Protocol for
Surveillance of Surgical Site Infection

Surgical Site Infection Surveillance Service

England

Version 4          July 2008
Acknowledgments

This revision of the protocol for the surveillance of surgical site infection reflects changes made to the data handling systems and incorporates a standard approach to the surveillance of surgical site infections (SSI) that occur after the patient has been discharged from hospital. Hospitals that choose to undertake post-discharge surveillance using these methods will be able to measure the risk of SSI more accurately and make comparisons with benchmark rates that include SSI detected post-discharge.

These methods have been developed using information obtained from a survey of our users together with a review of relevant literature. We acknowledge the commitment of all hospitals in undertaking surveillance of SSI and hope that these changes will enhance the value of the data in measuring and managing the quality of care in relation to the prevention of SSI.

We would like to thank Gillian Case, Jo Griffin and Vishal Sookhoo for their assistance in developing the category for spinal procedures.

Jennie Wilson

Surgical Site Infection Surveillance Service

July 2008
Section 1 – Surgical Site Infection Surveillance

1.1 Background
Infections acquired in hospital are recognised to be associated with significant morbidity. They result in extended length of hospital stay, pain, discomfort and sometimes prolonged or permanent disability.\(^1\)\(^2\) Infections of the surgical site account for approximately 14% of all HAI, are estimated to double the length of post-operative stay in hospital and significantly increase the cost of care.\(^3\)\(^4\) The Study on the Efficacy of Nosocomial Infection Control (SENIC) showed that well-organised surveillance and infection control programmes that included feedback of infection rates to surgeons were associated with significant reductions in surgical site infection.\(^5\) Similar findings were reported by Cruse and Ford.\(^6\)

1.1.1 External benchmarks of surgical site infection can be a powerful driver for effecting change but require effort and co-ordination to develop.\(^7\) A number of national SSI surveillance systems, including SSISS in England, have demonstrated significant reductions in rates of SSI in hospitals that participate in these benchmarking schemes.\(^3\)\(^8\)\(^-\)\(^10\)

1.1.2 Valid benchmarks must be based on standardised definitions and monitoring systems. The SSISS national co-ordinating centre serves to enhance the value of surveillance by providing high quality comparative data based on a standardised approach to data collection, analysis and interpretation.\(^11\)\(^12\)

1.2 Developments to the Surgical Site Infection Surveillance protocol
A national surveillance system for SSI was established in England in 1997 as part of the Nosocomial Infection National surveillance Scheme and this early scheme evolved into the Surgical Site Infection Surveillance Service (SSISS). Subsequently, the prevention of healthcare associated infection (HCAI) has been highlighted as a priority for action by the Chief Medical Officer. In April 2004 surveillance of SSI in orthopaedic surgery became mandatory for all English NHS Trusts and the data handling systems were redeveloped in order to manage the extension of participation and size of the database.\(^13\)\(^14\)

1.2.1 When the SSI surveillance scheme was established the surveillance was focused on the inpatient stay as this enabled accurate data to be collected in a cost-effective way. Recent marked reductions in post-operative hospital stay, particularly following elective surgery, mean that that data are not captured on the significant proportion of SSIs that occur after the patient has been discharged from hospital.\(^15\) This adversely affects the ability of the data to accurately reflect rates of SSI and enable comparisons between hospitals. SSISS has therefore developed the system to facilitate post discharge surveillance (PDS) and the comparison of rates incorporating SSI detected post-discharge. In addition, the development has taken advantage of developments in technology and now provides a totally webbased data handling and reporting system. The main changes to the surveillance protocol are listed below.
1.3 Overview of amendments to the SSI surveillance Protocol

1. **Hip hemiarthroplasty category replaced by repair of neck of femur category**
   Dynamic hip screw (DNS) procedures have historically been included in the open reduction of long bone fracture (ORLBF) category. However, it is acknowledged that these procedures are commonly performed to repair a fractured neck of femur and SSISS data shows that the risk of SSI and age of patients on which they are performed are dissimilar to other procedures in the ORLBF category but similar to the hip hemiarthroplasty category, a procedure undertaken for the similar reasons to DNS. Thus, the hip hemiarthroplasty category has been replaced by a category now called repair of neck of femur which includes both hip hemiarthroplasties and DNS. Benchmark rates for this new category will be cumulated from July 2007.

2. **New category for spinal surgery**
   In response to user demand a new category for spinal surgery incorporating spinal fusion and laminectomy procedures is now amiable.

3. **Post-discharge surveillance**
   Evidence from user-surveys suggests that at least one third of SSISS hospitals already carry out some form of post-discharge surveillance (PDS).  However, if comparable rates that include SSI detected post-discharge are to be reported then a standard approach to PDS must be used that is able to systematically and accurately identify patients with SSI.

   The SSISS protocol has therefore been developed to include a defined approach to finding SSIs that occur after the patient has been discharged using the following case-finding methods:
   1. identification of patients readmitted with SSI (required)
   2. detection of SSI at outpatient clinic, other return visit to hospital or review by healthcare staff (optional)
   3. patient questionnaire returned at 30 days post-op (optional)

   This approach has been informed by a review of the published literature and a survey of current users to establish the extent to which they undertake PDS and the methods they employ. All hospitals will be required to establish systems to identify and report SSIs in patients included in the surveillance who are readmitted to hospital. The other case-finding methods are optional although we would strongly recommend that hospitals use them as they will considerably enhance the value of the data as a quality improvement measure.

4. **Webbased data entry and reporting**
   The new system is totally web based and will enable records to be entered, saved and retrieved and edited until they are ready for submission. Once submitted changes to the data have to be made through SSISS. Administrative forms will also be available for completion via the web site.

   Hospitals will be able to generate reports of their data directly from the website, either in the form of specific user-defined tables or as a summary report for any period in which data have been collected.
1.5 Aim of SSISS

The aim of SSISS is to enhance the quality of patient care by encouraging hospitals to use data obtained from surveillance to compare their rates of SSI over time and against a benchmark rate, and to use this information to review and guide clinical practice.

In order to meet these aims the key principles that underpin the surveillance are that:

♦ The dataset will be the minimum required to enable benchmarking of rates of SSI and take account of key risk factors for infection that may explain variation
♦ hospitals will be provided with tools that enable them to collect and analyse data in a standardised way
♦ error checking mechanisms will be employed to assure, as far as possible, the accuracy of the data
♦ hospitals will receive standard reports of their data and comparisons with benchmark rates derived from all participating hospitals enabling the results of surveillance to be used to inform and guide the review or change of local practice where results indicate these may be necessary to improve the quality of care.
Section 2 – Surveillance Methodology

2.1 Introduction

A key aim of this surveillance service is to enable participating hospitals to compare their rates of surgical site infection (SSI) in a specific group of surgical procedures against a benchmark – the pooled mean rate of other participating hospitals. For this comparison to be valid the data collection methods used by participating hospitals must be similar, since the sensitivity with which different surveillance methods identify hospital-acquired infections varies, and requires active and prospective methods of surveillance.24,25

2.1.1 Active surveillance is where designated, trained personnel use a variety of methods to identify cases of infection. In contrast, passive methods rely on infections being reported by staff who do not have designated responsibility for the surveillance programme and such an approach is associated with a lower case-finding sensitivity. Prospective surveillance is the application of methods to detect surgical site infection from the time of exposure (the surgical procedure). This method is more likely to identify cases of infection than retrospective review of case-records after the patient has been discharged from hospital.

2.1.2 This section describes the active, prospective methods of data collection that hospitals participating in the surveillance should use to enable them to compare their incidence of SSI with other participating hospitals. The surveillance is patient-based, that is data is collected on all patients at risk of acquiring SSI and all are followed–up to find those who develop SSI. The process is summarised in Figure 1.

Figure 1: Summary of the SSISS data handling process

![Diagram of data handling process](image-url)
2.2 Categories of procedure included in the surveillance

The surveillance is targeted on surgical procedures that are relatively common and/or associated with a relatively high risk of infection, and which are likely to require at least three days of post-operative hospital stay. These are procedures where the maximum benefit from surveillance is likely to be obtained.

2.2.1 The surgical procedures are grouped into categories of clinically similar procedures (see Table 1). The full list of procedures included within each category, together with their corresponding OPCS surgical procedure codes are given in the SSI Protocol OPCS Codes Supplement.26

2.2.2 Participating hospitals are able to choose from one or more of the fifteen categories of surgical procedures (see Table 1 and the SSI Protocol OPCS Codes Supplement). These have been based on those described by the NNIS system in the USA.27 The study population will be those patients admitted to hospital, who undergo a surgical procedure in the chosen category(ies).

2.2.3 All patients undergoing any of the surgical procedures in the chosen categories are eligible for inclusion in the surveillance even if the procedure was performed as an emergency, or if they were not the original, or main reason for surgery. e.g. abdominal hysterectomy performed due to complications during an explorative laparotomy.

2.2.4 The following procedures are excluded from the surveillance:-

a) Procedures not included in the chosen category. Check SSI Protocol OPCS Codes Supplement for eligible procedures

b) Procedures performed by endoscopy or laparoscopy. These procedures have a different risk of developing surgical site infection, and very short length of post-operative hospital stay. Some bowel and vascular procedures where part of the procedure is performed endoscopically but the procedure is completed via an incision are included (see OPCS Codes Supplement for eligible procedures).

c) Procedures where primary closure of the incision is not completed in theatre. For example, debridement, drainage of haematoma.

d) Diagnostic procedures performed in the operating theatre. For example, biopsy, gastroscopy, aspiration, injection, or catheterization.
**Table 1. Categories of surgical procedures included in the surveillance**

See SSI Protocol OPCS Codes Supplement for detailed lists of eligible procedure codes.

<table>
<thead>
<tr>
<th>Category</th>
<th>Summary of surgical procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abdominal hysterectomy</strong></td>
<td>Excision of uterus through an abdominal incision with or without concurrent excision of ovary and/or fallopian tube</td>
</tr>
<tr>
<td><strong>Bile duct, liver, or pancreatic surgery</strong></td>
<td>Operative procedures on the bile duct, gall bladder, liver or pancreas, <em>excluding cholecystectomy without exploration of the bile duct and biopsy of lesions</em></td>
</tr>
<tr>
<td><strong>Cholecystectomy (non-laparoscopic)</strong></td>
<td>Partial or total excision of the gall bladder, <em>excluding laparoscopic approach and procedures involving exploration of the bile duct</em></td>
</tr>
<tr>
<td><strong>Coronary artery bypass graft</strong></td>
<td>Open chest procedure to perform direct revascularization of heart, for example, using a vein graft</td>
</tr>
<tr>
<td><strong>Gastric surgery</strong></td>
<td>Incision, excision or anastomosis of stomach, including partial or total gastrectomy, vagotomy, pyloromyotomy, pyloroplasty and gastroenterostomy</td>
</tr>
<tr>
<td><strong>Hip replacement</strong></td>
<td>Replacement of the hip joint including resurfacing of the joint, acetabulum replacement and revision of a previous replacement and conversion from a previous hemiarthroplasty or bone fixation</td>
</tr>
<tr>
<td><strong>Knee replacement</strong></td>
<td>Replacement of all or part of knee joint (with or without patella resurfacing), including revision of a previous replacement. <em>Excludes patella replacement</em></td>
</tr>
<tr>
<td><strong>Large bowel surgery</strong></td>
<td>Incision, excision or anastomosis of the large bowel, including procedures which involve anastomosis of small to large bowel</td>
</tr>
<tr>
<td><strong>Limb amputation</strong></td>
<td>Total or partial amputation or disarticulation of the upper or lower limbs, including digits</td>
</tr>
<tr>
<td><strong>Reduction of long bone fracture</strong></td>
<td>Open or closed reduction of fracture of long bones requiring surgical incision to apply internal or external fixation. <em>Excludes replacement or open fixation of hip fracture, of small bones or intraarticular fracture</em></td>
</tr>
<tr>
<td><strong>Repair of neck of femur</strong></td>
<td>Replacement of the head of femur, including revision of a previous hemiarthroplasty (but excluding conversion to total joint replacement) and reduction of a fractured neck of femur using open fixation e.g. dynamic hip screw</td>
</tr>
<tr>
<td><strong>Small bowel surgery</strong></td>
<td>Incision, excision or anastomosis of small intestine, <em>excluding procedures which involve anastomosis of small to large bowel</em></td>
</tr>
<tr>
<td><strong>Spinal surgery</strong></td>
<td>Surgical procedures on the vertebral structures of the spine including the exploration or decompression of the spinal cord, the removal or resection of intervertebral discs, spinal fusion; and repair of fractures or deformities.</td>
</tr>
<tr>
<td><strong>Vascular surgery</strong></td>
<td>Operative procedure involving arteries or veins includes aortic aneurysm repair, vascular grafts, and carotid, iliac, femoral or popliteal artery operations. <em>Excludes varicose vein repair, creation of arterial shunts, coronary artery bypass graft, or procedures involving the pulmonary artery</em></td>
</tr>
</tbody>
</table>
2.3 Surveillance periods

All eligible patients must be recruited into the surveillance throughout the selected minimum three month period. Hospitals may choose to participate in the following periods:

1 January to 31 March
1 April to 30 June
1 July to 30 September
1 October to 31 December

2.3.1 A hospital must indicate on the SSISS weblink their intention to participate in specific period. Data for the period can not be entered until this is done.

