie, confirms diagnosis of SSI).

Confirmation of cases

If any of the above methods identifies a potential SSI, a review of the patient's records including vital signs charts should be undertaken by the surveillance data collector. The SSIIP definitions are used to confirm a diagnosis of SSI.

For procedures that fulfil the criteria for SSI in accordance with the definitions, complete the additional SSI minimum data set in the SSIS forms database. Once the data collection form has been updated with the additional infection data, save it and send it to the National Monitor.

Users of an electronic IPC management system (eg, ICNet) may use re-admission and microbiology reports and/or alerts to identify possible SSI cases and complete the infection details in the SSIS forms database.

Please note that organ/space infections occurring more than 90 days following implant surgery when the patient is an inpatient or is re-admitted to hospital are out of scope for the SSIIP.

Investigating a confirmed SSI

Districts undertaking light surveillance are required to undertake a detailed review of SSIs, prioritising deep and organ/space infections. These reviews are undertaken using the Commission's SSI investigation tool.

The SSI investigation tool is a way for health care providers to review and analyse an SSI, to find out why it happened ('contributing causal factors') and identify actions to stop it from happening again (improvements in clinical practice). It provides a structured process to follow before making improvements. The tool is also available in local ICNet under the title *ALL DHB – Orthopaedic SII Investigation Answers*.

At the end of each quarter, submit a summary of all SSI investigations carried out using the SSIIP investigation quarterly summary form to **SSIIP@hqsc.govt.nz**. Note that this summary is for investigations carried out within the quarter, so may include SSIs that occurred outside of the quarter.

Submission dates for the summary report are:

- 1 April for investigations conducted in January–March
- 1 July for investigations conducted in April–June
- 1 October for investigations conducted in July–September
- 14 January for investigations conducted in October–December.

These findings are then discussed at quarterly SSI investigation meetings.

6 Defining SSIs | Te tautohu i ngā SSI

Use the definitions below to determine and confirm an SSI event. This ensures consistent interpretation and collection of SSI data. The flow charts in **Appendix 1** and **Appendix 2** will also help you make decisions about applying the definitions. The definitions are those utilised by the Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) (CDC 2022a, 2022b). There are three types of SSI events, superficial incisional SSI, deep incisional SSI and organ/space SSI.

1. Superficial incisional SSI

A superficial incisional SSI must meet the following criteria:

Date of event (infection) occurs within 30 days after any operative procedure (where day 1 = the procedure date)

AND
infection involves only skin and subcutaneous tissue of the incision

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

a. purulent drainage from the superficial incision

b. organism(s) identified from an aseptically obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis or treatment

c. superficial incision that is deliberately opened by a surgeon and culture* or non-culture based testing of the superficial incision or subcutaneous tissue is not performed
and
patient has at least one of the following signs or symptoms: localised pain or tenderness; localised swelling; erythema; or heat

d. diagnosis of a superficial incisional SSI by a physician** or physician designee.

* A culture-negative finding does not meet this criterion.

** The term 'physician' for the purpose of application of the NHSN SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician's designee (nurse practitioner or physician's assistant).

The following do not qualify as criteria for meeting the definition of superficial incisional SSI:

- diagnosis/treatment of cellulitis (redness/warmth/swelling) – by itself, this does not meet superficial incisional SSI criterion 'd'
- a stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration)
- a localised stab wound or pin site infection. Note: A laparoscopic trocar site is considered a surgical incision and not a stab wound.

If the superficial incisional site infection extends into fascia and/or muscle layers, report as a deep incisional SSI only.

2. Deep incisional SSI

A deep incisional SSI must meet the following criteria:

Date of event (infection) occurs within 90 days after any operative procedure (where day 1 = the procedure date)

AND
infection involves deep soft tissues of the incision (eg, fascial and muscle layers)

AND
the 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 or aspirated by a surgeon or physician*
and
organism(s) identified from the deep soft tissues of the incision by a culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis or treatment (eg, not active surveillance culture/testing (ASC/AST)) or culture** or non-culture based microbiologic testing method is not performed
and
patient has at least **one** of the following signs or symptoms: fever (> 38°C); localised pain or tenderness

c. an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.

* The term 'physician' for the purpose of application of the NHSN SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician's designee (nurse practitioner or physician's assistant).

** A culture-negative finding does not meet this criterion.

Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

3. Organ/space SSI

A deep incisional SSI must meet the following criteria:

Date of event (infection) occurs within 90 days after any operative procedure (where day 1 = the procedure date)

AND
infection involves any part of the body deeper than the fascial/muscle layers that is opened or manipulated during the operative procedure

AND
the patient has at least **one** 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-tube drain, CT-guided drainage)

b. organism(s) identified from fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis or treatment (eg, not 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

AND
meets at least one criterion for one of these specific organ/space infection sites:

a. osteomyelitis

b. joint or bursa infection.

See **Appendix 3** for definitions for the above specific types of infections.

* Evidence of infection elicited or visualised on physical examination or observed during an invasive procedure. This includes findings elicited on physical examination of a patient during admission or subsequent assessments of the patient and may include findings noted during a medical/invasive procedure, dependent upon the location of the infection as well as the NHSN infection criterion (**www.cdc.gov/nhsn/faqs/faq-ssi.html#q15**).

Resolving possible cases of SSI

The following scenarios may aid with interpretation of SSI definitions in specific situations.

SSI following manipulation of the operative site

An SSI will not be attributed if **all** of the following three criteria are met.

- During the postoperative period, the surgical site is without evidence of infection.
- An invasive manipulation/accession of the site is performed for diagnostic or therapeutic purposes (eg, needle aspiration, arthroscopy, and open surgery without component exchange).
- An infection subsequently develops in a tissue level that was entered during the manipulation/accession.

Non-infective dehiscence/incision opening

- After a patient is discharged from the index hospital, if the incision opens due to a fall or another reason and there was no evidence of incisional infection at the time of opening (as defined by lack of symptoms that make up the definition), then subsequent infection of the incision is not considered an SSI or a healthcare-associated infection for the index hospital as this implies a mechanical reason for the dehiscence rather than an infectious reason.
- If a postoperative patient is still hospitalised following surgery and is asymptomatic, and an incision opens due to a fall or for another reason (eg, patient picking at the wound), it is not considered an SSI.

SSI due to trauma or bodily fluid contamination

- If a postoperative patient sustains an injury to the incision area and the incision does not open, but later an incisional infection develops, this is considered an SSI.
- If a postoperative patient has an intact incision (or status is unknown because it is not seen) or it is noted that the patient was incontinent and the incision may have been contaminated, the subsequent incisional infection is considered an SSI.

SSI due to skin condition or seeding from other site

- If a postoperative patient has a skin condition (eg, dermatitis near intact incision) and then subsequently develops an incisional infection within the follow-up surveillance period, this is considered an SSI.
- If a patient has a remote site infection either before or after an operation or has a manipulation that 'seeds' the operative site (eg, dental work) and later develops a deep incisional or organ/space infection during the follow-up surveillance period, this is considered an SSI.

7 Assurance | Whakataurangi

Validity of data

Interventions to improve health care outcomes rely on robust measurements and clinician confidence in the data being reported. Therefore, surveillance data collected for the SSIIP must be validated.

The local SSIIP project coordinator is responsible for data validation in order to:

- ensure patient demographics and other data for submission are correct
- verify that all eligible patients are included (ie, the denominator data is complete)
- audit the interpretation of variables, such as infection/no infection and the classification of SSI
- assess the competency of staff and structure within the district to ensure it is adequate to perform the tasks required for the SSIIP.

The following validation methods are based upon protocols from the United Kingdom (UK Health Security Agency 2013).

Validation of data for the SSIIP

Stage of data collection	Information	Methods
Transcription from paper to online form	All data	Audit of 10 percent of forms each quarter.
Online data collection form/local ICNet data collection form	NHI	Linked to database to check patient demographics (not currently available). Double-check NHI at time of entry.
	Date of birth	Double-check date of birth at time of entry. Date of birth cannot be after date of procedure. Dates for operation and discharge cannot be before admission date.
	Complete data	Operation finish cannot be before operation start time. Online form indicates percentage of completeness of each form.
Following submission to National Monitor	Outliers/abnormal data Age Numerator Denominator Compliance with programme interventions including QSMs	A series of reports has been made available to the districts to support data review and validation. Districts should run the reports with prefix 'QCK' (quick check) to review data input and identify any abnormal results. If abnormal data is found, it is expected that the data will be corrected. QCK reports should be run at least each quarter in the 30 days following the close of the 90-day period. To reduce the burden of data review, the SSIIP team recommends submitting SSI data and running QCK reports monthly.

Stage of data collection	Information	Methods
Eligible patients	Type of surgery	Check the ACHI/ICD-10 codes for surgery and re-admission / operating lists / microbiology results / pharmacy records.
SSI definition	SSI definition interpretation	Use algorithms in manual. Check with another member of local SSIIP team. National SSIIP team checks where necessary (for complex cases). Refer to published case studies.
Case detection	Initial admission and re-admission	Robust methods to detect SSIs. Refer to **Chapter 5: SSI case finding**.
Local SSIIP (in district)	Data collection/ structure/education related to the NZ SSIIP	External audit of all processes, structure and competency within the district for submission of data to the SSIIP.