2.3.2 Surveillance in more than one consecutive period is recommended for hospitals that perform few operations in their chosen category. Hospitals may also choose to undertake continuous surveillance so that more precise rates can be estimated from a larger set of cumulative data. If the number of operations in the chosen category is likely to be less than 10 in a surveillance period please discuss with a member of the SSISS team prior to commencing surveillance.

2.4 Ensuring all eligible patients are included in the surveillance

Once the category/ies of surgical procedure that it is intended to include in the surveillance has been selected refer to the SSI Protocol OPCS Codes Supplement to ensure that all relevant procedures are identified and included in the surveillance.

2.4.1 Data collection on each eligible procedure should start as close to the date of surgery as possible. Although operating theatre computer systems may provide a list of eligible operations these must be available soon after the procedure has been performed to ensure active follow up of patients for SSI.

2.4.2 More than one source of data may need to be reviewed on a daily basis to ensure that all eligible procedures are included in the surveillance, for example, operating theatre records, emergency theatres, ward operating and admission lists etc.

2.5 Collecting the surveillance dataset

The standard set of demographic and operation data should be completed for each procedure included in the surveillance. These data items are defined in Section 5 and staff collecting the data should refer to this to ensure accuracy and completeness of data.

2.5.1 Surveillance Data sheets: These provide a paper copy of the data items required for the surveillance together with space to record the patient’s name, NHS number, and ward details to aid their follow-up in hospital. The data for each patient included in the surveillance should initially be collected onto one of these forms. A copy can be obtained via the SSISS weblink for local printing and they can be adapted for local use if required. Two data sheets are available, one for joint replacement procedures (hip and knee replacements; repair of neck of femur) and the second for all other categories (see Appendices 1 and 2).
2.5.2 If a patient has a bilateral procedure, for example bilateral knee replacement, a separate form must be completed for each procedure.

2.5.3 Theatre staff should be encouraged to document important information for retrieval from patient records, notes or theatre computer systems. They may also be able to contribute to the collection of demographic and operation data provided they are trained in the definitions of the data items.

2.5.4 When the patient is discharged, systems must be in place to ensure that the Surveillance Data Sheet can be linked to post-discharge surveillance data. Completed a patient Wound Healing questionnaires (see Appendix 3) if available, should be attached to the original data sheet matched by name and serial number and any patient reported and confirmed SSI added to the record on the web link.

2.5.5 Pursuing late questionnaires is resource intensive, therefore it should be decided locally how many attempts should be made to recover questionnaires or to complete questionnaires over the telephone so that data reconciliation and reports on the data are not delayed.

2.6 Methods for finding cases of SSI

Review of patients to find cases of SSI should start as soon after the date of surgery as possible to ensure active follow up of patients to identify those that develop SSI. Finding cases of SSI requires designated staff who have been trained in applying the surveillance methods and definitions of SSI to ensure that the sensitivity of case-finding is high and as many SSI as possible are identified.

2.5.1 Every patient included in the surveillance should be actively and systematically followed up from the time of surgery to establish whether they develop signs and symptoms that meet the definition of SSI (see Section 3). This includes monitoring during the post operative hospital stay, on readmission or any other return visit to the hospital e.g. outpatient clinic. SSI may also be reported by the patient in a post-discharge questionnaire. These methods are detailed in Box 1.

2.5.2 Notes on any signs or symptoms of SSI should be recorded on the Surveillance Data Sheet at each review.

2.5.3 Follow-up period: The maximum period of follow-up depends on whether the surgical procedure involved the insertion of an implant (see page 33).

- **No implant inserted:** surveillance for SSI should be stopped on the 30 day after the operation (since an infection that develops after the 30 day would not meet the definition of SSI (see section 3).

- **Implant inserted:** a deep incisional or organ/space SSI may meet the definition of SSI for up to 1 year after the operation. Surveillance should therefore be continued for the duration of the patients’ post-operative stay.
  - If a patient with an implant is still in hospital 30 days after the end of a surveillance period, submit the record and continue to monitor for SSI until discharge.
• If the patient is discharged before 30 days the post-discharge patient questionnaire should still be returned at 30 days after the operation but SSI identified between the 30th day and 1 year after the operation can still be reported to SSISS e.g. if the patient is readmitted with an infection in the joint following hip replacement.

2.5.4 The identification of SSIs that meet the definitions of infection can be facilitated by the following measures:

- Encourage medical and nursing staff to clearly document the clinical symptoms of SSI they observe both in case notes and on laboratory request forms.
- Encourage medical staff to write a diagnosis of SSI in the case notes.
- Develop clear guidance for staff on when a wound swab should be taken: there should be some signs of infection, e.g. discharging pus, redness, swelling, heat, pain.
- Microbiology results should be interpreted in conjunction with clinical information. Advice from a Medical Microbiologist should be sought if there is doubt about the interpretation of a result.
### Box 1: Methods of surveillance to identify surgical site infections

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

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

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

   b). Regularly review microbiology reports to find any positive surgical site cultures from patients in the study population and check why the cultures were taken and if there are clinical signs of infection

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

2. **Detecting SSI in patient readmitted to hospital (required)**

   Systems must be in place to identify patients included in the surveillance that are subsequently readmitted with SSI. These must meet the criteria for SSI and be reported as ‘SSI detected on readmission’. These are likely to include the more severe deep and organ/space SSI. These infections will be included with the SSI detected during the admission when calculating rates of SSI.

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

   - **Wards most likely to receive patients readmitted with SSI**: Patients with SSI may not be readmitted to the same ward they were discharged from. Wards that could accept such readmissions should be identified and contacted regularly to ask about patients readmitted with SSI. The staff working on them should be made aware of the surveillance, and asked to document clinical signs of SSI and report them to designated surveillance personnel.

   - **Patient Administration Systems**: establish systems to alert designated surveillance staff if a patient included in the surveillance is readmitted.

   - **Medical notes**: could be flagged to prompt reporting to designated surveillance staff if the patient is readmitted with an SSI.

   - **A&E**: staff working in A&E should be made aware of the surveillance and asked to document clinical signs of SSI and report them to designated surveillance personnel. Reminder notices could be position in the A&E triage area to remind staff to report possible SSI.

   - **Bed managers**: should be made aware of the surveillance and asked to inform designated surveillance staff about patients readmitted following surgery.

   If a patient is admitted with an SSI resulting from an operation performed in another hospital the surveillance co-ordinator should liaise with surveillance staff at the hospital in which the procedure took place so that they can report the infection.
Box 1 cont’d: Methods of surveillance to identify SSI

3. **SSI detected by other post discharge follow up (optional)**

SSI may be detected and confirmed as meeting the definition of SSI by the following methods:

a) Patients should be encouraged to contact a key person at the hospital if they have concerns about their wound and arrangements made to return to the hospital for the wound to be reviewed and SSI that meet the definitions of SSI reported. Provision of a ‘drop in’ post operative clinic for patients with problem with their wounds could be considered to enhance the surveillance.

b) Staff trained in applying the definitions identify SSI in patients included in the surveillance who return to an outpatient clinic appointment. These SSI are more likely to be detected if active surveillance systems are established, for example:
   - Designated staff are responsible for actively monitoring patients attending outpatient departments to detect SSI and collect the relevant data.
   - Surgical staff complete a form on all patients included in the surveillance when they return to the outpatient clinic indicating if the patient had signs/symptoms meeting the definition of SSI.

c) Community-based healthcare staff trained in applying the definitions report SSI identified when the patients visits/is visited for treatment.

These surveillance methods will provide more complete data on SSI that occur post-discharge and can be confirmed as meeting the definition of SSI. However, since consistent follow-up and reporting using these methods is unlikely across all participating hospitals, the SSI identified will not be included with those detected in inpatients/readmissions when reporting comparative rates of SSI.

4. **SSI reported by Patient Wound Surveillance Questionnaire (optional)**

To obtain more complete data on SSI that develop post-discharge, patients should be asked to report problems with the healing of their wound 30 days after the operation (see Wound healing Questionnaire - appendix 3) using one of the following methods:

a) On discharge patients should be given a copy of the Wound Healing Questionnaire and the details of designated staff to contact if they are readmitted, or an SSI is suspected. The 30th post-op date and patient details must be written on the questionnaire and a pre paid addressed envelope should be provided to encourage return. Patients who do not return the questionnaire should be followed-up by letter or telephone.

b) Designated staff telephone patients on or soon after their 30th post operative day and ask them the set of questions on the Wound Healing Questionnaire. Patients will need to be informed on discharge that they will be contacted following their operation to find out if their wound has healed satisfactorily.

If the responses in the questionnaire are indicative of an SSI contact the patient to confirm the symptoms and record as SSI if one of the criteria for patient reported SSI are met (see App. 3).
   - If a healthcare professional e.g. GP, practice/district nurse, have examined the wound they should be contacted and a diagnosis of SSI confirmed.
   - If a wound swab was taken, the result should be pursued.
   - If an SSI reported by the patient has also been identified and confirmed by another method only the confirmed SSI should be reported to avoid counting SSIs more than once.
   - If an SSI has been confirmed and reported during post operative hospital stay or by any other method described above it is not necessary to complete the patient questionnaire.

Rates based on patient reported SSI will be analysed separately as it is not possible to determine the type of SSI or confirm that they meet the definition of SSI.
2.6 Data submission

Records are submitted to SSISS via a secure weblink. A unique user name and password is issued to each participating hospital to enable them to access the web link.

2.6.1 Data are entered into a form that corresponds with the Surveillance Data Sheet. Error messages indicate when required data items are not entered or the data entered is inconsistent.

2.6.2 Records can be saved and retrieved for editing, for example until the data from post-discharge surveillance has been obtained. These will appear on the web link as records ‘in progress’. Once the record has been completed it must be submitted, changes to the record can then only be made by contacting SSISS.

2.6.3 The unique serial number generated on each record entered into the weblink should be entered onto the Surveillance Data Sheet in the space provided. This number will be required to deal with any future queries about the record.

2.6.4 All data for a surveillance period must be submitted within 60 days from the end of the period. A message indicating the submission deadline will be displayed on the weblink when the user logs on.

2.7 Batch submission of data held in local database

Hospitals that have designed their own systems of data collection and who prefer to collect and store the data required for the SSI surveillance on a local database can submit the set of records relating to a particular surveillance period via the weblink.

2.7.1 The format of the data submitted will need to correspond with that of the national database and arrangements with the co-ordinating centre will therefore need to be made before data can be transferred in this way.

2.7.2 Hospitals submitting data as CSV files must ensure that each record submitted to SSISS is given a unique Serial Number in the form of a long integer value. The set of data is imported into the web link and appear as ‘in progress’ until errors are corrected from individual records. Each record is then submitted separately.

2.8 Data reconciliation

Approximately 4 weeks after the end of each surveillance period a message will appear on the ‘log on’ page of the web link asking for data for the surveillance period to be ‘reconciled’. This can only be done once all the records for the surveillance period have been submitted.

2.8.1 To complete the reconciliation the number of Surveillance Data Sheets and SSIs should be carefully counted to confirm that the total number of records collected match the number shown in the reconciliation form. If the records match then data reconciliation can be confirmed via the weblink.
2.8.2 If numbers do not agree make the following checks:
   • recount the data sheets and records with SSI, check whether the SSI was detected during admission, on readmission, other post-discharge or patient reported.
   • Ensure records for different categories have not been mixed-up and miscounted or submitted into the wrong category.
   • If data is entered for more than one hospital site check that the hospital codes are correct.
   • If there are more records in the database than Surveillance Data Sheets the same record may have been entered twice. Check for duplicates by reviewing the data submitted for records with the same name, date of birth and operation date.

2.8.3 Once the data reconciliation has been completed and all error checks completed by SSIS a message will appear on the ‘log on’ page of the web link indicating that the ‘summary data report’ for your hospital is ready for printing. You will be able run reports on the data you have collected during the period on the web link (see figure 2).