Confidentiality

The SSIIP follows strict confidentiality and privacy regulations.

Data collection

Data collected as part of the SSIIP shall be obtained and held in accordance with the following legislation:

- Health Information Privacy Code 2020
- Health Act 1956
- Privacy Act 2020
- Official Information Act 1982
- Code of Health and Disability Services Consumers' Rights 1996.

The information is also covered by the confidentiality/privacy policy of each district.

The information collected through SSIS forms will be stored in a central database that will be:

- held in the strictest confidence
- used only for the stated purpose. Each district can only access its own data.

The only patient-identifiable data that should be sent to the SSIIP team is the NHI and date of birth.

The SSIIP team will not send patient-identifiable data by email.

Districts can access/download their data by logging into the system. When querying a case/ procedure, refer to the form ID in correspondence.

Where appropriate, research requests to use this data with appropriate ethical approval will be considered.

Access to the online data collection form

Designated data entry staff will need a password to access the online form. Each person must have their own login and comply with the Canterbury district's 'General conditions for access to information systems'. Contact **ICNetSupport@cdistrict.health.nz** if you need a copy of the conditions.

The local coordinator is responsible for ensuring all data submitted is anonymous (with the exception of NHI and date of birth), including the surgeon performing the operation. Codes must be used to identify surgeons at a local level.

Collection and local storage of any data will be in accordance with local policies.

8 Reports | Ngā pūrongo

The SSIIP generates reports both for local use as well as on national data to allow comparison between districts. Through these reports, we can evaluate the value of local and national improvement interventions.

National reports

Reports of infection rates and compliance with the SSIIP evidence-based interventions, including national and local district data, will be generated each quarter.

- Quarterly reporting of the number of procedures, outcome measure, process measures, risk factor analysis and equity data is presented on the Commission's SSI orthopaedic district dashboard.
- Districts receive draft reports prior to their publication for accuracy checking. It is the responsibility of the SSI champions to ensure their data is correct. Processes and procedures for data checking are available on the SSIIP webpages.
- The orthopaedic public dashboard reports outcome and process measures but excludes case numbers, risk factor analysis and equity data.
- The outcome measure and two process measures are included in the Commission's QSM quarterly reporting.
- The SSI orthopaedic variable life-adjusted display (VLAD) chart displays **cumulative expected against observed infections** in each district.

Outcome measure

The outcome measure is the number of SSIs per 100 hip and knee procedures. The national results are displayed as a run chart and the local results as line graphs.

Process measures

Four process measures are reported for those districts undertaking full surveillance.

Timing: Antimicrobial prophylaxis is administered as a single dose 0–60 minutes before knife to skin in primary procedures (target 100 percent).

Rationale	This measure assesses whether districts are complying with evidence-based practice
Improvement	An increase in the rate of compliance
Numerator statement	Number of primary procedures in which antimicrobial prophylaxis was initiated within one hour before surgical incision (two hours if receiving vancomycin)
Denominator statement	Number of procedures
Collection guidance	This is a Yes/No question. Was antimicrobial prophylaxis given within 60 minutes of knife to skin? If antimicrobial was not administered or time of recording is not documented, count this case as one in which the patient was not given the antimicrobial on time, ie, count as an error

Dosing: The first choice for antimicrobial prophylaxis is ≥ 2 g of cephazolin or ≥ 1.5 g of cefuroxime (target 95 percent).

Rationale	This measure assesses whether districts are complying with evidence-based practice
Improvement	An increase in the rate of compliance, ie, xx% of patients received cefazolin ≥ 2 g or cefuroxime ≥ 1.5 g
Numerator statement	Number of procedures where either a ≥ 2 g dose of cefazolin or a ≥ 1.5 g dose of cefuroxime was administered
Denominator statement	Number of procedures
Collection guidance	If cefazolin is used, record as the first antibiotic

Skin preparation: Alcohol-based skin antisepsis is always used (target 100 percent).

Rationale	This measure assesses whether districts are complying with evidence-based practice
Improvement	An increase in the rate of compliance, ie, xx% of patients receiving skin antisepsis with alcohol (at least 70%) containing either chlorhexidine or povidone-iodine
Numerator statement	Number of patients where a skin antisepsis with alcohol (at least 70%) containing either chlorhexidine or povidone-iodine was used
Denominator statement	Number of procedures

Postoperative antibiotics: Surgical antimicrobial prophylaxis is discontinued within 24 hours (target 100 percent).

Rationale	This measure assesses whether districts are complying with evidence-based practice
Improvement	An increase in the rate of compliance
Numerator statement	Number of procedures where antimicrobial prophylaxis was discontinued within 24 hours after surgery end time
Denominator statement	Number of procedures
Collection guidance	This is a Yes/No question. Was prophylaxis discontinued within 24 hours of the end of surgery? Exclude patients in whom antimicrobials are continued as treatment from this measure

Risk factor analysis

This report displays a deeper dive of the outcome measure over time and as district variation by selected risk factors. The risk factors are age group, body mass index (BMI) category, emergency surgery, gender, ASA score, surgical risk score, type of SSI and *Staphylococcus aureus* identified as infective organism.

Districts undertaking light surveillance will only report risk factor data for SSI cases. There are different pages for light-surveillance and full-surveillance risk factor reports.

Equity data

Equity data is reported for the age-standardised rates of SSI for the Māori and Pacific equity groups and the reference groups of non-Māori, non-Pacific, district or non-Māori, non-Pacific, New Zealand.

Districts should consider how this information can be used to inform quality improvement measures.

Quality safety markers

Data collected by the SSIIP is fed into the Commission's QSM report, which is published on a quarterly basis. There are three QSMs for the orthopaedic SSIIP.

- The outcome measure of SSIs per 100 hip and knee procedures.
- Two process measures for those districts participating in full surveillance associated with the use of surgical antimicrobial prophylaxis; correct dose and correct timing.

Antimicrobial dosing: District performance is measured against selection of the correct antimicrobial choice and dose (either ≥ 2 g of cefazolin or ≥ 1.5 g cefuroxime), with a compliance target of 95 percent.

Antimicrobial timing: District performance is measured against the correct antimicrobial timing (within 60 minutes of 'knife to skin'), with a compliance target of 100 percent for primary procedures.

Equity data for the two process measures is also reported as a QSM for this programme.

The variable life-adjusted display chart

The SSI VLAD chart is a way of tracking orthopaedic SSIs in individual districts. It shows **cumulative expected against observed infections** in each district. It was developed to support districts using both full- and light-surveillance monitoring. The model for districts using full-surveillance monitoring is risk-adjusted while the model for districts using light-surveillance monitoring is not.

The status boxes provide a warning or alert of increases in SSI risk.

Together, the VLAD chart and the status boxes give a picture of performance against expectation while also serving as a system to detect an increase in SSI risk.

This report is linked through the SSI orthopaedic dashboard.

Using reports for quality improvement

Measurement and using collected data for improvement are critical parts of testing and implementing changes because they tell a team whether the changes being made are actually leading to improvement. Reviewing data provides the team with a picture of where they are starting from and where they are heading.

We have included in **Appendix 6** an overview of the Institute for Healthcare Improvement's (IHI's) Model for Improvement (IHI 2012). The SSIIP recommends providers use the model when undertaking improvement projects and activities. It is a simple yet powerful tool for accelerating improvement that has been used successfully by hundreds of health care organisations internationally.

Given the complexity of reducing the outcome measure of SSI, in **Appendix 6** we offer several tips and suggestions for any SSI-related improvement activities.

9 Interventions to prevent SSI | Ngā wawaotanga hei aukati SSI

Implementing the interventions to prevent SSI for hip and knee arthroplasty presents an important opportunity to build collaboration within the hospital setting, including in the following ways.

- Enlist the support of senior leadership in the hospital and surgical and anaesthesia departments.
- Identify one or two surgeons and anaesthetists to further champion the case and influence peers to encourage the adoption of, implementation of and adherence to the above interventions.
- Explore how best to communicate the interventions through strategies such as face-to-face communication at staff meetings, outreach to surgeons' offices, or telephone calls from leaders to their peers.
- Build collaborative relationships between the hospital operating room management team (operating room nurses, anaesthetists and anaesthetic technicians) and surgeons to establish reliable processes and handovers for pre-operative assessment, planning and follow-up.
- Engage with patients about how they can help reduce the risk of SSI (Health Quality & Safety Commission 2014a).

Surgical antimicrobial prophylaxis

One of the most important interventions in preventing SSI is the optimisation of surgical antimicrobial prophylaxis (Bratzler et al 2013; Uçkay et al 2013). Surgical antimicrobial prophylaxis is the use of antibiotics to prevent SSI. It should be distinguished from the use of antibiotics in early treatment, where infection is already established although not necessarily evident pre-operatively.