2.8.4 Hospitals can export their own data from the weblink as a csv file for a selected category and surveillance period.

2.9 Data sharing
At the end of each surveillance period, surgical site infection data is shared with Regional Epidemiology Units and made available to the Hospitals in Europe Link for Infection Control through Surveillance (HELICS)\(^{28}\). HELICS is a network of European countries that are committed to collecting data on nosocomial infections using compatible protocols with the aim of analysing and disseminating data on the risks of nosocomial infections in European hospitals. It provides an important opportunity to explore variation in infection rates between European countries and to improve our understanding of how these infections may be prevented. Only a limited part of the dataset is used and this does not include any information that enables records to be traced back to individual patients, surgeons or named hospitals.
Section 3 - Definitions of Surgical Site Infections

Definitions of surgical site infections are based on those published by CDC in 1992, and are classified as incisional (superficial or deep), or organ/space infection.29

**Superficial incisional infection**

This is defined as a surgical site infection that occurs within 30 days of surgery and involves only the skin or subcutaneous tissue of the incision, and meets at least one of the following criteria:

- **Criterion 1:** Purulent drainage from the superficial incision.
- **Criterion 2:** The superficial incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.
- **Criterion 3:** At least two of the following symptoms and signs:
  - pain or tenderness
  - localised swelling
  - redness
  - heat
  
  a. the superficial incision is deliberately opened by a surgeon to manage the infection, unless the incision is culture-negative
  
  or
  
  b. the clinician diagnoses a superficial incisional infection.

**Note:** Stitch abscesses: These are defined as minimal inflammation and discharge confined to the points of suture penetration, and localised infection around a stab wound. They are not classified as surgical site infections.

**Deep incisional infection**

This is defined as a surgical site infection involving the deep tissues (i.e. fascial and muscle layers) that occurs within 30 days of surgery if no implant is in place, or within a year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

- **Criterion 1:** Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
- **Criterion 2:** The deep incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.
  
  **Criterion 3:** A deep incision that spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following symptoms or signs (unless the incision is culture-negative):
    - fever (>38°C)
    - localized pain or tenderness

- **Criterion 4:** An abscess or other evidence of infection involving the deep incision that is found by direct examination during re-operation, or by histopathological or radiological examination.
- **Criterion 5:** Diagnosis of a deep incisional surgical site infection by an attending clinician.

**Note:** An infection involving both superficial and deep incision is classified as deep incisional SSI
Organ/space infection

This is defined as a surgical site infection involving any part of the anatomy (i.e. organ/space), other than the incision, opened or manipulated during the surgical procedure, that occurs within 30 days of surgery if no implant is in place, or within one year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

**Criterion 1:** Purulent drainage from a drain that is placed through a stab wound into the organ/space.

**Criterion 2:** The organ/space yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

**Criterion 3:** An abscess or other evidence of infection involving the organ/space that is found by direct examination, during re-operation, or by histopathological or radiological examination.

**Criterion 4:** Diagnosis of an organ/space infection by an attending clinician

Note: 1. Occasionally, an organ/space infection drains through the incision. Such infection generally does not require re-operation and is considered to be a complication of the incision, and is therefore classified as a deep incisional infection.

2. Where doubt exists, refer to the Definitions of specific site of organ/space infection to determine if the organ/space infection meets the definition

The organ/space infection should be allocated to one of the specific sites in the following list:

- arterial or venous
- bone (osteomyelitis)
- endocardium (endocarditis)
- gastrointestinal tract
  - includes oesophagus, stomach, small and large bowel and rectum (excluding appendicitis and gastroenteritis).
- intra-abdominal
  - includes peritoneum, sub-phrenic or sub-diaphragmatic space, gall bladder, bile duct, liver (excluding hepatitis), spleen, pancreas, or other intra-abdominal tissue or area not specified elsewhere
- joint or bursa
- mediastinum (mediastinitis)
- myocardium or pericardium (myocarditis or pericarditis)
- other female reproductive tract
  - includes vagina, uterus, ovaries, or other deep pelvic tissue
- spinal abscess (without meningitis)
- vaginal cuff.
- vertebral disc space

See pages 22 to 26 for the criteria used to define the organ/space infection at each specific site.
Notes on the application of definitions of surgical site infections

Clinicians diagnosis: these should be carefully evaluated before being accepted as meeting the definition of SSI. The prescription of antimicrobials would not be sufficient evidence of a clinicians diagnosis of SSI without confirmation that an SSI was the reason for treatment. If the reason for antimicrobial treatment has not been documented the surveillance staff should discuss the case with the medical staff. A clinician's diagnosis can be confirmed verbally if it is not documented in the notes but to meet the definition of superficial SSI there must also be at least two clinical signs of infection.

Micro-organisms from culture: A positive culture does not necessarily imply infection and a negative result may not necessarily exclude infection. Microbiology results should be interpreted in conjunction with the information from clinical sources and advice from a Medical Microbiologist should be sought if there is doubt about the interpretation of a result.

The presence of pus cells is required to avoid the inclusion of positive cultures that reflect colonization rather than infection of the wound. Not all laboratories look for pus cells when examining wound swabs. Micro-organisms reported from wound cultures are not necessarily indicative of SSI and if pus cells are not indicated as present in the wound culture report there must also be at least two clinical symptoms of infection and a clinicians diagnosis.

More than one SSI from the same incision
Occasionally, more than one surgical site infection (which meets one of the definitions) may occur from the same surgical procedure. This should only be considered as a different infection when a specimen, obtained from the same wound, yields organisms that are unrelated to the previous infection.

If a superficial SSI develops into a deep or organ space SSI, report the most severe or worst SSI only.

Documentation of clinical signs of infection
Information about the presence of clinical signs is essential to establish if SSI meet the definitions. Encourage medical and nursing staff to document clear, specific information about surgical wounds and any signs of SSI they observe on care plans, microbiology request forms and medical notes. For example, ‘yellow/green pus leaking from the upper section of the wound’, rather than ‘wound leaking ++’. 
Specific sites of organ/space surgical site infection

Definitions of specific sites of organ/space surgical site infection are based on those used by the American National Nosocomial Infection Surveillance system.28

Arterial or venous infection
Arterial or venous infection, including arteriovenous graft, must meet at least one of the following criteria:

Criterion 1: Organisms are cultured from arteries or veins removed during a surgical operation, and blood culture yielded no organisms or were not done.

Criterion 2: There is evidence of arterial or venous infection during a surgical operation or on histopathological examination.

Criterion 3: The patient has purulent drainage at the vascular site and blood cultures yielded no organisms or were not done.

Endocarditis
This includes endocarditis of a natural or prosthetic heart valve, and must meet at least one of the following criteria:

Criterion 1: Organisms are cultured from valve or vegetation.

Criterion 2: The patient has two or more of the following signs or symptoms with no other recognised cause: fever (>38°C), new or changing murmur, embolic phenomena, skin manifestations (i.e. petechiae, splinter haemorrhages, painful subcutaneous nodules), congestive heart failure, or cardiac conduction abnormality,* and at least one of the following:

   a. organisms cultured from two or more blood cultures
   b. organisms seen on Gram stain of valve, when blood cultures were negative or not done
   c. valvular vegetation seen during a surgical operation or autopsy
   d. positive antigen test on blood or urine (e.g. H. influenzae, S. pneumoniae, N. meningitidis, or Group B streptococci)
   e. evidence of new vegetation seen on echocardiogram

   and if the diagnosis is made antemortem, the physician institutes appropriate antimicrobial therapy.

*For patients ≤1 year of age at least two of the following signs or symptoms with no other recognised cause: fever (>38°C), hypothermia (<37°C), apnoea, bradycardia, new or changing murmur, embolic phenomena, skin manifestations (i.e. petechiae, splinter haemorrhages, painful subcutaneous nodules), congestive heart failure, or cardiac conduction abnormality.
**Gastrointestinal tract infection**

This includes oesophagus, stomach, small and large bowel, and rectum (excluding gastroenteritis and appendicitis), and must meet at least one of the following criteria:

**Criterion 1:** There is an abscess or other evidence of infection seen during a surgical operation or on histopathological examination.

**Criterion 2:** Patient has at least two of the following signs or symptoms with no other recognised cause and compatible with infection of the organ or tissue involved: fever (>38°C), nausea, vomiting, abdominal pain, or tenderness, and at least one of the following:

- a. organisms cultured from drainage or tissue obtained during a surgical operation or endoscopy, or from a surgically placed drain
- b. organisms seen on Gram stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during a surgical operation or endoscopy or from a surgically placed drain
- c. organisms cultured from blood
- d. evidence of pathological findings on radiological examination
- e. evidence of pathological findings on endoscopic examination (e.g. Candida oesophagitis or proctitis).

**Intra-abdominal infection**

This includes gall bladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, sub-phrenic or sub-diaphragmatic space, or other intra-abdominal tissue or area not specified elsewhere, and must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from purulent material from intra-abdominal space obtained during a surgical operation or needle aspiration.

**Criterion 2:** There is an abscess or other evidence of intra-abdominal infection during a surgical operation or on histopathological examination.

**Criterion 3:** The patient has at least two of the following signs or symptoms with no other recognised cause: fever (>38°C), nausea, vomiting, abdominal pain, or jaundice, and at least one of the following:

- a. organisms cultured from drainage from surgically placed drain (e.g., closed suction drainage system, open drain, T-tube drain)
- b. organisms seen on Gram stain of drainage or tissue obtained during surgical operation or needle aspiration
- c. organisms cultured from blood and radiographic evidence of infection, e.g., abnormal findings on ultrasound, CT scan, magnetic resonance imaging (MRI), or radiolabelled scans (gallium, technetium, etc.) or on abdominal x-ray.
Joint or bursa infection
Joint or bursa infections must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from joint fluid or synovial biopsy.

**Criterion 2:** There is evidence of joint or bursa infection seen during a surgical operation or histopathological examination.

**Criterion 3:** The patient has at least two of the following signs or symptoms with no other recognised cause: joint pain, swelling, tenderness, heat, evidence of effusion or limitation of motion, and at least one of the following:
   a. organisms and white blood cells seen on Gram stain of joint fluid
   b. positive antigen test on blood, urine, or joint fluid
   c. cellular profile and chemistry of joint fluid compatible with infection and not explained by an underlying rheumatological disorder
   d. radiographic evidence of infection, e.g., abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI), radiolabelled scan (gallium, technetium, etc.).

Mediastinitis
Mediastinitis must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from mediastinal tissue or fluid obtained during a surgical operation or needle aspiration.

**Criterion 2:** There is evidence of mediastinitis seen during a surgical operation or histopathological examination.

**Criterion 3:** The patient has at least one of the following signs or symptoms with no other recognised cause: fever (>38°C), chest pain, or sternal instability, and at least one of the following:
   a. purulent discharge from mediastinal area
   b. organisms cultured from blood or discharge from mediastinal area
   c. mediastinal widening on x-ray.

*For patients ≤1 year of age at least one of the following signs or symptoms with no other recognised cause: fever (>38°C), hypothermia (<37°C), apnoea, bradycardia, or sternal instability.

Myocarditis or pericarditis
Myocarditis or pericarditis must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from pericardial tissue or fluid obtained by needle aspiration or during a surgical operation.

**Criterion 2:** The patient has at least two of the following signs or symptoms with no other recognised cause: fever (>38°C), chest pain, paradoxical pulse, or increased heart size, and at least one of the following:
   a. abnormal ECG consistent with myocarditis or pericarditis
   b. positive antigen test on blood (e.g. H. influenzae, S. pneumoniae)
c. evidence of myocarditis or pericarditis on histological examination of heart tissue

d. fourfold rise in type-specific antibody with or without isolation of virus from pharynx or faeces

e. pericardial effusion identified by echocardiogram, CT scan, magnetic resonance imaging (MRI), or angiography

*For patients ≤1 year of age at least two of the following signs or symptoms with no other recognised cause: fever (>38°C), hypothermia (<37°C), apnea, bradycardia, paradoxical pulse, or increased heart size

**Osteomyelitis**

Osteomyelitis must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from bone.

**Criterion 2:** There is evidence of osteomyelitis on direct examination of the bone during a surgical operation or histopathological examination.

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

a. organisms cultured from blood

b. positive blood antigen test (e.g. *H. influenzae*, *S. pneumoniae*)

c. radiographic evidence of infection, e.g., abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI), radiolabel scan (gallium, technetium, etc.).