Antimicrobial prophylaxis may be beneficial in surgical procedures associated with high rates of infection such as clean-contaminated or contaminated procedures. It may also be beneficial in clean surgery where prosthetic devices are implanted, because although the infection rate is low, the consequence of infection is severe. Prophylaxis is recommended for orthopaedic surgery (Bratzler et al 2013).

Optimal surgical antimicrobial prophylaxis

An optimal surgical antimicrobial prophylaxis regimen that helps to reduce the risk of SSI ensures that patients receive **all** of the following:

- **correct antimicrobial choice and dose**
- **correct antimicrobial timing**
- **correct duration.**

Correct antimicrobial choice and dose

The first choice for surgical antimicrobial prophylaxis for orthopaedic surgery is a ≥ 2 g dose of cefazolin. (A ≥ 1.5 g dose of cefuroxime is an acceptable alternative.)

- Clindamycin (600 mg) or vancomycin (1 g up to 70 kg and then 15 mg/kg for patients weighing more than 70 kg, to a maximum of 2 g) should be reserved as alternative agents in the event of allergy to ß-lactam agents.
- Clindamycin is the preferred agent because it is easier to complete the infusion before knife to skin – that is, involving 20 minutes of infusion versus 60 minutes for vancomycin.
- Vancomycin should be included with cefazolin for routine prophylaxis for patients known to be colonised with MRSA.
- The recommended dose of cefazolin for **all** adults (≥ 18 years) is 2 g.

Notes

It is unclear if the dose of cefazolin for those patients weighing > 120 kg should be increased to 3 g. A number of studies, all with differing design, have looked at this issue and provide conflicting conclusions (Coates et al 2022; Edmiston et al 2004; Forse et al 1989; Ho et al 2012; Koopman et al 2007; Ryan et al 2022; Sommerstein et al 2021; Van Kralingen et al 2011). However, given the low cost and safety profile of cefazolin, a 3 g dose for those weighing > 120 kg can easily be justified (Bratzler 2013).

Two studies have reported the outcome of arthroplasty surgery based on cefazolin dose (Morris et al 2019; Rondon et al 2018). Underdosing was associated with a higher SSI rate and most patients underdosed were over 120 kg, receiving < 3 g cefazolin.

We recommend that a 3 g dose of cefazolin is used for those weighing > 120 kg.

The use of gentamicin for prophylaxis in orthopaedic patients is associated with an increase in acute renal injury (Bell et al 2014). It is recommended that gentamicin should be avoided in orthopaedic patients in the perioperative period (Bell et al 2014). If additional gram-negative cover is required, this should be provided with another agent.

Correct antimicrobial timing

Surgical antimicrobial prophylaxis for primary procedures is administered 0–60 minutes before knife to skin as a single dose.

- Evidence indicates that antimicrobial prophylaxis should be given within the 60 minutes before the surgical incision (knife to skin) (Classen et al 1992).
- For patients receiving vancomycin, antibiotics must be commenced within two hours prior to the surgical incision, allowing adequate time for the infusion to occur. The infusion must be completed prior to knife to skin.
- An additional dose of cefazolin may be necessary if the length of surgery is prolonged. It is recommended that re-dosing occurs when the length of the procedure exceeds two half-lives; as this is 1.2–2.2 hours for cefazolin, re-dosing should occur four hours after the first dose was given. The same re-dosing timing holds for cefuroxime.
- Re-dosing should also be considered if there is excessive blood loss (> 1,500 mL) in order to ensure an adequate antimicrobial level until wound closure.
- Bilateral procedures: If the second side of a bilateral procedure is commenced more than an hour after the initial dose of prophylaxis, a second dose is required to provide the second side with the same level of protection as the first. If vancomycin has been used, no second dose is required.

Correct duration

Discontinue surgical antimicrobial prophylaxis within 24 hours after surgery end time.

- Data and clinical practice guidelines do not support antimicrobial prophylaxis continuing beyond 24 hours (Bratzler et al 2013). There is also no evidence of benefit for continuing antimicrobial administration until all drains or catheters are removed.
- Three doses of cefazolin or cefuroxime administered eight hours postoperatively is accepted as discontinuation within 24 hours of surgery.
- The use of antimicrobials is not without risk for patients. Exposure to antimicrobials is associated with a greater risk of subsequent colonisation with resistant organisms.
- Antimicrobial use is a risk factor for *Clostridium difficile*-associated disease.

Implementing surgical antimicrobial prophylaxis

We suggest that, in implementing the three components for optimal use of antimicrobial prophylaxis, clinicians consider the following where appropriate or applicable to their district.

- Engage with the anaesthesia service to ensure that the correct antimicrobial agent, timing and dose for perioperative prophylaxis occur.
- Use pre-printed or computerised instructions specifying postoperative antimicrobials and timely discontinuations.
- Use electronic prescribing order sets or pathways to direct to the appropriate antimicrobials and timely discontinuation.
- Change operating room drug stocks to include only recommended antimicrobial agents.
- Use visible reminders/checklists/stickers.
- Involve pharmacy, infection prevention and control, clinical microbiologists and infectious disease physicians to ensure appropriate timing, selection and duration.
- Verify administration time during a specified 'time out' period (eg, five minutes) so action can be taken if not administered.
- Use ward rounds and consider using pharmacist involvement to ensure antimicrobials are stopped within 24 hours of surgery.

Patients with a history of previous *Staphylococcus aureus* infection

Around 30 percent of SSIs in the national SSIIP are due to *S. aureus*. Some patients coming forward for arthroplasty may have had a previous *S. aureus* infection. This may have been after a previous arthroplasty.

- When a procedure is being undertaken in a patient with a previous *S. aureus* infection, especially an SSI, infectious disease or clinical microbiology advice should be sought on how to suppress/eradicate *S. aureus* before the procedure.

Surgical skin antisepsis

Pre-operative skin antisepsis is a simple and effective measure to reduce the risk of SSI (Maiwald and Chan 2012). The primary source of organisms contributing to infection following surgery is the bacteria on a patient's skin. The aim of skin antisepsis is to eliminate and rapidly kill skin flora at the site of a planned surgical incision (Canadian Patient Safety Institute 2019). Evidence supports the use of surgical skin antisepsis for all classes of surgery.

Antiseptics can be defined as biocidal products that destroy or inhibit growth of micro-organisms in, or on, living tissue, for example, the skin. Antiseptics can include a wide variety of formulations and preparations such as hand hygiene products, pre-operative skin preparations, ointments, creams, tinctures and mouthwashes. Overall, they should have the following characteristics:

- a wide spectrum of activity against bacteria, fungi and viruses
- rapid biocidal activity
- little or no damage, irritation or toxicity to the tissue
- little or no absorption into the body
- if possible, some persistent biocidal activity.

Recommended pre-operative skin antisepsis agents

Pre-operative skin antiseptic agents should have both rapid and long-acting antimicrobial activity. Skin preparations that combine alcohol (which has an immediate and dramatic effect on skin bacteria) with long-acting antimicrobial agents appear to be more effective at preventing SSI (IHI 2012). Alcohol, chlorhexidine gluconate (CHG) and povidone-iodine (iodine tinctures or iodophors) are the most commonly used antiseptic agents.

Alcohol-based CHG and povidone-iodine antiseptic solutions significantly reduce the likelihood of surgical site colonisation and maximise the rapidity, potency and duration of bactericidal activity when compared with other solutions (Wade et al 2021). The immediate killing activity of alcohol requires that the alcohol evaporates; therefore adequate drying time is required for killing to occur.

The preferred formulation of pre-operative skin antisepsis is CHG plus ≥ 70 percent alcohol, with povidone-iodine plus ≥ 70 percent alcohol reserved for patients with an allergy to CHG. Data collected for this intervention is no longer reported as a QSM; however, districts may wish to continue to collect, analyse and report on this data element within their facility.

Chlorhexidine gluconate

The properties that make CHG highly effective are a strong affinity for binding to the skin, high antibacterial activity and prolonged residual effects on rebound bacterial growth. CHG exhibits excellent activity against gram-positive and good activity against gram-negative vegetative organisms and fungi.

CHG is typically used in concentrations of 2–4 percent for hospital scrubs and hand washes; however, when the formulation includes alcohol, the concentration of CHG is usually 0.5–2 percent.

Patients that are allergic to CHG should receive povidone-iodine with alcohol (at least 70 percent) as an alternative.

Povidone-iodine

Iodine has been widely used as an antiseptic. Traditional solutions in water or alcohol include tincture of iodine or Lugol's solutions.

Iodophors are preparations containing iodine complexed with a solubilising agent such as a surfactant or povidone (povidone-iodine). Iodophors have allowed for greater flexibility in the use of iodine in antiseptics. Depending on the concentration of free-iodine, iodophors can be used for routine and high-risk applications such as surgical scrubs and pre-operative skin antisepsis. They are generally associated with low toxicity and little irritation.

The concentration of iodine varies depends on the formulation used. For example, one formulation contains iodine povacrylex (0.7 percent available iodine) and 74 percent weight-to-weight (w/w) isopropyl alcohol.

Precautions when using surgical skin antisepsis agents

Alcohol-based antiseptics are flammable and therefore we recommend you take the following precautions when using alcohol-based skin antiseptics.

- Educate staff on how to be safe and effective when applying a flammable skin preparation agent.
- Avoid dripping or pooling of alcohol-based antiseptic solutions on sheets, padding, positioning equipment and adhesive tape, and on or under the patient.
- Ensure the liquid has completely dried by evaporation – three minutes is usually enough time. Areas with excess hair may take longer to dry. Evaporation is essential for the biocidal activity of alcohol.
- Develop protocols that ensure and document the applied solution is completely dry before draping the patient.
- Single-use applicators should ideally be used to apply flammable antiseptic agents.
- Cleanse the incision area for 30 seconds and then paint the rest of the area.
- Consider use of a tinted CHG-alcohol preparation (orange, red or teal) for greater visibility.

Pre-operative hair removal

Studies show that pre-operative hair removal by any means is associated with increased SSI rates (CDC 1999). Hair should not be removed unless it interferes with the operation (Canadian Patient Safety Institute 2019; National Institute for Health and Care Excellence 2008).

If removal is necessary, remove by clipping not shaving (Nichols 2001, Health Quality & Safety Commission 2014b). Clipping rather than shaving improves the safety and quality of patient care.

- Hair removal should be performed using hospital-approved electric clippers.
- Hair removal should be performed outside the operating room.
- Hair removal should be performed as close to the time of the procedure as possible.

Pre-operative hair removal the night before an operation is associated with a significantly higher risk of SSI than hair removal immediately before the operation. This is due to skin micro-trauma and bacterial colonisation (Ng et al 2013).

To limit bacterial contamination of the surgical site, clipping should occur less than two hours before surgery.

- Educate and engage patients on the topic of not shaving in the vicinity of the surgical site before their surgery.

Staphylococcus aureus is the most common cause of SSI both in New Zealand and globally. It accounts for about 30 percent of orthopaedic SSIs identified in patients in New Zealand hospitals. Implementing a pre-operative anti-staphylococcal bundle of decolonisation interventions can reduce patient harm and costs.

Decolonisation is a strategy to reduce the patient's microbial load of *S. aureus* before their surgical procedure so their risk of infection is decreased. A recent study concluded that screened and subsequently treated patients were approximately 50 percent less likely to require revision due to prosthetic joint infection compared with those not screened and treated (Ma et al 2017).

Since 2019, the Commission's IPC programme team has facilitated the implementation of a pre-operative anti-staphylococcal bundle within the SSIIP.

The components of an anti-staphylococcal bundle may include:

- *S. aureus* pre-operative screening
- nasal decolonisation
- skin decolonisation.

Other guidance

A number of countries, including Wales (NHS Wales 2010), Canada (Canadian Patient Safety Institute 2019), and jurisdictions within countries (Safety and Quality Investment for Reform 2007) provide guidance on reducing SSI rates. The Joint Commission's (2013) Implementation Guide also provides an overview of evidence-based best practices for preventing SSI, as does a recent CDC publication (Berrios-Torres et al 2017).

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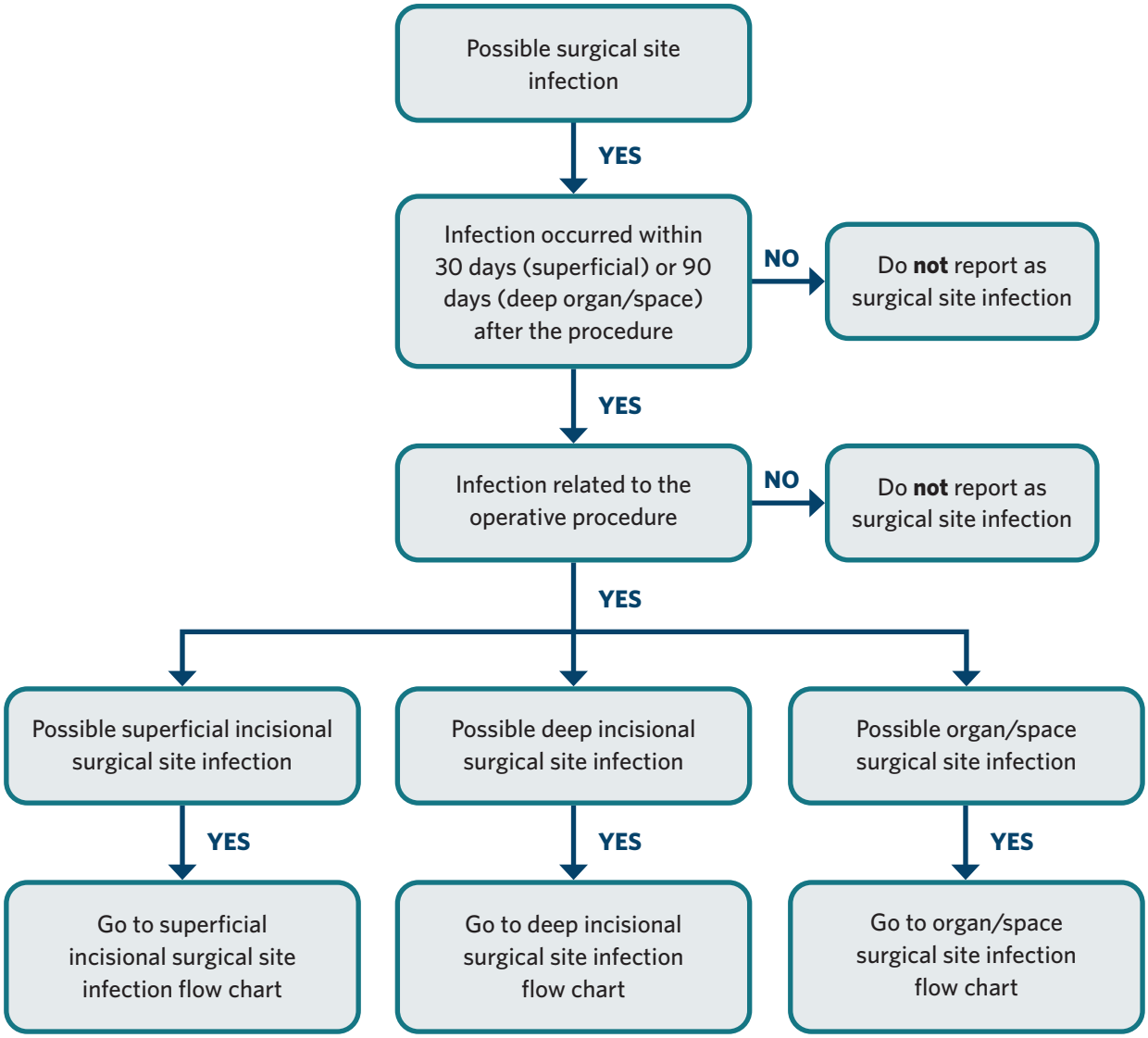
Appendices | Ngā āpitihanga

Appendix 1: Flow charts to assist decision-making

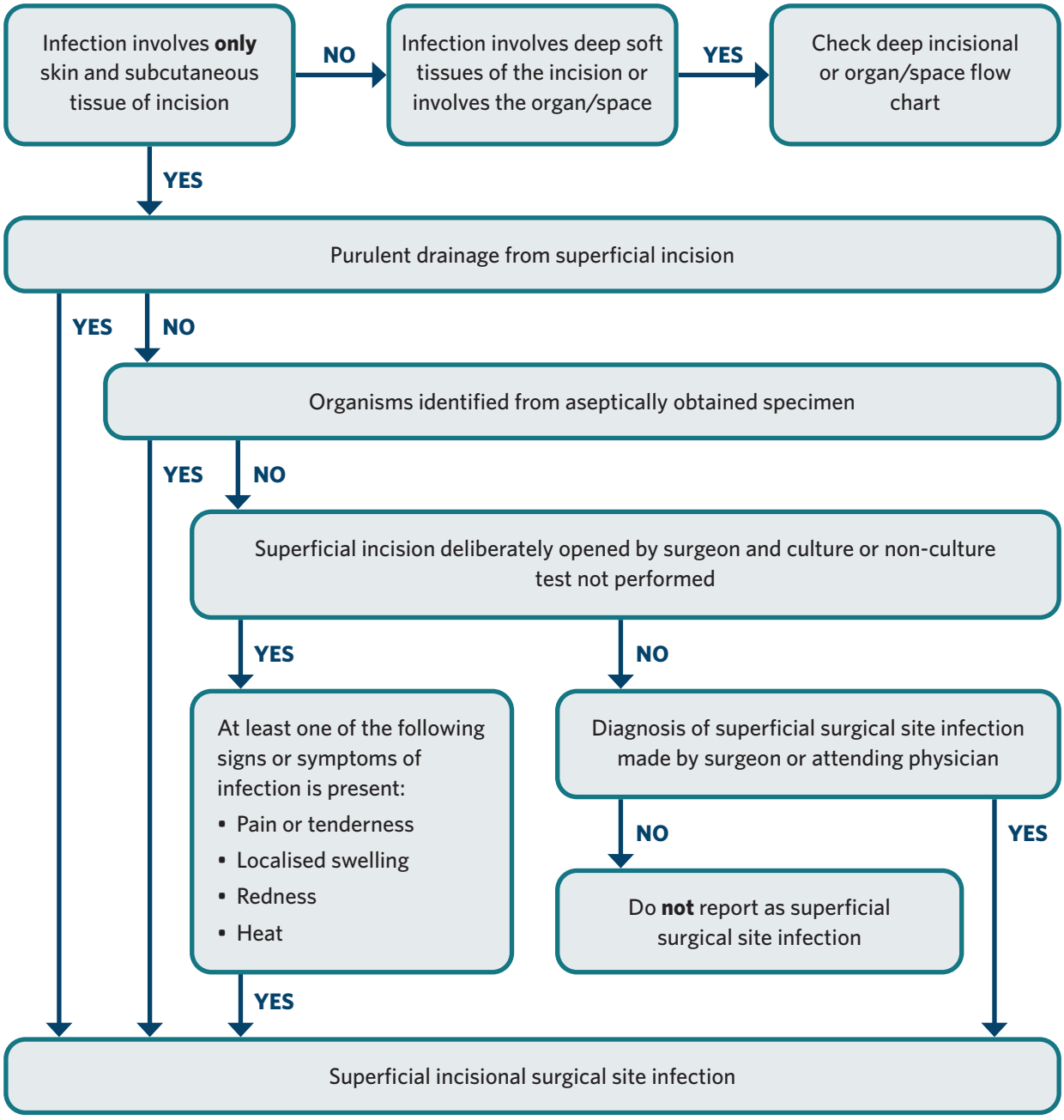
The following flow charts are based on National Healthcare Safety Network definitions.