**Other infections of female reproductive tract**

Other infections of the female reproductive tract including vagina, ovaries, uterus or other deep pelvic tissues (excluding endometritis or vaginal cuff infections), must meet at least one of the following criteria:

**Criterion 1:** Organisms are cultured from tissue or fluid from affected site.

**Criterion 2:** There is an abscess or other evidence of infection of affected site seen during a surgical operation or histopathological examination.

**Criterion 3:** The patient has two of the following signs or symptoms with no other recognised cause: fever (>38°C), nausea, vomiting, pain, tenderness, or dysuria, and at least one of the following:

a. organisms cultured from blood

b. diagnosis by physician
**Vaginal cuff**
Vaginal cuff infection must meet at least one of the following criteria:

**Criterion 1:** Posthysterectomy patient has purulent drainage from the vaginal cuff.

**Criterion 2:** Posthysterectomy patient has an abscess at the vaginal cuff.

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

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

**Criterion 1:** Patient has organisms cultured from vertebral disc space tissue obtained during a surgical operation or needle aspiration.

**Criterion 2:** Patient has evidence of disc space infection seen during a surgical operation or histopathologic examination.

**Criterion 3:** Patient has fever (>38°C) with no other recognised cause or pain at the involved vertebral disc space and radiographic evidence of infection e.g. abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI), radiolabel scan with gallium or technetium.

**Criterion 4:** Patient has fever (>38°C) with no other recognised cause and pain at the involved vertebral disc space and positive antigen test on blood or urine (e.g. H.influenza, S. pneumoniae, meningitidis, or group B streptococcus)

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

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

**Criterion 2:** Patient has abscess in the spinal epidural or subdural space seen during a surgical operation or at autopsy of evidence of an abscess seen during a histopathologic examination.

**Criterion 3:** Patient has at least one of the following signs or symptoms with no other recognised cause: fever (>38°C), back pain, focal tenderness, radiculitis, paraparesis, or paraplegia and if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy and at least one of the following:

a. organisms cultured from blood
b. radiographic evidence of a spinal abscess, e.g. abnormal findings on myelography, ultrasound, CT scan, MRI or other scans (e.g. gallium or technetium)
Section 4 – Organising the surveillance

4.1 Introduction

If the results of surveillance are to be of value in informing clinical practice then they must be based on accurate data. Hospitals should therefore have systems in place to ensure that:

- all eligible patients in the chosen category are identified at the time of surgery;
- systematic, active surveillance for SSI is undertaken prospectively on them until they are discharged from hospital;
- systems are in place to identify patients subsequently readmitted with SSI;
- if post-discharge surveillance is undertaken this complies with the protocol.

4.1.1 Problems with the quality of data and reliability of the results are likely to be encountered if staff are not designated or trained to undertake the surveillance and if arrangements to cover absence of staff responsible for the surveillance are not made. Departures from the standard methodology may render comparison with national benchmark rates of SSI invalid if the standard methodology described in this protocol has not been followed.

4.2 Registration with SSISS

Hospitals wishing to participate in the surveillance should be registered with the SSISS. Registered hospitals are assigned a unique number (hospital code) that is then used to distinguish the surveillance data they submit. If your hospital is already registered you should use the existing hospital code.

4.2.1 Where an NHS Trust has more than one hospital or facility participating in the surveillance, each hospital is registered separately and allocated a separate hospital code so that the surveillance data collected at each hospital can be interpreted separately and appropriate local action taken.

4.3 Role of the Surveillance Co-ordinator/Administrator

Each hospital should nominate a Surveillance Coordinator / Administrator who is responsible for coordinating surveillance activity and acts as the main contact with SSISS across all categories of procedure that are included in the hospitals’ surveillance programme. This person will be responsible for:

- Receiving and disseminating all correspondence related to the surveillance, and submitting the intention to participate and reconciliation data (see page 16).
- Acting as the point of contact for SSISS for queries arising from the data and changes in hospital contact details,
- Ensuring an adequate supply of data sheets are available to any other staff responsible for collecting data, and that all data are collected and submitted to the co-ordinating centre at the appropriate time and within deadline dates.
• Receiving post-discharge Patient Wound Surveillance Questionnaires, co-
  ordinating:
  o the follow-up of non-responders
  o confirmation of SSI reported by patients
• Acting as a point of contact for patients with concerns about their wounds.
• Being an active member of the surveillance committee
• Ensuring reports are generated from the data as required and the results are
  disseminated to the relevant people in the hospital.

4.3.1 Monitoring the reliability and accuracy of the data. The Surveillance
  Co-ordinator/Administrator should contact the SSI Surveillance Service before submitting
  data that they consider may be unreliable, or if unreliable data has already been
  submitted. Departures from the standard methodology described in this protocol may
  render comparison with national benchmark rates of SSI invalid.

4.4 Report Contact
  Each hospital should also identify one person as a report contact. This person will be
  responsible for:-
  • Receiving reports from the coordinating centre by email.
  • Generating reports from the data as required
  • Ensuring reports are distributed to key staff members.
  • Liaising with key staff members in interpreting results and ensuring the results
    are acted on as appropriate
  • Being an active member of the surveillance committee

4.5 Staff designated to collect and submit data
  If staff other than the surveillance co-ordinator are involved in data collection e.g.
  surveillance nurses, ward staff, theatre staff, it is essential that:
  • They have received training in the surveillance methodology and applying the
    definitions of SSI by attendance at the SSISS training day
  • They are fully conversant with how the surveillance is organised in the hospital
  • They have designated time to collect the data
  • They work closely with the Surveillance Coordinator/administrator and infection
    control team.
  • One or more of these staff should be members of the surveillance committee
  • Arrangements have been made to cover absence of these staff

4.5.1 More than one person can submit data via the weblink but contact between SSISS
  and the hospital has to be via one person (the Surveillance Administrator) who has
  responsibility for coordinating surveillance activity across different surgical departments.
4.6 Surveillance committee or coordination group

It is the responsibility of participating hospitals to comply with the standardised methodology set out in this protocol. This is most likely to be achieved by planning and co-ordinating the data collection and ensuring that governance systems are in place. This can be managed by forming a Surveillance Committee to support and direct the surveillance and to establish systems for collecting the data that conform to the methodology described in this protocol. Key responsibilities of this committee are:

- Developing a planned programme of surveillance
- Ensuring adequate resources have been identified to implement the planned programme of surveillance
- Promote the surveillance within the Trust.
- Plan and oversee the collection and submission of data, including that required for post-discharge surveillance, and ensure effective arrangements are made to cover leave and sickness
- Identify and address training needs.
- Monitor the accuracy and completeness of data collected.
- Review, interpret and distribute reports and results of the surveillance.
- Contribute to the development and monitoring of action plans for improving practice when the results of the surveillance suggest this is required

4.6.1 Membership of the surveillance committee should include representatives of the following key stakeholders:

- Surveillance Coordinator/Administrator
- Infection control department
- Clinical governance
- Surgical teams
- Theatre staff
- Relevant hospital directorates
- Director of Infection Prevention and Control

4.6.2 The key systems and activities that need to be in place to enable the surveillance to run effectively are summarised in Figure 2.
Figure 2: Overview of the organisation of the SSI surveillance process

Before surveillance period

Surveillance Committee:
- Select categories for surveillance
- Identify designated person/s to collect the data
- Identify training needs
- Raise awareness and promote the surveillance
- Surveillance Administrator submits participation form
- Pilot data collection methods if necessary.

During the three month surveillance period

Surveillance personnel:
- Confirm intended participation in surveillance
- Complete data sheet for all eligible procedures
- Actively monitor wounds for SSI whilst patient in hospital
- Actively monitor for readmissions
- Remind all relevant staff to be vigilant and notify suspected SSI
- Follow up patient questionnaires at 30 days post-op
- Person/s responsible for data entry:
  - Enter data onto the web link

Exclude:
- Endoscopy procedures
- Diagnostic procedures
- Wounds not closed in theatre

Follow up period

Surveillance personnel:
- Monitor remaining inpatients until discharge or for 30 days.
- Continue to actively monitor for readmissions and SSI reported by other follow up post-discharge e.g. outpatient clinic visits
- Remind patients to return post-discharge questionnaires
- Follow up patients that report problems with wound to identify SSI
- Person/s responsible for data entry:
  - Enter data onto web link
  - Submit completed records

During the 6 weeks following the surveillance period the records of patients included in the surveillance must be completed and submitted.

After the follow-up period

Surveillance Administrator:
- Ensure all records are submitted before the deadline for the period
- Complete and submit data reconciliation on weblink
- Produce reports from the data when prompted by SSISS
- Distribute reports to clinical teams, DIPC and others

Surveillance Committee:
- Review results and take action as necessary

If a hospital carries out surveillance in consecutive periods or continuously, these stages will overlap.
Section 5 – Definition of Data Items

5.1 Introduction
This section defines each question in the surveillance dataset. Most data items are required for all categories of surgical procedures, but some only form part of the hip and knee replacement dataset.

5.1.1 The demographic and surgical data should be completed for all patients included in the surveillance. The infection data is only required for those patients that develop an SSI that meets the case definitions described in Section 3. Every effort should be made to ensure all data is accurate and complete to enable inter-hospital comparisons and facilitate interpretation of results.

5.2 Demographic and surgical data
These data can be obtained from the patients administration system (PAS), patients’ clinical records, and theatre records. Some of the demographic data required for this surveillance also forms part of the National Joint Registry (NJR) dataset. While it is not feasible to undertake SSI surveillance using the NJR dataset because this does not include data collected prospectively whilst the patient is in hospital, every effort has been made to ensure that the denominator data are compatible. Hospitals participating in the NJR may therefore be able to explore mechanisms of sharing data.

5.2.1 Patient name and NHS number
This information may be recorded for the purposes of recognising and tracking individual patients included in the surveillance. Although retained in the operation record on submission it can only be accessed by the submitting hospital, not SSISS.

5.2.2 Hospital code
This is a unique number that is allocated to each hospital registered with SSISS.

5.2.3 Surveillance year and period
This indicates the year and surveillance period in which the surgical procedure was performed. This data is used for processing and presenting data.

5.3.4 Date of birth
The patient’s date of birth is used to calculate age and to help identify duplicate records.

5.3.5 Date of hospital admission
This refers to the admission during which the patient had the operation, and it is required to calculate the length of pre-operative hospital stay. If the patient is re-admitted within 24 hours of discharge this will be regarded as a continuation of the previous admission.

5.3.6 Date of operation
This is required to allocate the patient to the correct surveillance period, to calculate the number of days from admission to operation, and from operation to detection of a surgical site infection.
5.3.7 Gender
This is required to calculate the incidence of surgical site infection according to the gender of the patient.

5.3.8 Weight and Height (optional)
If possible, the patient’s weight in kilograms and the height in centimetres should be recorded. These data will be used to determine the body mass index (BMI), which is defined as follows:

\[ \text{BMI} = \frac{\text{Weight in kg}}{(\text{Height in m})^2} \]

5.3.9 Primary indication for surgery (hip and knee replacements only)
Indicate the primary reason for the replacement procedure from the list provided.

- Osteoarthritis: Impaired function of joint due to disease of joint cartilage
- Inflammatory joint disease: Degenerative disease of joint caused by inflammatory processes
- Avascular necrosis: Degradation of the joint as a result of impaired blood supply
- Trauma/fracture: Replacement required because of a fracture at or close to the joint
- Revision due to infection: Previous prosthetic joint replaced because of infection
- Revision for fracture: Previous prosthetic joint replaced because of a fracture
- Revision for other reason: Previous prosthetic joint replaced for other reasons e.g. aseptic loosening, misalignment
- Other: Primary reason for procedure not in above list
- Unknown: Primary reason for procedure unknown

**Note:** If the indication for surgery is the revision of a previous prosthesis then an OPCS code corresponding to a revision procedure should be entered.

5.3.10 Categories of surgical procedures
Each set of clinically similar surgical procedures has been assigned to a category. The list of categories included in the surveillance, together with a description of the category, is given in Table 1 (page 10). The incidence of surgical site infection will be primarily reported by these categories.

5.3.11 Type of knee replacement
For partial knee replacements, where both tibial and femoral condyles are not replaced then mark the box for ‘knee replacement’, but in addition select the type of partial replacement procedure:

- **Unicondylar:** the replacement of one tibial and one femoral condyle, with or without resurfacing of the patella
- **Patellofemoral:** the replacement of both femoral condyles with resurfacing of the patella
5.3.12 Revision of total hip replacement (revision total hip replacement only)
Where a previous total hip replacement is being revised indicate which component(s) of the joint are being replaced.

5.3.13 OPCS code
Within each category, there is a restricted list of surgical procedures that can be included in the surveillance. These are detailed in SSI Protocol OPCS Codes Supplement 1 with corresponding OPCS operative procedure codes. Select and enter the relevant three or four digit OPCS codes. Only codes for procedures within the chosen category of surgical procedures should be recorded. OPCS codes for a maximum of three surgical procedures can be entered.