Flow chart for possible surgical site infection



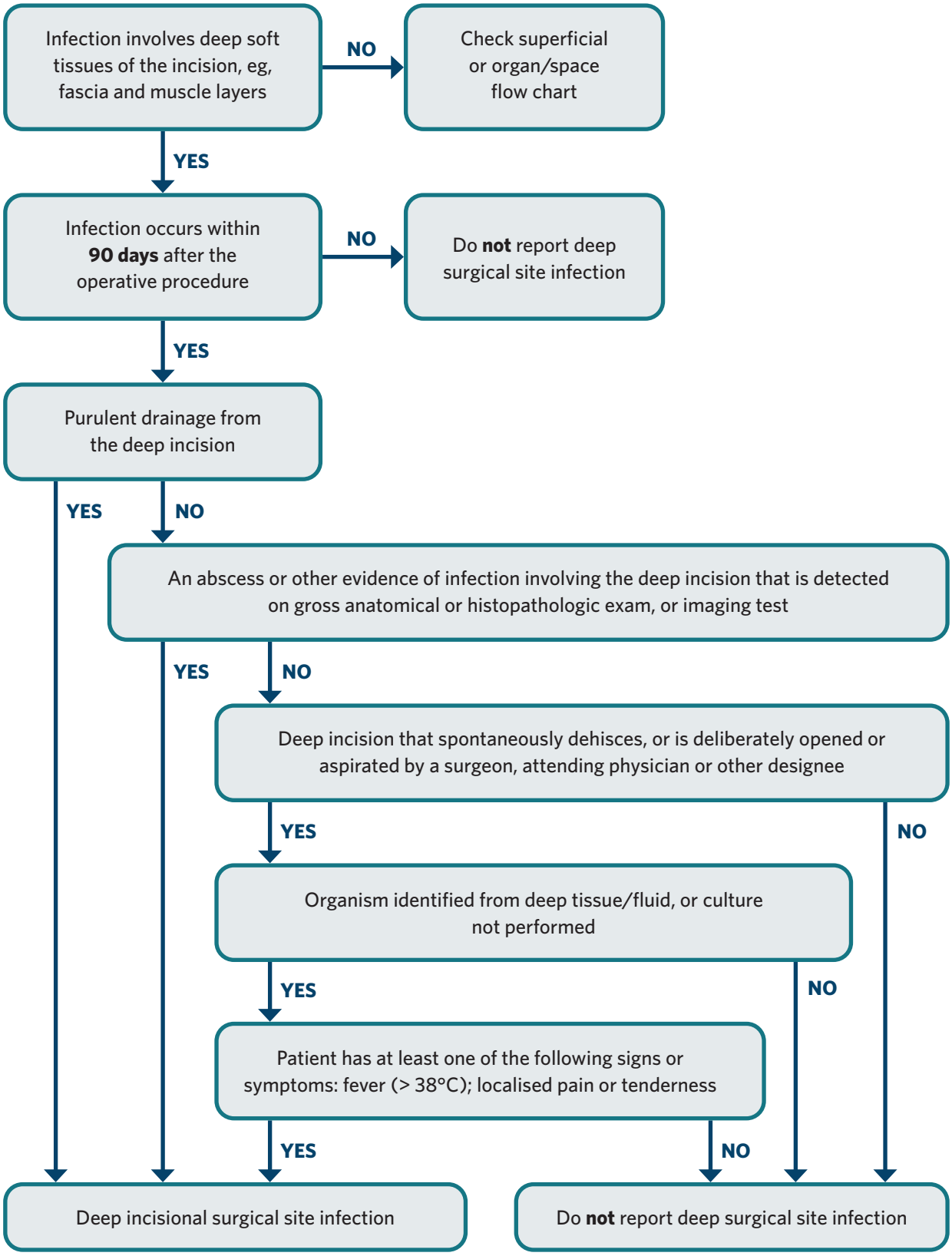
Flow chart for possible superficial incisional surgical site infection

(Occurs within 30 days after the procedure. Day 1 = procedure date.)



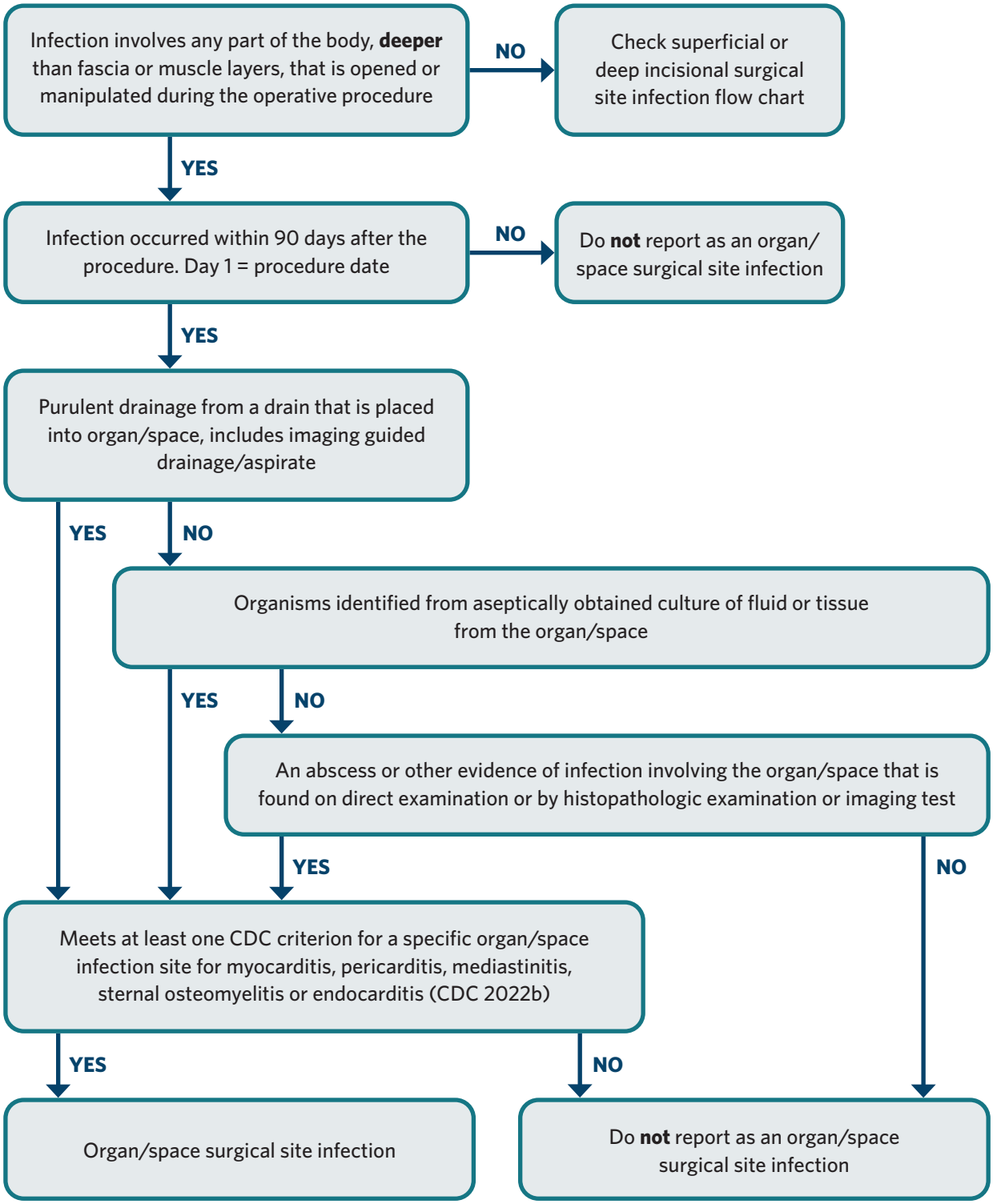
Flow chart for possible deep incisional surgical site infection

(Occurs within 90 days after the procedure. Day 1 = procedure date.)



Flow chart for possible organ/space surgical site infection

(Occurs within 90 days after the procedure. Day 1 = procedure date.)



Appendix 2: Counties Manukau Health algorithm for surveillance categories and infection definition

Guidance for surveillance and reporting for the Surgical Site Infection Improvement Programme (SSIIP)

The SSIIP aims to survey a subset of joint arthroplasty surgeries where hip and knee prostheses are implanted and/or subsequently manipulated. This aims to supply data on the majority of joint arthroplasty surgeries while maintaining a degree of homogeneity within primary arthroplasty and revision arthroplasty surgeries to improve data interpretation.

All operations funded by a district are eligible for surveillance under the SSIIP, including operations performed at private facilities with district funding.

The inclusion criteria for surveillance under the SSIIP are:

- primary arthroplasty, in the absence of current infection, where the prosthesis implanted is a total hip joint replacement (THJR), total knee joint replacement (TKJR) or knee joint hemiarthroplasty
- revision arthroplasty, in the absence of previous or current deep or organ/space infection, on an existing THJR,* TKJR or knee joint hemiarthroplasty.

* Hip hemiarthroplasty procedures are not included.

All references to SSI use the **SSI definitions** for 'superficial', 'deep' or 'organ/space' infection found in this implementation guide. All reported SSIs must fulfil criteria for one of these categories. Suspected SSIs that do not fulfil criteria for one of these categories are not considered infections for the purposes of the SSIIP.

Definitions

- 'Primary arthroplasty' is defined as the first joint arthroplasty performed on a native joint.
- 'Revision arthroplasty' is defined as any operation on a joint that has, or has had, a prosthesis in situ where 'component exchange' is performed.
- 'Component exchange' is defined as removal/exchange of **any** or **all** components of the prosthesis. This includes liner exchange and modular component exchange (eg, femoral head). Component exchange may involve removal and exchange of the entire prosthesis.
- The 'index operation' is defined as the operation under surveillance.
- 'Possible SSI event' is defined as the time when suspicion of an SSI has prompted evaluation for SSI using the SSIIP definitions.
- 'Invasive manipulation' is defined as any intervention that enters the joint space. Examples would include joint aspiration, arthroscopy and open surgery without component exchange.

Arthroplasty definitions

A. 'Primary arthroplasty' definition

- The first joint arthroplasty performed on a native joint

Wound classes:

- Clean
- Contaminated
- Dirty/infected

B. 'Revision arthroplasty' definition

- Any operation on a joint that has, or has had, a prosthesis in situ

and

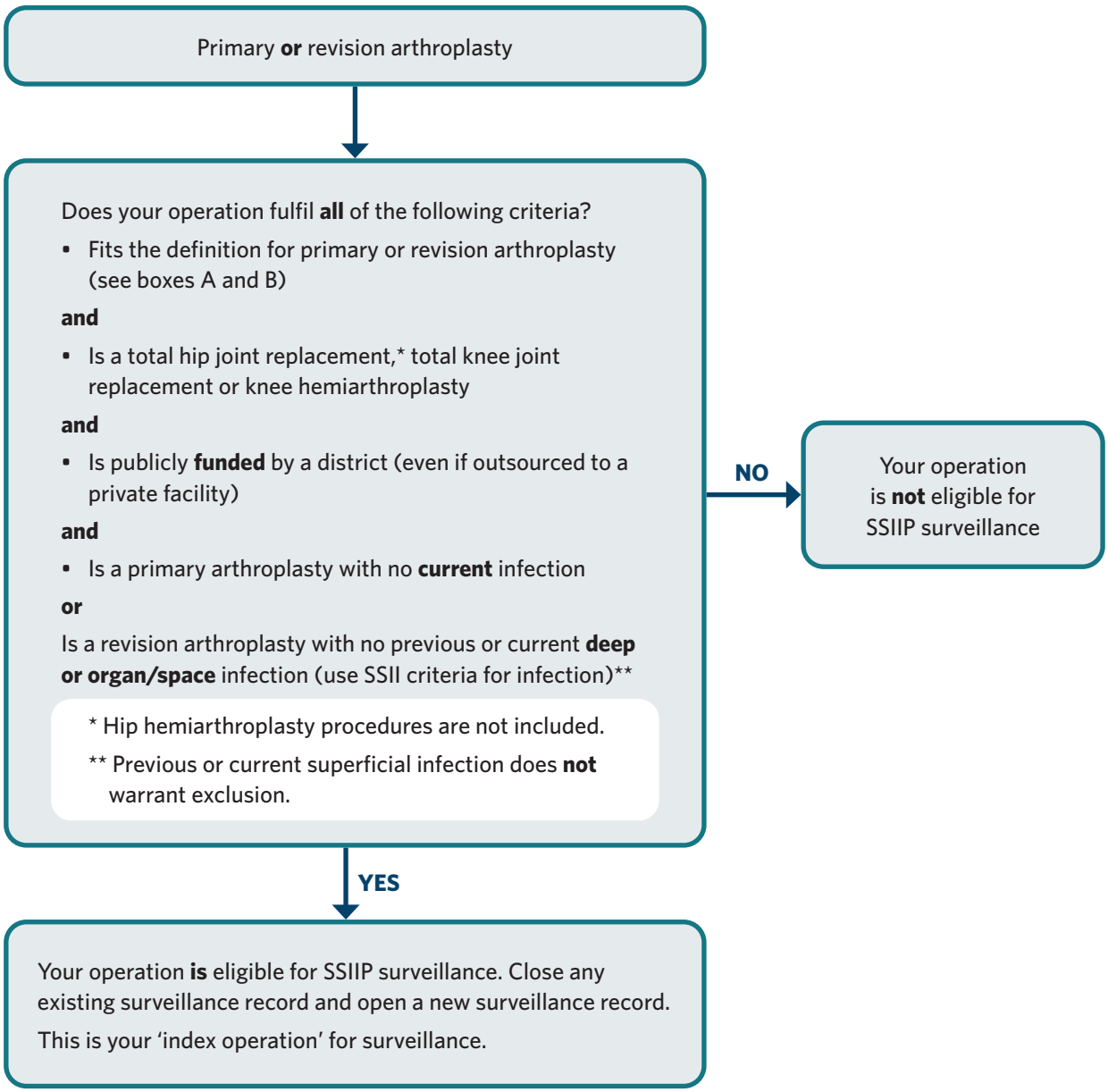
- Where 'component exchange' is performed

Wound classes:

- Clean
- Contaminated
- Dirty/infected

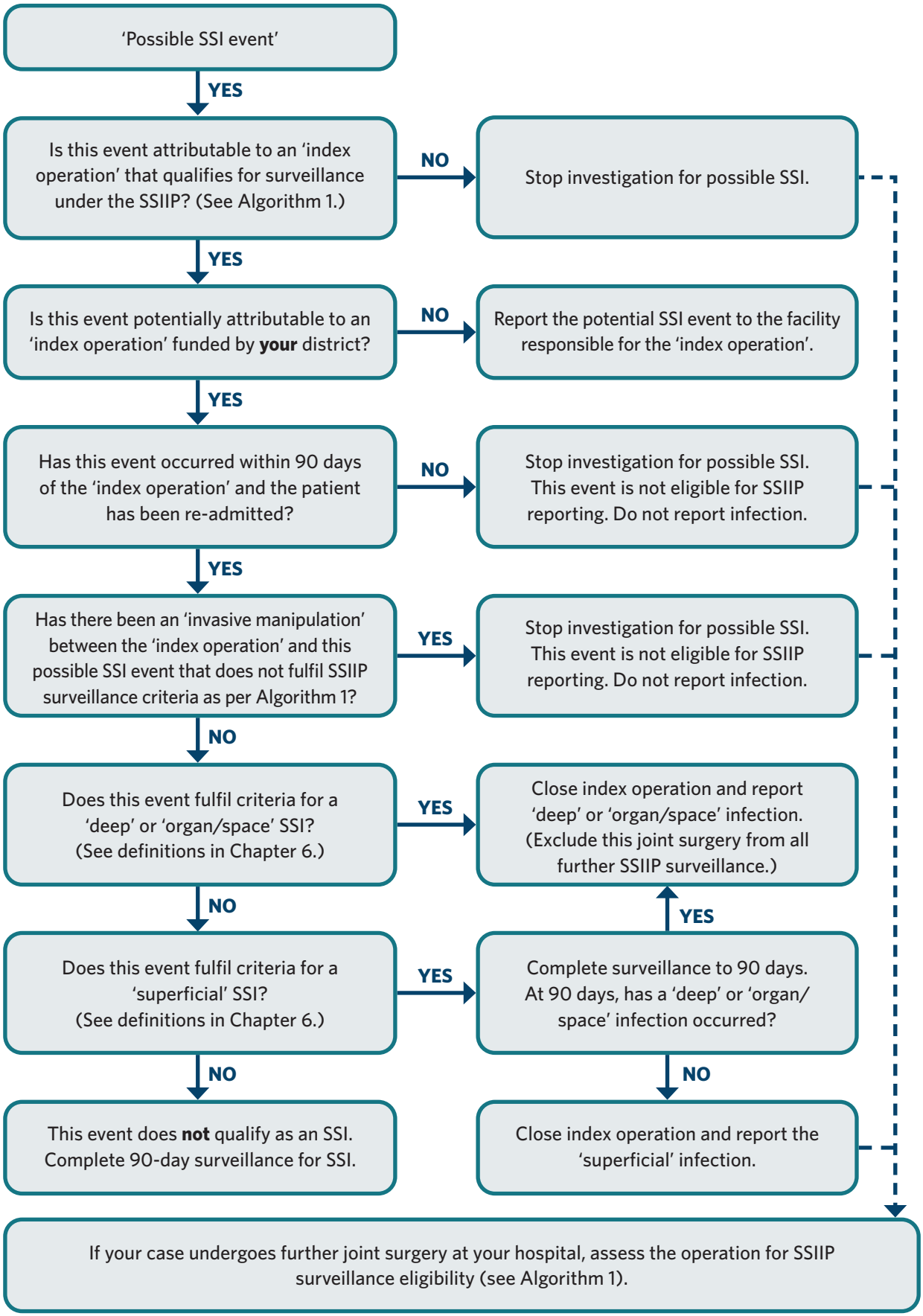
Algorithm 1: Flow chart for SSIIP programme surveillance eligibility