If coding is routinely carried out by theatre staff, check that the corresponding procedure appears in SSI Protocol OPCS Code Supplement before including the patient in the surveillance. If OPCS codes are not routinely available at your hospital, select the code that most closely matches the procedures carried out.

5.3.14 Multiple surgical procedures through the same incision
Multiple procedures should be recorded when more than one surgical procedure is performed through the same incision during the same operation. This applies even if some of the surgical procedures are not included in any of your chosen categories for surveillance, or do not appear in the list of surgical procedures given in SSI Protocol OPCS Codes Supplement. This is because the duration of the surgery is likely to be longer and more tissue is handled, both of which increase the risk of surgical site infection. This question is not included in the hip and knee replacement dataset as it is rarely performed during these procedures and is therefore not an important risk factor for SSI.

5.3.15 Type of surgery
This information will be used to calculate the incidence of surgical site infection or elective and emergency operations. The intention is to distinguish emergency procedures that are not accompanied by the usual pre-operative preparation and could therefore be expected to be associated with a higher risk of SSI. The surgical procedure should be classified as either ‘elective’ or ‘emergency’ according to the following definitions:

**Elective**
This includes operations that have been planned at a time to suit both patient and surgeon, and early operations on more serious cases. This includes operations that have been planned for example elective hip or knee replacement at a time to suit both patient and surgeon, and early operations on more serious cases arranged around theatre time. *For example, open reduction of fracture or fractured hip repair on patients admitted following trauma and classified as ‘emergency admission’ but where there is time to carry out pre-operative preparation.*

**Emergency**
This includes unplanned, immediate life-saving operations, and operations conducted as soon as possible after resuscitation. *For example, patients admitted as an emergency with critical conditions or inpatients whose condition suddenly deteriorates for example bowel obstruction/perforation, CABG following myocardial infarction and arrest, leaking aneurism.*
5.3.16 Operation due to trauma
This is defined as an operation that was performed because of blunt or penetrating traumatic injury to the patient. Note: This does not include pathological fractures where there is no associated traumatic injury. This information will be used to calculate the incidence of surgical site infection for operations due to trauma.

5.3.17 Implant
This is defined as a non-human foreign body that is placed permanently in the patient during an operation and is not routinely manipulated for diagnostic or therapeutic purposes. Examples are joint prostheses, prosthetic heart valves, screws, wires, or meshes that are left permanently in situ. Homologous grafts, such as heart, kidney, and liver, are defined as organ transplants and not as implants.

The presence of an implant extends the period of time in which an SSI may occur (see Section 3) and may affect the risk of developing SSI. This information will be used to calculate the incidence of surgical site infection for operations involving the insertion of an implant.

5.3.18 Antibiotic-loaded cement (Hip and knee replacements only)
Indicate if cement impregnated with an antimicrobial agent was used for this surgical procedure. Note: the OPCS code must also indicate a cemented joint replacement.

5.3.19 Antimicrobial prophylaxis
This is defined as the administration of one or more antimicrobial agents during the peri-operative period for prophylaxis. This also includes antimicrobial agents that are given during the peri-operative period to treat a pre-existing infection at the operative site.

5.3.20 Surgeon codes 1 and 2 (optional)
Information about the surgeon who performed the principal operative procedure is optional and for local use only. Hospitals that choose to provide this information should create their own unique three-digit codes, so they can identify the surgeon who performed the surgical procedure, while maintaining confidentiality.

Record the code corresponding to the ‘Lead Operating Surgeon’ as surgeon code 1 and the ‘First Assistant Surgeon’ as surgeon code 2. If supplied, this information can be used to calculate surgeon-specific surgical site infection rates by surgeon code for Lead Operating and First Assistant surgeons.

5.3.20 Grade of surgeon
Indicate the grade of Lead Operating Surgeon from the following options. This information will be used to calculate rates of SSI by grade of operating surgeon.

- Consultant
- Staff grade
- Associate specialist
- Specialist registrar (SpR)
- Specialist trainee (SpT)
- Final year trainee 2 (FY2)
- Final year trainee 1 (FY1)
- Other
- Unknown
5.4 Risk Index Data

A Risk Index comprising data obtained from three factors – ASA score, wound classification and duration of operation - is used to assign a risk score of between 0 and 3 to each operation. Operations with a risk index score of 3 have a higher risk of developing SSI than those with a score of 0. This score is used to stratify operations and enable rates of SSI to be adjusted by these risk factors (see section 6).

5.4.1 ASA score

The pre-operative ASA score is an assessment by the anaesthetist of the patient’s pre-operative physical condition according to the American Society of Anesthesiologists’ classification of physical status. The patient’s pre-operative physical condition will be scored by the anaesthetist, as indicated below. It is important that relevant anaesthetists understand the importance of clear documentation of the ASA score.

<table>
<thead>
<tr>
<th>Class 1</th>
<th>Normal healthy patient.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2</td>
<td>Patient with mild systemic disease caused either by the condition to be treated surgically or by other pathophysiological processes.</td>
</tr>
<tr>
<td>Class 3</td>
<td>Patient with severe systemic disease that is not incapacitating</td>
</tr>
<tr>
<td>Class 4</td>
<td>Patient with an incapacitating systemic disease that is already life-threatening, and not always correctable by operation</td>
</tr>
<tr>
<td>Class 5</td>
<td>Moribund patient who has little chance of survival.</td>
</tr>
<tr>
<td>Unknown</td>
<td>Patient whose ASA score is not available, e.g. emergency operation.</td>
</tr>
</tbody>
</table>

If a patient requires re-operation within 72 hours of the first operation due to an early complication such as bleeding, the ASA score should be re-assessed in case it has changed (see ‘Early re-operation’ on page 37).

5.4.2 Wound class

The degree of wound contamination at the time of operation is an important predictor of infection. Surgical wounds can be classified according to the likelihood and degree of wound contamination at the time of operation. The wound classification used for this surveillance is based on that developed by the National Research Council in the USA. The classification of the wound contamination at the time of surgery should be made by the surgeon. If this information is not available, SSI Protocol OPCS Codes Supplement gives the minimum wound class for each surgical procedure. The minimum wound class is only indicative and may vary according to certain pre-operative events (e.g. emergency operations, trauma) and intra-operative events (e.g. major break in aseptic technique, pre-existing infection or acute inflammation). Thus, the final classification of wound contamination must be confirmed by consultation with the surgeon, or by checking the patient’s records using the definitions given below.

**Clean wounds**: Uninfected operative wounds in which inflammation is not encountered, and the respiratory, gastro-intestinal, genital, urinary tracts or the oropharynx are not entered, and there is no break in aseptic technique. In addition, clean wounds must be primarily closed and, if there is drainage, this must be closed. Operative wounds that follow non-penetrating trauma, e.g. fractured neck of femur, should be included in this category providing they meet these criteria.
Clean-contaminated wounds: Operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination, providing that there is no evidence of infection or a major break in aseptic technique. Note: procedures that do not enter one of these body tracts cannot be clean contaminated e.g. orthopaedic procedures.

Contaminated wounds: Operations on fresh, open traumatic wounds; or operations where there is a major break in aseptic technique; or operations in which there is gross spillage from the gastrointestinal tract; or acute inflammation without pus is encountered.

Dirty or infected wounds: Operations in which acute inflammation with pus is encountered, or in which perforated viscera are found; operations on traumatic wounds which have retained devitalised tissue, foreign bodies or faecal contamination, or where the operation on the traumatic wound has been delayed. Operations included in this class are those in which the organisms causing post-operative infection are likely to have been present in the operative field before surgery.

Notes on wound class
1. Large bowel surgery: for emergency operations on unprepared bowel, or obstructed bowel, the minimum wound class is contaminated.
2. Limb amputations: amputations where the limb is ischaemic, or where dry gangrene is present should be classified as clean. Amputations through, or adjacent to, an area of acute inflammation (without pus or ulceration) should be classified as contaminated. Amputations adjacent to, or through necrotic ulcers and/or purulent areas should be classified as dirty.
3. Open reduction of long bone fractures: If the fracture is open and the operation is performed within the first 10 hours, the minimum wound class is contaminated. If the operation is performed after 10 hours, the minimum wound class is dirty.
4. More than one surgical procedure through the same incision during the same operation: record the wound class that reflects the highest degree of contamination of the wound, i.e. the ‘dirtier’ class.
5. Re-operation within 72 hours: due to an early complication such as bleeding, the wound class should be re-assessed in case it has changed (see ‘Early re-operation’ on page 37).

5.4.3 Duration of operation
The duration of operation is a measure of the length of exposure to potential contamination. It is defined as the time in minutes from skin incision to skin closure. Whilst it should be as precise as possible, it may be estimated from the time in and out of the operating theatre.

If more than one surgical procedure is performed through the same incision during the same operation, record the total duration of operation, regardless of whether the procedures belong to different surgical categories.
For example, if your chosen categories are gastric and large bowel surgery and a patient undergoes total gastrectomy and total colectomy through the same incision, and the time from skin incision to closure is 240 minutes, record the duration of the operation as 240 minutes for both the gastrectomy (on one Data Collection Form) and the total colectomy (on a separate Data Collection Form).

For surgical procedures performed through different incisions during the same operation, record the duration of operation for each incision. However, for coronary artery bypass graft involving both chest and leg incisions, record the total duration of the operation for both incisions on a single Data Collection Form.

For example, if your chosen categories are gastric surgery and open reduction of long bone fracture, and a trauma patient undergoes total gastrectomy (which lasts for 95 minutes from skin incision to closure) and open reduction of a fractured femur (which lasts for 85 minutes), record the duration of the gastrectomy as 95 minutes on one Data Collection Form, and the duration of the open reduction of fractured femur as 85 minutes on a separate Data Collection Form.

If a patient requires re-operation within 72 hours of the first operation due to an early complication such as bleeding, the duration of each operation should be re-calculated (see ‘Early re-operation’).

5.4.4 Re-operation

Re-operation is defined as a new operation through an incision used for a previous operation during the same admission. For the purposes of this surveillance, re-operations will be classified as either ‘early’ or ‘late’.

Early re-operation: This is when a re-operation (through the same incision) is performed within 72 hours of the first operation because attention to the surgical site is required, e.g. for complications such as bleeding. An early re-operation will be regarded as a continuation of the first operation. Therefore, add together the times of both operations, and assess whether the wound class and ASA score have changed. If so, record the higher ASA score, and the higher degree of wound contamination.

Late re-operation: This is when a re-operation (through the same incision) is performed more than 72 hours after the first operation because of complications that require another procedure; or because the operation is part of a two-stage surgical procedure. A late re-operation will not be regarded as a continuation of the first operation. Therefore, surveillance should be discontinued the day before the re-operation, and no further follow-up for the first operation carried out.

However, if the late re-operation involves a procedure that is in one of your chosen categories, and is listed in SSI Protocol OPCS Codes Supplement, a new Surveillance Data Sheet should be completed for the new procedure.

5.5 Discontinuation of surveillance

The period of surveillance depends on whether the operation involves the insertion of an implant. If no implant is inserted surveillance for SSI does not continue beyond the 30 day after the operation (since an infection that develops after the 30 day would not meet the definition of SSI (see section 3). If an implant is inserted and left in the surgical site then an infection may meet the definition of SSI for up to 1 year after the operation.
In calculating rates infection, SSI that are detected during the inpatient stay are distinguished from those detected by post-discharge surveillance because the latter are more likely to be associated with variation in intensity of case finding.

Surveillance should therefore be continued for the duration of the patients’ post-operative stay. If post-discharge patient questionnaire are in place these should still be returned at 30 days after the operation. Although active surveillance may not be in place beyond the 30th day and SSI detected in patients with an implant can still be reported.

5.5.1 Date inpatient surveillance discontinued
Insert the date that surveillance during the admission in which the operation was performed was discontinued. This will usually be when the patient has been discharged from hospital. This information is required to calculate the length of post-operative hospital stay. If a patient is re-admitted for any reason within 24 hours of discharge, this will be regarded as continuation of the previous admission.

If surveillance is discontinued when a patient is discharged but he/she is subsequently re-admitted with a SSI, or a SSI is identified by post-discharge follow-up, the ‘date inpatient surveillance is discontinued’ should remain as the original date of discharge.

5.5.2 Reason inpatient surveillance discontinued
Surveillance can be discontinued if the patient:
   a) is discharged from hospital, either home or to another hospital/care facility, i.e. the patient leaves the hospital on completion of the hospital episode, and is not on temporary leave from hospital
   b) died during the follow-up period
   c) has a late re-operation, i.e. a new operation through the same incision more than 72 hours after the first operation. This requires that surveillance on the first procedure is discontinued see page 37
   d) has completed 30 days of post-operative hospitalisation if the procedure did not involve an implant. Infections that occur after this time do not meet the case definitions of SSI. This option does not apply for hip and knee replacements since all these procedures involve implants.
   e) follow-up completed because the patient had an implant and is still in hospital 60 days after the end of the surveillance period. Data must be submitted to ensure that the record is included in the results for the relevant surveillance period.

5.5.3 Patient given a Post-discharge Wound Surveillance Questionnaire
Indicate whether the patient was given a questionnaire to return at 30 days post-operation. This data is necessary to indicate whether data on patient-reported SSI is being captured and to calculate the response rate. This information will be used to interpret rates of SSI.

5.5.4 Patient questionnaire completed
Indicate if whether the patient questionnaire has been completed (either if as a postal return or follow up telephone call). If a questionnaire was not sent select ‘no’. This information is required to estimate the proportion of patient wound questionnaires returned.
5.5.5 Patient reviewed for SSI post discharge
Indicate ‘yes’ if the patient has been systematically and actively followed up for SSI post discharge, regardless of whether an SSI was identified, by a method other than the Patient Wound Surveillance Questionnaire. For example the patient is actively reviewed for signs/symptoms of SSI at an outpatient clinic visit, or seen by surveillance staff to identify SSI that meet the definitions. If an SSI is detected post-discharge but this is not as a result of a systematic programme of post-discharge surveillance then indicate ‘no’.

This information is required to estimate the proportion of patients actively monitored for SSI following discharge from hospital and used to interpret rates of SSI that include SSI detected by post-discharge surveillance.

5.5.6 Date of post-discharge surveillance review
If the patient has been systematically followed up post-discharge by a method other than the post-discharge Patient Wound Surveillance Questionnaire indicate the date of the last review.

This information is required to estimate the period of active follow-up for SSI following discharge from hospital and used to interpret rates of SSI that include SSI detected by post-discharge surveillance.

5.6 Surgical Site Infection data
If a patient develops a SSI that meets the case definitions (see Section 3) then data on the SSI must be completed. If the patient does not develop an SSI, the dataset is complete and the form can be submitted to the co-ordinating centre. If an SSI is detected after data has been submitted it can still be reported by contacting SSISS. The data required to complete this section can be obtained from the patient’s clinical records and microbiology reports.

5.6.1 Detection of surgical site infection
The surgical site infection may be detected:
- during the admission in which the operation was performed
- on re-admission to hospital
- by post-discharge follow-up e.g. outpatient clinic, specialist nurse visit, review on ward
- Patient reported in Patient Wound Surveillance Questionnaire

SSI identified during the post-operative stay in hospital or in patients readmitted to hospital will be combined in calculating rates of inpatient SSI. Rates of SSI detected by ‘other post-discharge surveillance’ and ‘patient reported’ (via the Patient Wound Surveillance Questionnaire) will be calculated separately as the intensity of case finding and application of the definitions may vary between hospitals.

5.6.2 Date of onset of surgical site infection
This is the date of the first signs or symptoms of SSI. If this information is not available or is unclear, the following alternate dates can be accepted:-
- a microbiological sample was taken to confirm the diagnosis
- patient was re-admitted with SSI
• patient presented at outpatient clinic or other hospital department with clinical symptoms of SSI
• patient first observed symptoms of SSI

If a positive microbiological surgical site specimen is taken before the patient’s discharge or death but reported after discharge, the medical and nursing records should be reviewed in order to establish whether the patient had a SSI that met the criteria. This information will be used to calculate the number of days from operation to detection of surgical site infection, and to distinguish different surgical site infections related to the same operation in the same patient.

5.6.3 Type of surgical site infection
A surgical site infection is defined as incisional (superficial or deep) or organ/space according to the criteria for infection given in the definition of SSI (see Section 3).

For patients who have undergone abdominal surgery involving multiple procedures through the same incision, record the procedure that was most likely to be related to the infection. If this is not clear, select the procedure that falls into the category with the highest infection risk, according to the following list (which is arranged in descending order of risk):

- colon surgery
- bile duct, liver, or pancreatic surgery
- gastric surgery
- cholecystectomy
- small bowel surgery
- abdominal hysterectomy
- vascular surgery

For patients who have undergone coronary artery bypass graft with both sternal and donor site incisions, and develop a superficial or deep incisional infection, the location of the infection (chest or donor site) must be specified. If the patient develops surgical site infection at two sites (both chest and donor site) both should be reported. Record the second SSI on another Data Collection Forms and staple the two forms together to ensure all of the information is entered onto the web link correctly.

5.6.4 Allocation of the organ/space surgical site infection to a specific site
Organ/space infections should be allocated to one of the specific sites listed in the 'Definition of specific sites of organ space surgical site infection' (see Section 3).

5.6.5 Criteria for surgical site infection
Record the clinical signs and symptoms and microbiological criteria that were present at the time the patient was identified as having an SSI. This information is required to confirm that the infection fulfils the definitions given in Section 3.

If a patient develops more than one infection from the same surgical procedure, from which micro-organisms that are unrelated to the previous infection are cultured, this may be considered as another infection. Record details of the second SSI on the SSI section of another data collection form and staple the forms together to ensure all of the information is entered onto the web link correctly.
If a superficial SSI deteriorates to a deep incisional or organ/space SSI with the same causative organism, report only the more serious of the two SSI as this is likely to be a worsening of an infection rather than a subsequent infection.

5.6.6 Causative micro-organisms
Record only micro-organisms considered to be the cause of the surgical site infection, rather than those colonising the surgical site, using the codes given in Appendix 4. If in doubt as to the likely causative micro-organisms discuss with the Medical Microbiologist. A maximum of three micro-organisms can be entered on the form. When more than three micro-organism are identified, enter the three micro-organisms that are considered to be the most important.
Section 6 - Analysis and Feedback of Data

6.1 Introduction
The analysis and timely dissemination of results to relevant clinical and other staff is essential if surveillance is to be effective as an infection prevention and control tool.5,6,7 At the end of a surveillance period hospitals participating in the SSI surveillance will be able to generate from the weblink an individual summary report of the results of surveillance for each of their chosen categories of surgical procedures. This report will contain their own data together with aggregated data from other hospitals contributing data to the same surgical category. In addition, hospitals will also be able to create defined reports from their data for surveillance periods of their choice from the weblink.

6.1.1 Participating hospitals should develop a clear strategy for actively dissemination the SSI surveillance reports and acting on the results. Where the rates indicate this is necessary local practice should be reviewed to ensure that it complies with best practice.32,33

6.2 Process for report production
At the end of each surveillance period a period of 40 days will be permitted to follow-up patients still in hospital and complete post-discharge follow-up. Reminders of the deadlines for submission and reconciliation of data (see page 17) will be displayed on the login page of the weblink.

Once all the data for a period has been submitted and reconciled and final validation checks made by SSISS the data for the period will be released for report generation. A message will appear on the login page of the weblink indicating that the reports are available.

6.3 Report options
The reports that will be available to hospitals from the report page on the weblink are:

- **Summary report:** containing data from the surveillance period, data combined for both the last 4 and all periods in which surveillance has been undertaken, and comparative data from all hospitals that have participated in the category. This report will include rates of SSI, trends in rates of SSI by period, type of SSI and data on key risk factors. This report can be generated for any category and surveillance period in which the hospital has undertaken surveillance.

- **User-defined reports:** a list of individual report options is available and users can run each of these reports for a selected category and time period. These reports include:
  - Rate of SSI
  - Trend in rate of SSI
  - Type of SSI
  - Rate of SSI by risk index factors
  - Rate of SSI by selected risk factors
6.4 Incidence of surgical site infection

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

\[
\frac{\text{No. SSIs in a specific category}}{\text{No. operations in the specific category}} \times 100
\]

6.4.1 Since SSI reported by patients cannot be verified in the same way as those detected by active surveillance in hospital, rates based on patient reported SSI will be calculated separately to those based on SSI detected in inpatients. Thus two rates of SSI will be reported:

a. Cumulative incidence of SSIs detected during the inpatient stay and in patients readmitted with SSI
b. Cumulative incidence of SSI based all SSI detected by inpatient and post-discharge surveillance including those reported by the patient at 30 days post-operation.

6.4.2 When comparing rates based on patient reported SSI it is important to take into account the proportion of patients who have been followed up post-discharge as this will affect the number of SSI reported.

6.4.3 An ‘All hospital’ rate of SSI based only on operations where a patient received a post-discharge wound surveillance questionnaire are provided in order to enable comparison of rates of SSI that include patient reported infections.

6.5 Cumulation of data

The number of surgical procedures undertaken by an individual hospital in one surveillance period may be small and the reported incidence of SSI for a single period may therefore be imprecise. To address this problem it is recommended that data is also cumulated over several periods to calculate the incidence of SSI. For the user-defined reports the periods over which to cumulate data can be selected by the user. In the summary report data is reported as follows:

**All periods:** data collected by the hospital in any surveillance period since the surveillance service began in 1997.
**Last four periods:** data collected by the hospital in the current period combined with the three most recent periods for which data were collected.

6.5.1 In most categories the ‘all hospital’ data will be cumulated from the last 5 years of data submitted by all hospitals participating in that category. In some small volume categories data will be cumulated from 1997 to increase the precision of the estimated rate.

### 6.6 Comparing the incidence of SSI with aggregated data from other participating hospitals

The incidence of SSI at a participating hospital can be compared with all other hospitals by referring to the distribution of the incidence of SSI by category of surgical procedure (see Figure 4). This figure shows the estimates of the 10th, 25th, 50th, 75th and 90th percentiles of the incidence of SSI for each category of surgical procedure. If the incidence at a hospital lies above the 90th percentile or below the 10th percentile this may indicate it is particularly high or low.

The figure does not take into account any major risk factors and should therefore also be considered in conjunction with the results stratified by NNIS risk index and other risk factor data. In addition, the precision of the estimated rate must be considered as rates based on small numbers of operations may reflect chance variation. In the national annual reports adjustment for variation in numbers of operation is made using funnel plots.34

**Figure 4: Distribution of the incidence of SSI by category of surgical procedure**
6.6.1 SSISS will review the results and contact hospitals with rates that lie above the 90th percentile.

## 6.7 Stratification by the NNIS risk index

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

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

- **a)** an American Society of Anesthesiologists’ (ASA) pre-operative assessment score of 3, 4 or 5
- **b)** an operation classified as contaminated or dirty
- **c)** an operation lasting for more than a specific period of time ('T hours'), where T is the 75th percentile of the duration of surgery and depends on the surgical procedure being performed (see Table 2).

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

### Table 2: T Times for the duration of operations by category of surgical procedures

<table>
<thead>
<tr>
<th>Category of surgical procedures</th>
<th>T Time (hrs)</th>
<th>Category of surgical procedures</th>
<th>T Time (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal hysterectomy</td>
<td>2</td>
<td>Large bowel surgery</td>
<td>3</td>
</tr>
<tr>
<td>Bile duct, liver, pancreatic surgery</td>
<td>4</td>
<td>Limb amputation</td>
<td>1</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>2</td>
<td>Reduction of long bone fracture</td>
<td>2</td>
</tr>
<tr>
<td>Coronary artery by-pass graft</td>
<td>5</td>
<td>Repair of neck of femur</td>
<td>1.5*</td>
</tr>
<tr>
<td>Gastric surgery</td>
<td>3</td>
<td>Small bowel surgery</td>
<td>3</td>
</tr>
<tr>
<td>Hip replacement</td>
<td>2</td>
<td>Spinal surgery</td>
<td>2</td>
</tr>
<tr>
<td>Knee replacement</td>
<td>2</td>
<td>Vascular surgery</td>
<td>3</td>
</tr>
</tbody>
</table>

*T time derived from SSISS data

### 6.7.2 At present, it seems that the NNIS risk index is the best method available to stratify surgical site infection rates according to the degree of risk. This data helps to identify how the incidence of SSI may be affected by differences in case-mix, and is important in order to make valid comparisons within and between hospitals, between surgeons, and over time. Thus, the surveillance system described in this protocol has been designed to obtain the information required to calculate the NNIS risk index, and to estimate the effect of the individual risk factors that contributed to this index.
6.7.3 Figures included in the reports should be interpreted with caution because apparently high rates of SSI in a particular risk index group may be based on very small numbers of operations and therefore represent an unreliable estimate. This is illustrated by the data in risk index group 2 in Figure 3.

*Figure 3: An example of the incidence of SSI by risk index group where apparently high rates of SSI are based on small number of operations.*

<table>
<thead>
<tr>
<th>Risk index</th>
<th>No. operations</th>
<th>No. SSIs</th>
<th>% infected</th>
<th>No. operations</th>
<th>No. SSIs</th>
<th>% infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>55</td>
<td>1</td>
<td>1.8</td>
<td>114</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>1</td>
<td>16</td>
<td>0</td>
<td>0.0</td>
<td>54</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
<td>33.3</td>
<td>5</td>
<td>1</td>
<td>20.0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
<td>0</td>
<td>0.0</td>
<td>55</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>2</strong></td>
<td><strong>2.9</strong></td>
<td><strong>228</strong></td>
<td><strong>4</strong></td>
<td><strong>1.8</strong></td>
</tr>
</tbody>
</table>

6.7.4 The summary report contains data on other key risk factors for SSI such as age group, pre-operative stay in hospital; and primary indication for surgery in prosthetic joint replacement procedures. In the user-defined reports any risk factor can be selected for reporting of rates of SSI.

6.7.5 The number of operations and number of SSIs for each surgeon is reported by surgeon code where this has been provided. Small numbers of operations will give imprecise estimates of the incidence of SSI, so these data should be interpreted with caution.
Section 7 - Ethical and Confidentiality Issues

7.1 The Caldicott principles
The six Caldicott principles are upheld across the Health Protection Agency (HPA). However, data collected during the surgical site infection surveillance process may give rise to some areas of concern with regard to confidentiality. These are addressed as follows:

7.1.1 The SSI surveillance web link
The web link is located on an HPA server and set up with Secure Sockets Layer (SSL) encryption. Authentication and verification procedures ensure that all information exchanged is secure during transmission (irrespective of the encryption capabilities of browsers used locally). No complicated online procedures are necessary to ensure encryption.

User names and passwords will be assigned to participating hospitals and it will not be possible for other hospitals or web users to enter or retrieve data relating to another hospital. SSISS will not hold records of individual hospital passwords. If a password has to be reissued, this will be generated automatically by the database system and given to the main contact for that hospital by SSISS who will not retain a copy of the password.

7.1.2 Patient-identifiable data
Hospitals are able to record the name and NHS number of patients included in the surveillance in the SSI dataset. However, this data can not be accessed by SSISS. The only patient-specific data accessible to SSISS is the date of birth which alone is not sufficient to lead to patient disclosure. Participating hospitals are allocated a unique identifier (3-digit number) and each data collection form bears this number and a unique serial number for administrative purposes but no access to information about the individual patient exists outside the hospital of admission.

7.1.3 Hospital-specific infection rates
Individual hospital reports that describe the incidence and rates of infection, together with comparative data, are available via the weblink by entering the username and password that is unique to the participating hospital. Each hospital only has access to its own data.

The data from hospitals within a specific HPA region will be shared with the local regional epidemiologist in order to monitor and support further investigation of outlying rates of SSI. SSI data are also made available to the Hospitals in Europe Link for

The Caldicott Report 1997, Department of Health, the Caldicott principles:

1. Justify the purpose(s) of using confidential information
2. Don’t use patient-identifiable information unless it is absolutely necessary
3. Use the minimum necessary patient-identifiable information
4. Access to patient-identifiable information should be on a need to know basis
5. Everyone must understand his or her responsibilities
6. Understand and comply with the law
Infection Control through Surveillance (HELICS). Only a limited part of the dataset is used which does not enable records to be traced back to individual patients, surgeons or named hospitals.

7.1.4 Surgeon-specific infection rates
Surgeon specific codes are included in the dataset as an optional item. If they wish to collect these data, individual hospitals allocate surgeon codes but the identity of individual surgeons is not known to SSISS.

7.2 Freedom of Information
The Freedom of Information Act 2000 gives the following rights of access:
- The right to be told whether the information exists and,
- The right to receive the information

National reports on surgical site infection surveillance are available on the HPA website (http://www.hpa.org.uk). Participation in SSISS will be regarded as in the public domain. However, no information about infection rates for individual hospitals or Trusts will be disclosed by the HPA. Enquiries will be referred to the organisation concerned.
References


32. National Institute for Clinical Excellence. Guideline for preventing surgical site infection. *Due for publication October 2008*


39. The Society of Hospital Epidemiology of America; the Association for Practitioners in Infection Control; the Centers for Disease Control; the Surgical Infection Society. Consensus paper on the surveillance of surgical wound infection. *Infect Control Hosp Epidemiol* 1992;13:599-605.
## Surveillance Data Sheet

**Hip & knee replacements and neck of femur repair**

**Patient Name:**

**Surveillance year**

**Ward:**

**Surveillance period:**

[Jan-Mar] or [Apr-Jun] or [Jul-Sep] or [Oct-Dec]

**NHS No**

**Date of Birth:** ___/___/____

**Date of Admission:** ___/___/____

**Date of Operation:** ___/___/____

**Gender:** Male / Female

**Height (cm):** ____ ____ ____

**Weight (Kg):** ____ ____ ____

### Primary Indication for surgery

- Avascular necrosis
- Inflammatory joint disease
- Osteoarthritis
- Other
- Revision - due to fracture
- Revision - due to infection
- Revision - other reason
- Revision - reason unknown
- Trauma/fracture
- Unknown

### Category of surgical procedure

- Hip replacement
- Knee replacement
- Repair of neck of femur

### Description of procedure

- **OPCS code 1**
- **OPCS code 2**
- **OPCS code 3**

### Type of partial knee

- Unicondylar
- Patellofemoral

### Revision of hip replacement

- Acetabulum
- Stem
- Both

### ASA score

- 1
- 2
- 3
- 4
- 5
- Unknown

### Type of surgery

- Elective
- Emergency

### Wound class

- Clean
- Clean-contaminated
- Contaminated
- Dirty
- Unknown

### Trauma

- Yes
- No

### Grade of surgeon

- Consultant
- Staff grade
- Associate specialist
- SpR
- Other
- Unknown

### Surgeon code

**Surgeon code 1**

**Surgeon code 2**

### Antibiotic - loaded cement

- Yes
- No
- Unknown

### Duration of operation

- Time of incision
- Time of closure
- Minutes: ____ ____ ____

### Antimicrobial prophylaxis

- Yes
- No
- Unknown

---

**Surgical Site Infection Surveillance Service**

**Use to match with web entry**

**Serial No.:** ________________

**SSI:**

- Yes
- No

**Detected:**

- Inpatient
- Readmission
- Post discharge
- Patient reported

---

**Surveillance Box**

**Use to match with web entry**

**Serial No.:** ________________

**SSI:**

- Yes
- No

**Detected:**

- Inpatient
- Readmission
- Post discharge
- Patient reported

---

**Health Protection Agency**

---

**Reconciliation Box**

**Use to match with web entry**

**Serial No.:** ________________

**SSI:**

- Yes
- No

**Detected:**

- Inpatient
- Readmission
- Post discharge
- Patient reported

---

**Surveillance Box**

**Use to match with web entry**

**Serial No.:** ________________

**SSI:**

- Yes
- No

**Detected:**

- Inpatient
- Readmission
- Post discharge
- Patient reported

---

**Health Protection Agency**
### Ward visits for case review

<table>
<thead>
<tr>
<th>Date</th>
<th>Signs/symptoms</th>
<th>Other criteria for infection</th>
</tr>
</thead>
</table>

### Date inpatient surveillance discontinued

<table>
<thead>
<tr>
<th>Date inpatient surveillance discontinued</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><strong>/</strong></em>/_____</td>
</tr>
</tbody>
</table>

### Reason inpatient surveillance discontinued

- Died
- Discharged home/another care facility
- Follow-up completed after end of surveillance period
- Late re-operation (after 72 hours)

### Patient given Post-discharge Wound Questionnaire (PDQ)

<table>
<thead>
<tr>
<th>Patient given Post-discharge Wound Questionnaire (PDQ)</th>
<th>Post-discharge Wound Questionnaire completed</th>
<th>Patient reviewed post-discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### Date

<table>
<thead>
<tr>
<th>Date</th>
<th><strong>/</strong>/_____</th>
</tr>
</thead>
</table>

### SURGICAL SITE INFECTION

<table>
<thead>
<tr>
<th>SURGICAL SITE INFECTION</th>
<th>Detection of SSI</th>
<th>Date of onset of SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>During this admission</td>
<td><em><strong>/</strong></em>/_____</td>
</tr>
<tr>
<td>No</td>
<td>On readmission</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other, post-discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient reported</td>
<td></td>
</tr>
</tbody>
</table>

### Type of SSI

- Superficial
- Deep
- Organ/space

### Specific site for organ/space SSI

- Bone (Osteomyelitis)
- Joint or bursa

### Criteria for SSI (indicate all that apply)

- Abscess or other evidence of infection found during a re-operation, by radiology or histopath examination
- Antibiotics prescribed by GP for SSI (patient reported only)
- Aspirated fluid/swab of surgical site yields organisms and pus cells are present
- Clinician’s diagnosis
- Fever (temperature 38°C or more)
- Heat
- Incision spontaneously dehisces or opened by surgeon
- Localised pain and tenderness
- Localised swelling
- Purulent drainage
- Redness

### Causative micro-organisms (only report those considered to be causing infection)

<table>
<thead>
<tr>
<th>Organism 1</th>
<th>Organism 2</th>
<th>Organism 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: <em><strong>/</strong>/</em>____</td>
<td>Code: <em><strong>/</strong>/</em>____</td>
<td>Code: <em><strong>/</strong>/</em>____</td>
</tr>
</tbody>
</table>

2nd SSI: If the patient develops another SSI related to this surgical procedure, complete the SSI data on another data sheet with the patient identifier details, attach the sheets and submit both SSI with the record.  V2 26-06-08

---

## Appendix 2: Surveillance data sheet (general categories)

### Surveillance Data Sheet

**Main Categories**

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>Surveillance year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward:</td>
<td>Surveillance period:</td>
</tr>
<tr>
<td></td>
<td>[Jan-Mar] or [Apr-Jun] or [Jul-Sep] or [Oct-Dec]</td>
</tr>
<tr>
<td>NHS No</td>
<td>Date of Birth: <em><strong>/</strong></em>/____</td>
</tr>
<tr>
<td>Date of Admission: <em><strong>/</strong></em>/____</td>
<td>Date of Operation: <em><strong>/</strong></em>/____</td>
</tr>
</tbody>
</table>

| Gender: Male / Female | Height (cm): _____ _____ ____ | Weight (Kg): _____ _____ ____ |

<table>
<thead>
<tr>
<th>Category of surgical procedure</th>
<th>ASA score</th>
<th>Description of procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal hysterectomy</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bile duct, liver or pancreatic surgery</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Coronary artery bypass graft</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Gastric surgery</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Large bowel surgery</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Limb amputation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction of long bone fracture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small bowel surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal surgery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPCS code 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OPCS code 2</td>
<td></td>
</tr>
<tr>
<td>OPCS code 3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration of operation</th>
<th>Wound class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of incision _________</td>
<td>Clean</td>
</tr>
<tr>
<td>Time of closure _________</td>
<td>Clean -contamination</td>
</tr>
<tr>
<td>Minutes: _____ _____ ____</td>
<td>Contaminated</td>
</tr>
<tr>
<td></td>
<td>Dirty</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade of surgeon</th>
<th>Surgeon code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>Lead surgeon: ____________</td>
</tr>
<tr>
<td>Staff grade</td>
<td>Second surgeon: ______________</td>
</tr>
<tr>
<td>Associate specialist</td>
<td></td>
</tr>
<tr>
<td>SpR</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Operation due to trauma</th>
<th>Antimicrobial prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Emergency</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prosthetic Implant</th>
<th>Multiple surgical procedures through the same incision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ward visits for case review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
</tr>
</tbody>
</table>

SSI Protection Agency

---

### Date inpatient surveillance discontinued

___/___/____

### Reason inpatient surveillance discontinued
- 30th day of post-operative stay (no implant)
- Died
- Discharged home/another care facility
- Follow-up completed after end of surveillance period
- Late re-operation (after 72 hours)

### Patient given Post-discharge Wound Questionnaire (PDQ)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

### Post-discharge Wound Questionnaire completed

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

### Patient reviewed post-discharge

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

### Date ___/___/____

### SURGICAL SITE INFECTION

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

### Detection of SSI

- During this admission
- On readmission
- Other, post-discharge
- Patient reported

### Date of onset of SSI

___/___/____

### Type of SSI

- Superficial
- Deep
- Organ/space

### For CABG indicate the site of the incisional SSI. If both sites are infected report each infection on a separate form.

- Chest incision
- Donor site incision

### Criteria for SSI (indicate all that apply)

- Abscess or other evidence of infection found during a re-operation, by radiology or histopath examination
- Antibiotics prescribed by GP for SSI (patient reported only)
- Aspirated fluid/swab of surgical site yields organisms and pus cells are present
- Clinician’s diagnosis
- Fever (temperature 38ºC or more)
- Heat
- Incision spontaneously dehisces or opened by surgeon
- Localised pain and tenderness
- Localised swelling
- Purulent drainage
- Redness

### For organ/space SSI - indicate specific site

- Arterial or venous
- Bone (osteomyelitis)
- Endocardium
- Female genital tract (not vaginal cuff)
- Gastrointestinal tract
- Intervertebral disc space
- Intra–abdominal
- Joint or bursa
- Mediastinum
- Myocardium or pericardium
- Spinal abscess
- Vaginal cuff

### Causative micro-organisms (only report those considered to be causing infection)

<table>
<thead>
<tr>
<th>Organism 1</th>
<th>Organism 2</th>
<th>Organism 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: <em><strong>/</strong></em>/____</td>
<td>Code: <em><strong>/</strong></em>/____</td>
<td>Code: <em><strong>/</strong></em>/____</td>
</tr>
</tbody>
</table>

### Appendix 3

Patient develops another SSI related to this surgical procedure, complete the SSI data on another data sheet with the patient identifier details, attach the sheets and submit both SSI with the record.

V2 26-06-08
Surgical wound healing post discharge questionnaire

Hospital number

Full name

Date of birth or addressograph

Date of operation

Category

Please complete the following questionnaire and return it in the envelope provided on the 30th day after your operation or as soon as possible after that day. The 30th day will be: ______/_____/______ (enter the estimated date here)

Did your surgical wound heal without problems ☐ YES ☐ NO

If you have answered YES you do not need to continue with the rest of the form but it is very important that you return it to the hospital in the envelope provided. Thank you for taking the time to do this. If you have answered NO, please read the following carefully and complete the rest of the form.

Since you were discharged from hospital after your operation have you noticed any of the following symptoms?

Was there any discharge or leakage of fluid from any part of the wound. ☐ Yes ☐ No

If yes was it either; ☐ Clear or Blood stained ☐ Yellow/green (pus) ☐ other-please specify

Please tick any of the following that applied to your wound:
☐ Pain or soreness in addition to the discomfort experienced following the operation.
☐ Redness or inflammation spreading from the edges of the wound.
☐ The area around the wound felt warmer/hotter than the surrounding skin.
☐ The area around the wound became swollen.
☐ The edges of any part of the wound separated or gaped open

Did any health care worker take a sample from your wound to send to the laboratory? ☐ Yes ☐ No

If you saw a healthcare professional because of these symptoms please indicate who you saw from the list below-
☐ GP
☐ District nurse
☐ Midwife
☐ Doctor or nurse at the hospital
☐ Other – please specify
☐ Did not see one about my wound

Please tell us the date you noticed these symptoms.
If you cannot remember the exact date, please give an approximate date ______/_____/______

Have you been prescribed antibiotics for an infection in the wound? ☐ Yes ☐ No

If yes, who prescribed them? __________________________________________

Have you been re-admitted to hospital with an infection of the surgical wound?
☐ To the hospital at which the operation was carried out ☐ Yes ☐ No
☐ To another hospital ☐ Yes ☐ No, if yes which one _________________

Other comments…………………………………………………………………………………….............

For Office Use Only

Patient reported SSI meets definition ☐ Yes ☐ No

If yes enter criteria for SSI-
☐ Criterion 1 Discharge pus + antibiotics prescribed
☐ Criterion 2 Clinical signs* + dehiscence
☐ Criterion 3 Clinical signs ** antibiotics prescribed

*Clinical signs- at least 2 of pain, heat, redness or swelling

Note: Do not report stitch abscess (discharge confined to points of suture penetration, minimal inflammation)
### Appendix 4: Standard codes for micro-organisms, in alphabetical order

#### I. BACTERIA

<table>
<thead>
<tr>
<th>Code</th>
<th>Organism</th>
<th>Code</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>Acinetobacter spp.</td>
<td>570</td>
<td>Neisseria spp.</td>
</tr>
<tr>
<td>012</td>
<td>Acinetobacter baumannii (anitratus)</td>
<td>572</td>
<td>Neisseria meningitidis</td>
</tr>
<tr>
<td>014</td>
<td>Acinetobacter lwoffii</td>
<td>590</td>
<td>Nocardia spp.</td>
</tr>
<tr>
<td>030</td>
<td>Aeromonas spp.</td>
<td>592</td>
<td>Nocardia asteroides</td>
</tr>
<tr>
<td>050</td>
<td>Alcaligenes spp.</td>
<td>620</td>
<td>Peptococcus spp.</td>
</tr>
<tr>
<td>071</td>
<td>Anaerobic cocci (unspecified)</td>
<td>630</td>
<td>Peptostreptococcus spp.</td>
</tr>
<tr>
<td>090</td>
<td>Bacillus spp.</td>
<td>640</td>
<td>Prevotella spp.</td>
</tr>
<tr>
<td>110</td>
<td>Bacteroides spp.</td>
<td>650</td>
<td>Propionibacterium spp.</td>
</tr>
<tr>
<td>113</td>
<td>Bacteroides fragilis group</td>
<td>670</td>
<td>Proteus spp.</td>
</tr>
<tr>
<td>130</td>
<td>Burkholderia (Pseudomonas) spp.</td>
<td>672</td>
<td>Proteus mirabilis</td>
</tr>
<tr>
<td>132</td>
<td>Burkholderia cepacia</td>
<td>674</td>
<td>Proteus vulgaris</td>
</tr>
<tr>
<td>158</td>
<td>Burkholderia fragilis group</td>
<td>690</td>
<td>Providencia spp.</td>
</tr>
<tr>
<td>159</td>
<td>Burkholderia pickardii</td>
<td>692</td>
<td>Providencia alcalifaciens</td>
</tr>
<tr>
<td>180</td>
<td>Citrobacter spp.</td>
<td>694</td>
<td>Providencia rettgeri</td>
</tr>
<tr>
<td>182</td>
<td>Citrobacter diversus (koserii)</td>
<td>696</td>
<td>Providencia stuartii</td>
</tr>
<tr>
<td>184</td>
<td>Citrobacter freundii</td>
<td>710</td>
<td>Pseudomonas spp.</td>
</tr>
<tr>
<td>200</td>
<td>Clostridium spp.</td>
<td>712</td>
<td>Pseudomonas aeruginosa</td>
</tr>
<tr>
<td>202</td>
<td>Clostridium difficile</td>
<td>732</td>
<td>Salmonella enteritidis</td>
</tr>
<tr>
<td>204</td>
<td>Clostridium perfringens</td>
<td>733</td>
<td>Salmonella paratyphi</td>
</tr>
<tr>
<td>206</td>
<td>Clostridium septicum</td>
<td>734</td>
<td>Salmonella typhi</td>
</tr>
<tr>
<td>221</td>
<td>Coliforms (unspecified)</td>
<td>739</td>
<td>Salmonella -other spp.</td>
</tr>
<tr>
<td>240</td>
<td>Corynebacterium jeikeium</td>
<td>750</td>
<td>Serratia spp.</td>
</tr>
<tr>
<td>242</td>
<td>Corynebacterium jeikeium</td>
<td>752</td>
<td>Serratia liquefaciens</td>
</tr>
<tr>
<td>251</td>
<td>Diphtheroids (unspecified)</td>
<td>754</td>
<td>Serratia marcescens</td>
</tr>
<tr>
<td>270</td>
<td>Enterobacter spp.</td>
<td>770</td>
<td>S. aureus, methicillin - resistant (MRSA)*</td>
</tr>
<tr>
<td>272</td>
<td>Enterobacter aerogenes</td>
<td>771</td>
<td>MRSA, vancomycin - intermediate (VISA/GISA)</td>
</tr>
<tr>
<td>274</td>
<td>Enterobacter agglomerans</td>
<td>772</td>
<td>S. aureus, methicillin - sensitive (MSSA)</td>
</tr>
<tr>
<td>276</td>
<td>Enterobacter cloacae</td>
<td>780</td>
<td>Staphylococcus, coagulase - negative (CNS)</td>
</tr>
<tr>
<td>290</td>
<td>Enterococcus spp*.</td>
<td>782</td>
<td>Staphylococcus epidermidis</td>
</tr>
<tr>
<td>291</td>
<td>Enterococcus spp (vancomycin - resistant)</td>
<td>783</td>
<td>Staphylococcus haemolyticus</td>
</tr>
<tr>
<td>292</td>
<td>Enterococcus faecalis*</td>
<td>784</td>
<td>Staphylococcus hominis</td>
</tr>
<tr>
<td>293</td>
<td>Enterococcus faecalis (vancomycin - resistant)</td>
<td>785</td>
<td>Staphylococcus lugdunensis</td>
</tr>
<tr>
<td>294</td>
<td>Enterococcus faecium*</td>
<td>786</td>
<td>Staphylococcus saprophyticus</td>
</tr>
<tr>
<td>295</td>
<td>Enterococcus faecium (vancomycin - resistant)</td>
<td>787</td>
<td>Staphylococcus schleiferi</td>
</tr>
<tr>
<td>311</td>
<td>Escherichia coli</td>
<td>801</td>
<td>Stenotrophomonas (Xanthomonas) maltophilia</td>
</tr>
<tr>
<td>330</td>
<td>Flavobacterium spp.</td>
<td>821</td>
<td>Streptococcus agalactiae (group B)</td>
</tr>
<tr>
<td>350</td>
<td>Fusobacterium spp.</td>
<td>822</td>
<td>Streptococcus bovis</td>
</tr>
<tr>
<td>380</td>
<td>Haemophilus spp.</td>
<td>823</td>
<td>Streptococcus pneumoniae</td>
</tr>
<tr>
<td>382</td>
<td>Haemophilus influenza</td>
<td>824</td>
<td>Streptococcus pyogenes (group A)</td>
</tr>
<tr>
<td>384</td>
<td>Haemophilus parainfluenza</td>
<td>825</td>
<td>Streptococcus ‘viridans group’</td>
</tr>
<tr>
<td>400</td>
<td>Hafnia spp.</td>
<td>826</td>
<td>Streptococcus milleri</td>
</tr>
<tr>
<td>420</td>
<td>Klebsiella spp.</td>
<td>829</td>
<td>Streptococcus - other aerobic spp.</td>
</tr>
<tr>
<td>422</td>
<td>Klebsiella pneumoniae (aerogenes)</td>
<td>840</td>
<td>Yersinia spp.</td>
</tr>
<tr>
<td>424</td>
<td>Klebsiella oxytoca</td>
<td>842</td>
<td>Yersinia enterocolitica</td>
</tr>
<tr>
<td>450</td>
<td>Legionella spp.</td>
<td>860</td>
<td>Other Gram-negative bacteria</td>
</tr>
<tr>
<td>452</td>
<td>Legionella pneumophila</td>
<td>870</td>
<td>Other Gram-positive bacteria</td>
</tr>
<tr>
<td>470</td>
<td>Listeria spp.</td>
<td>880</td>
<td>Other anaerobes</td>
</tr>
<tr>
<td>472</td>
<td>Listeria monocytogenes</td>
<td>890</td>
<td>Other bacteria</td>
</tr>
<tr>
<td>490</td>
<td>Micrococcus spp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>510</td>
<td>Moraxella spp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>512</td>
<td>Moraxella (Brachamella) catarralis</td>
<td></td>
<td>II. FUNGI/ YEASTS</td>
</tr>
<tr>
<td>531</td>
<td>Morganella morganii</td>
<td>910</td>
<td>Aspergillus spp.</td>
</tr>
<tr>
<td>552</td>
<td>Mycobacterium avium</td>
<td>920</td>
<td>Candida spp.</td>
</tr>
<tr>
<td>554</td>
<td>Mycobacterium chelonae</td>
<td>922</td>
<td>Candida albicans</td>
</tr>
<tr>
<td>556</td>
<td>Mycobacterium fortuitum</td>
<td>924</td>
<td>Candida tropicalis</td>
</tr>
<tr>
<td>558</td>
<td>Mycobacterium tuberculosis</td>
<td>940</td>
<td>Other fungi/yeasts</td>
</tr>
<tr>
<td>559</td>
<td>Mycobacterium - other spp.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Vancomycin sensitive or not tested