This algorithm is intended to assist investigators in establishing whether an operation qualifies for 90-day surgical site infection surveillance under the SSIIP.



Algorithm 2: Flow chart for SSIIP infection reporting

This algorithm is intended to assist investigators with establishing whether or not any one event qualifies as a surgical site infection (SSI) which should be reported to the SSIIP.



Appendix 3: CDC/NHSN surveillance definitions for specific types of infections

See: CDC (2022a) **www.cdc.gov/nhsn/pdfs/pscmanual/17pscnosinfdef_current.pdf**

Periprosthetic joint infection (PJI) (for use as organ/space SSI following hip and knee arthroplasty only)

Joint or bursa infections must meet at least **one** of the following criteria:

1. two positive periprosthetic specimens (**tissue or fluid**) with at least one matching organism, identified by culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis and treatment, for example, not active surveillance culture/testing (ASC/AST)
2. a sinus tract* communicating with the joint identified on gross anatomic exam
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. organism(s) identified from a single positive periprosthetic specimen (**tissue or fluid**) by culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis and treatment, for example, not ASC/AST.

* A sinus tract is defined as a narrow opening or passageway that can extend in any direction through soft tissue and results in dead space with potential for abscess formation.

Comments

- Organism(s) identified from hip or knee hardware can be used to meet criterion 1.
- The NHSN definition of PJI is closely adapted from the Musculoskeletal Infection Society (MSIS) definition of PJI (Fillingham et al 2019).
- The standard laboratory cut-off values in criteria 3a–3d are provided by NHSN for hip prosthesis (HPRO) and knee prosthesis (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. Clinicians should refer to the MSIS consensus definition for clinical use.

Osteomyelitis

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

1. patient has organism(s) identified from bone by culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis and treatment, for example, not ASC/AST

2. patient has evidence of osteomyelitis on gross anatomic or histopathologic exam

3. patient has at least **two** of the following localised signs or symptoms: fever (> 38.0°C); swelling;* pain or tenderness;* heat;* or drainage*

   and at least **one** of the following:

   a. organism(s) identified from blood by culture or non-culture based microbiologic testing method that is performed for purposes of clinical diagnosis and treatment, for example, not ASC/AST
   and
   imaging test evidence suggestive of infection (eg, X-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc]), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for osteomyelitis

   b. imaging test evidence suggestive of infection (eg, X-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc]), which if equivocal is supported by clinical correlation, specifically, physician documentation of antimicrobial treatment for osteomyelitis.

* With no other recognised cause.

Appendix 4: Total surgical risk score

Total surgical risk score will be calculated as follows, providing that the following fields on the data set are completed.

Field	Score = 0 if:	Score = 1 if:
Wound class	1 or 2 (clean or clean-contaminated)	3 or 4 (contaminated or dirty/infected)
ASA classification	1 or 2	3, 4 or 5
Duration of operation	≤ 2 hours (arthroplasty)	> 2 hours (arthroplasty)
Total surgical risk index =	Sum of scores	

District data collectors do not need to calculate the total surgical risk index. This will be calculated during data analysis and used to risk stratify procedures in the report.

Appendix 5: Data collection form

Orthopaedic SSIIP data collection form
Last update: February 2019

SSII Surgical Site Infection Improvement Programme

Patient information (denominator data)		
Form ID		Insert patient sticker here if available. However, the only mandatory information required for data entry is specified in the adjacent table.
Facility ID		
NHI		
Gender	☐ M ☐F ☐ Unknown	
Date of birth	___/___/____.	

Primary admission/discharge	
Date of admission	___/___/____. Click here to enter a date.
Date of discharge	___/___/____. Click here to enter a date.
Date of death (if applicable)	___/___/____. Click here to enter a date.

Procedure					
Date of procedure	___/___/____. Click here to enter a date.				
Procedure code/description	_____. Choose an item.				
Location of procedure	☐ Left	☐ Right			
Is procedure an emergency?	☐ Y	☐ N	☐ Unknown		
Surgeon grade	☐ Consultant	☐ Specialty registrar	☐ Locum consultant	☐ Locum registrar	☐ Other
Surgeon code					
Antibiotic cement used?	☐ Y	☐ N	☐ Unknown		

Risk score					
Wound class	☐ Clean	☐ Clean-contaminated	☐ Contaminated	☐ Dirty or infected	
Knife to skin time	____/____ 24hr clock				
Wound closure time	____/____ 24hr clock				
Duration	*This field will be calculated in the database.*				
ASA score	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5 ☐ Not recorded

Anaesthetic		
Type of anaesthetic	☐ General	☐ General and regional – epidural
	☐ Regional – epidural	☐ General and regional – spinal
	☐ Regional – spinal	☐ General and regional – other
	☐ Regional – specific site not recorded	☐ Combined spinal and epidural
	☐ Local/other	☐ GA/combined spinal and epidural

Antibiotic prophylaxis					
If more than one antibiotic administered use additional antibiotic/microbiology form.					
Antibiotic 1 name	_____. Choose an item.				
Date given	___/___/____ Click here to enter a date.				
Time given	____/____ *(24hr clock)* or ☐ Unknown				
Dose and unit		☐ Grams	☐ Milligrams	☐ Unknown	
When was it administered?	☐ On induction	☐ Within one hour prior to incision	☐ After incision	☐ More than one hour prior to incision	☐ Not recorded

Intra-operative antibiotics			
Was an additional dose of antibiotics given intraoperatively e.g. for lengthy procedure?	☐ Y	☐ N	☐ Unknown

Post-operative antibiotics			
Were antibiotics given post-operatively?	☐ Y	☐ N	☐ Unknown
If yes, were they given for less than 24 hrs	☐ Y	☐ N	☐ Unknown

Skin preparation type used *(this is an optional field)*	
☐ Chlorhexidine and alcohol	☐ Chlorhexidine
☐ Povidone iodine and alcohol	☐ Povidone iodine
☐ Unknown	☐ Other (Contact SSII Programme team to get added)

Patient BMI		
Height _____ or ☐ Unknown	Weight _____ or ☐ Unknown	BMI _____or ☐ Unknown

Pre-operative anti-staphylococcal bundle					
Did the patient receive anti-staphylococcal bundle?	☐ No bundle protocol	☐ Y	☐ N		☐ Unknown
If pre-screening was performed on the patient what was the result? (*Select "MRSA positive" if mixed result.*)	☐ N/A *(No pre-screening)*	☐ No *S. aureus*	☐ MSSA positive	☐ MRSA positive	☐ Unknown
Skin decolonisation – compliance	☐ Full *(all doses)*	☐ Partial *(some doses)*	☐ Not *(no doses)*	☐ N/A *(not in bundle)*	☐ Unknown
Nasal decolonisation – compliance	☐ Full *(all doses)*	☐ Partial *(some doses)*	☐ Not *(no doses)*	☐ N/A *(not in bundle)*	☐ Unknown

Readmission (numerator data)	
Has patient been readmitted due to SSI?	☐ Y ☐ N
If yes, date of readmission.	__/__/____. Click here to enter a date.

SSI details (numerator data)	
Has SSI criteria been met for this procedure?	☐ Y ☐ N
When was SSI diagnosed?	☐ During initial admission ☐ During readmission up to 30 days post procedure ☐ During readmission up to 90 days post procedure
Date of Infection	__/__/____. Click here to enter a date.
Type of SSI (*check decision making flow charts*)	☐ Superficial (must occur within **30 days** post procedure) ☐ Deep (must occur within **90 days** post procedure) ☐ Organ/space (must occur within **90 days** post procedure)

Microbiology		
If more than one clinical sample taken please use additional antibiotic/microbiology form.		
Clinical sample taken?	☐ Y ☐ N	
Site of sample one	☐ Blood ☐ Tissue ☐ Aspirate ☐ Wound swab ☐ Other	
Clinically significant organism?	☐ Y ☐ N	
If yes, identify organism.	☐ Acinetobacter baumanii ☐ Enterococcus faecalis ☐ Escherichia coli ☐ Klebsiella pneumoniae ☐ Serratia marcescens ☐ Staphylococcus epidermidis ☐ Streptococcus agalactiae (GpB) ☐ Not specified _____.	☐ Candida albicans ☐ Enterococcus faecium ☐ Klebsiella oxytoca ☐ Pseudomonas aeruginosa ☐ Staphylococcus aureus ☐ Streptococcus pyogenes (GpA) ☐ Other (please state)
Is the organism an MDRO?	☐ Y ☐ N	
If yes, which of the following?	☐ MRSA ☐ ESBL ☐ VRE ☐ CRO *includes CRO, CRE, CPE, NDM* ☐ Other	

Notes (For your own reference. This is not reviewed by the SSII programme)

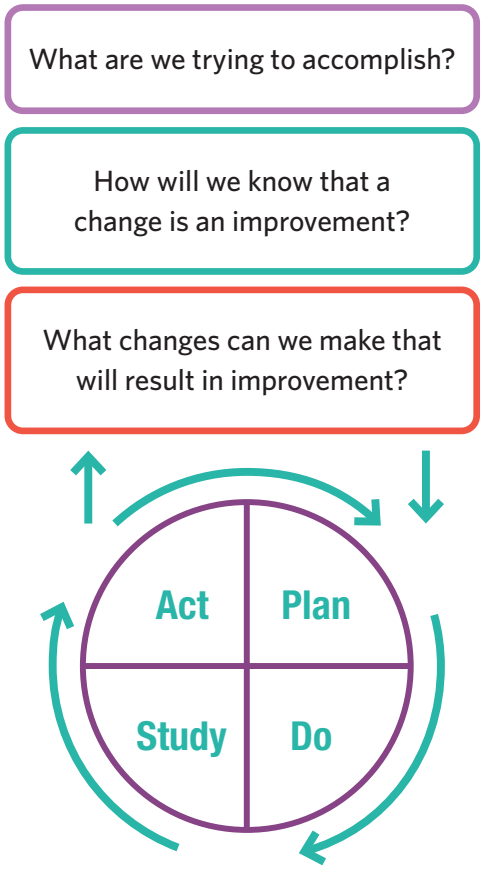
Appendix 6: Model for Improvement

The SSIIP recommends providers use the Model for Improvement when undertaking improvement projects and activities. This is a simple yet powerful tool for accelerating improvement that has been used successfully by hundreds of health care organisations internationally (IHI 2012).

The model has two parts:

- three fundamental questions, which can be addressed in any order
- the plan–do–study–act (PDSA) cycle to test changes in real work settings. The PDSA cycle guides the test of a change to determine if the change is an improvement.

The Model for Improvement



Build a team

It is crucial to have the active support of senior clinicians and leaders in this work. For any surgical care improvement programme to be successful, leadership must make patient safety and quality of care a strategic priority. Once leadership has publicly given recognition and support to the programme, the improvement team can be quite small.

The team should be responsible for:

- conducting small-scale tests of ideas for improvement
- tracking performance on a set of measures designed to help them see if the changes they are making are leading to improvement
- regularly report their findings back to leadership.

Model for Improvement

The following three fundamental questions are addressed.

1. What are we trying to accomplish?

Set clear aims (goals and objectives)

Improvement requires setting aims. An organisation will not improve without a clear and firm intention to do so. The aim should be time-specific and measurable. The aim should also define the specific population of patients or other system that will be affected. Setting an aim can help teams focus on what they hope to achieve.

2. How will we know that a change is an improvement?

The only reliable way to know if any change we make to practice brings about improvement is to collect data. 'Feelings', 'impressions' and other qualitative feedback can be useful, but hard numbers are needed if we are to decide whether we are meeting our aim.

Establish measures

Measurement is a critical part of testing and implementing changes; it tells a team whether the changes they are making are actually leading to improvement.

Measurement for improvement starts with collecting baseline data to provide your team with a picture of where you are starting from.

Given the complexity of reducing the outcome measure of SSI, we offer the following tips and suggestions.

- SSI rates need to be monitored for trend on a long-term basis. A normal variation may be noted in SSI rates even though antimicrobial prophylaxis compliance increases consistently.
- Improvement in SSI rates should be seen as a long-term goal. These events are uncommon, occurring in less than 2 percent of all procedures, and improvement will not be seen in the short term.
- Consistently applied best practice for every surgical procedure will influence SSI rates.
- There are many other variables, beyond the guidelines presented, that may affect SSI rates; for example, patient-specific factors such as diabetes, obesity, surgeon experience and technique, and duration of procedure.
- Work closely with your IPC team, clinical microbiologists, infectious disease physicians, surgeons, anaesthetists, operating room nursing staff, pharmacists and information support services to capture the process and outcome measure.

3. What change can we make that will result in improvement?

Not all changes result in an improvement, yet all improvement requires something to change

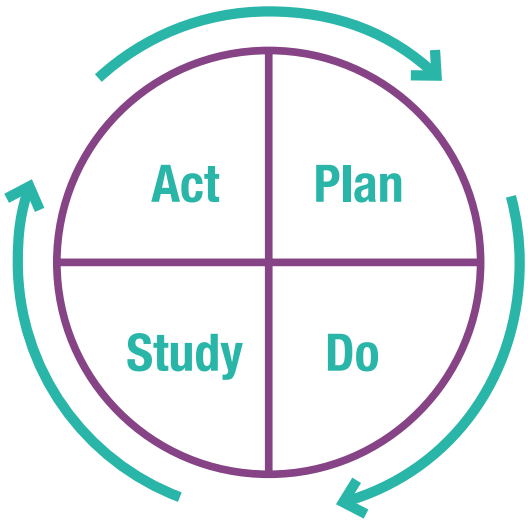
The ability to develop, test and implement changes is essential for any individual, group or organisation that wants to continuously improve.

After generating ideas, run PDSA cycles to test a change or group of changes on a small scale to see if they result in improvement. If they do, expand the tests and gradually incorporate larger and larger samples until you are confident the changes should be adopted more widely.

Using the PDSA cycle

The PDSA cycle is shorthand for testing a change in the real work setting – by planning it, trying it, observing the results and acting on what is learned (Figure 1). This is the scientific method adapted for action-oriented learning.

Figure 1. PDSA cycle



Plan – the change to be tested

Do – carry out the test and record the results

Study – look at the data, analyse and reflect

Act – make a decision (adopt, adapt or abandon) and do it again

Appendix 7: Abbreviations

ACC	Accident Compensation Corporation
ACHI	Australian Classification of Health Interventions
ASA	American Society of Anaesthesiologists
ASC	active surveillance culture
AST	active surveillance testing
BIU	business intelligence unit
BMI	body mass index
CDC	Centers for Disease Control and Prevention
CHG	chlorhexidine gluconate
CPE	carbapenemase-producing Enterobacteriaceae
CRE	carbapenem-resistant Enterobacteriaceae
CRO	carbapenem-resistant organism
CRP	C-reactive protein
csv	comma-separated values (file type)
CT	computerised tomography (scan)
DHB	district health board
ESBL	extended spectrum beta-lactamase
ESR	erythrocyte sedimentation rate
HPRO	hip prosthesis (arthroplasty of hip)
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems 10th Revision – Australian Modification
IHI	Institute for Healthcare Improvement
IPC	infection prevention and control
IT	information technology
KPRO	knee prosthesis (arthroplasty of knee)
MDRO	multidrug-resistant organism
MRI	magnetic resonance imaging
MRSA	methicillin-resistant *Staphylococcus aureus*
MSIS	Musculoskeletal Infection Society
MSSA	methicillin-susceptible *Staphylococcus aureus*
NDM	New Delhi metallo-beta-lactamase
NHI	National Health Index
NHSN	National Healthcare Safety Network
PDSA	plan–do–study–act
PJI	periprosthetic joint infection
PMN	polymorphonuclear neutrophil
QCK	quick check
QSM	quality and safety marker

SSI	surgical site infection
SSIIP	Surgical Site Infection Improvement Programme
THJR	total hip joint replacement
TKJR	total knee joint replacement
VLAD chart	variable life-adjusted display chart
VRE	vancomycin-resistant *Enterococcus*
WBC	white blood cell

SSII Surgical Site Infection Improvement Programme

Te Kāwanatanga o Aotearoa
New Zealand Government

Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa