APPENDIX 1. Definitions

1. Definitions of surgical site infections
   a. Superficial incisional infection
   b. Deep incisional infection
   c. Organ/space infection
   d. Site-specific organ/space infection
   e. Cardi thoracic surgery
   f. Cranial neurosurgery
   g. Ear, Nose and Throat surgery
   h. Oral and Maxillofacial surgery
   i. Urology

2. Definition of sepsis

3. References

1. Surgical Site Infections (SSIs)
The following definitions are that used by PHE in their Surgical Site Infection Surveillance Service and based on the definitions established by the US Centres for Disease Control and Prevention (CDC)\(^1,2\).

1a. Superficial incisional infection

(Involving only the skin or subcutaneous tissue of the incision) occurring within 30 days of surgery with the presence of at least one of the following:

1. purulent drainage, with or without laboratory confirmation
2. organisms isolated from the culture of aseptically obtained fluid or tissue, or from a swab and pus cells are present
3. at least two of the following symptoms and signs
   - pain or tenderness
   - localised swelling
   - redness
   - heat

and the superficial incision is opened by a surgeon to manage the infection, unless the incision is culture-negative or the clinician diagnose a superficial incisional infection.
1b. Deep incisional procedural-related infection

(Invoking the fascial and muscle layers) occurring within 30 days of surgery if no implant is in place, or within 1 year if implant is in place with the presence of at least one of the following:

1. purulent drainage from the deep incision, but not from the organ/space component of the surgical site.
2. organisms isolated from the culture of aseptically obtained fluid or tissue, or from a swab and pus cells are present.
3. a deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has a fever (>38°C) or localised pain/tenderness (unless site is culture-negative).
4. an abscess or other evidence of infection involving the deep incision is found by direct examination, during re-operation, or by histopathological or radiological examination.
5. the clinician diagnoses a deep incisional surgical site infection.

1c. Organ or space infection

(Invoking any part of the anatomy i.e. organ or space, other than the incision, which was opened or manipulated during the operation) occurring within 30 days of surgery if no implant is in place, or within 1 year if implant is in place with the presence of at least one of the following:

1. purulent drainage from a drain that is placed through a stab wound into the organ/space.
2. organisms isolated from the culture of aseptically obtained fluid or tissue, or from a swab and pus cells are present.
3. an abscess or other evidence of infection involving the organ/space is found by direct examination, during re-operation, or by histopathological or radiological examination.
4. the clinician diagnoses an organ/space infection.

* Infection that involves both superficial and deep incision sites should be reported as deep incisional SSI
* Organ/space SSI draining through the incision should be reported as a deep incisional SSI
1d. Site-specific organ or space infection


Site-specific definitions exist for the following type of organ/space infections and are used in the audit:

- Arterial or venous infection
- Breast abscess or mastitis
- Female genital tract
- Meningitis or ventriculitis
- Gastrointestinal tract infection
- Intra-abdominal infection
- Intra-cranial infection
- Joint or bursa infection
- Osteomyelitis
- Spinal abscess
- Vertebral disc space

1e. Cardiothoracic surgery

For cardiac surgery, cases of deep sternal wound infection (mediastinitis) and endocarditis should be reviewed.

To diagnose deep sternal wound infection, cases must meet at least one of the following criteria:\(^1\):

1. Organisms cultured from mediastinal tissue or fluid obtained during a surgical operation or needle aspiration.
2. Evidence of mediastinitis seen during a surgical operation or on histopathological examination.
3. In the absence of any other recognisable cause, the presence of fever (>38°C), chest pain or sternal instability in combination with at least one of the following:
   - purulent discharge from mediastinal area
   - organisms cultured from blood or discharge from mediastinal area
   - mediastinal widening on x-ray

The modified Dukes criteria are used for the diagnosis of infective endocarditis (IE).

1. Organisms cultured from intracardiac abscess or vegetation
2. 2 major criteria
3. 1 major criterion with 2 minor criteria
4. 5 minor criteria
Clinical criteria for the diagnosis of infective endocarditis are listed in Table 1.3

Table 1. European Society of Cardiology 2015 modified criteria for the diagnosis of infective endocarditis3

<table>
<thead>
<tr>
<th>Major criteria</th>
<th>Minor criteria</th>
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<tbody>
<tr>
<td><strong>Positive blood culture</strong></td>
<td>- Predisposing heart condition or injection drug use</td>
</tr>
<tr>
<td>- Viridans streptococci, streptococcus galloyticus/bovis, HACEK group, staphylococcus aureus or community-acquired enterococci (in the absence of a primary focus) from 2 separate blood cultures</td>
<td>- Fever (&gt;38°C)</td>
</tr>
<tr>
<td>- Microorganisms consistent with IE cultured from 2 blood samples drawn more than 12 hours apart</td>
<td>- Major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway’s lesions</td>
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<tr>
<td>- Microorganisms consistent with IE cultured from all 3 blood samples (or majority of greater than 4 blood samples), with first and last sample drawn 1h apart</td>
<td>- Glomerulonephritis, Osler’s nodes, Roth’s spots, and rheumatoid factor</td>
</tr>
<tr>
<td>- Single positive blood culture for coxiella burnetti or phase 1 IgG antibody titre greater than 1:800</td>
<td>- Positive blood culture (does not meet a major criterion) or serological evidence of active infection with organism consistent with IE.</td>
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<tr>
<td><strong>Positive imaging</strong></td>
<td></td>
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<tr>
<td>- Vegetation, abscess, aneurysm, intracardiac fistula, valvular perforation, valvular aneurysm or new partial dehiscence of prosthetic valve identified on echocardiogram</td>
<td></td>
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<tr>
<td>- Abnormal activity around site of prosthetic valve implantation detected radionlabelled leukocytes SPECT/CT or, if prosthesis implanted more than 3 months ago, by F-FDG PET/CT</td>
<td></td>
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<tr>
<td>- Paravalvular lesions on cardiac CT</td>
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</tbody>
</table>

For thoracic surgery, cases of SSIs should be defined as either deep incisional or organ/space SSI (as defined using PHE definitions).
1f. Cranial neurosurgery

Superficial craniotomy infection is defined as a superficial SSI post-craniotomy (see section 1a for criteria for superficial SSI).

Deep craniotomy infection is defined as a deep incisional or intra-cranial infection post-craniotomy (see section 1b – 1d for diagnostic criteria). Cases of post-operative meningitis should be separately identified.

EVD-related infection is defined as ventriculitis secondary to EVD-insertion.

To diagnose meningitis or ventriculitis, cases must meet at least one of the following criteria:

1. Organisms cultured from cerebrospinal fluid (CSF).
2. In the absence of any other recognisable cause, the presence of at least one of the following symptoms and signs
   - fever (>38°C)
   - headache
   - stiff neck
   - meningeal signs
   - cranial nerve signs
   - irritability
   in combination with at least one of the following:
   a. increased white cells, elevated protein, and/ or decreased glucose in CSF
   b. organisms seen on Gram stain of CSF or cultured from blood
   c. positive antigen test of CSF, blood, or urine
   d. diagnostic single antibody titre (IgM) or 4-fold increase in paired sera (IgG) for pathogen

Shunt-related infection is diagnosed when CSF microscopy or culture demonstrated an organism, or when fever, shunt malfunction or neurological symptoms is associated with CSF pleocytosis, resulting in subsequent shunt removal and antimicrobial treatment\(^4\_5\).
1g. Ear, Nose and Throat

Ear and mastoid infections organ/space infections have specific definitions, as laid out by CDC\(^6\).

*Organ/space SSI draining through the incision should be reported as a deep incisional SSI

To diagnose **otitis externa**, cases must meet at least one of the following criteria:

1. Organisms identified from purulent drainage from ear canal by a culture or non-culture based microbiologic testing method
2. Purulent drainage from ear canal demonstrated organisms on gram stain and patient had at least one of the following symptoms and signs
   - fever (>38°C)
   - pain or erythema, in the absence of any other recognisable cause

To diagnose **otitis media**, cases must meet at least one of the following criteria:

1. Organisms identified from fluid obtained from middle ear by a culture or non-culture based microbiologic testing method
2. Patient had at least two of the following symptoms and signs, in the absence of any other recognisable cause
   - fever (>38°C)
   - pain
   - inflammation
   - retraction or decreased mobility of eardrum
   - fluid behind eardrum

To diagnose **otitis interna**, cases must meet at least one of the following criteria:

1. Organisms identified from fluid obtained from inner ear by a culture or non-culture based microbiologic testing method
2. The clinician diagnoses an inner ear infection.

To diagnose **mastoiditis**, cases must meet at least one of the following criteria:

1. Organisms identified from fluid or tissue from mastoid by a culture or non-culture based microbiologic testing method
2. In the absence of any other recognisable cause, the presence of at least two of the following symptoms and signs
   - fever (>38°C)
   - erythema, pain or tenderness
   - post auricular swelling
   - headache
   - facial paralysis

   **in combination with at least one of the following:**
   a. organisms seen on Gram stain of fluid or tissue from mastoid
   b. imaging suggestive of infection (if test is equivocal, diagnosis is supported by clinical correlation)
1h. Oral and Maxillofacial surgery

To diagnose oral cavity infection, cases must meet at least one of the following criteria:

1. Organisms identified from abscess or purulent material from tissues of oral cavity by a culture or non-culture based microbiologic testing method
2. Presence of absence or other evidence of oral cavity infection identified on invasive procedure, gross anatomic or histopathological examination
3. In the abscess of any other recognisable cause, the presence of ulceration, raised white patches on inflamed mucosa or plaques on oral mucosa; in combination with at least one of the following:
   - Virus identified from mucosal scrapings or exudate from a culture or non-culture based microbiologic testing method
   - Multinucleated giant cells or fungal elements seen on microscopic examination of mucosal scraping or exudate
   - Diagnostic single antibody titre (IgM) or 4-fold increase in paired sera (IgG) for organism
   - Clinician initiates antimicrobial treatment within 2 days of onset or worsening of symptoms

1i. Urology

To diagnose organ/space infection following urological procedures, cases must meet at least one of the following criteria:

1. Organisms identified from fluid (not urine) or tissue from affected site by a culture or non-culture based microbiologic testing method
2. Presence of abscess or other evidence of infection identified on during invasive procedure or histopathological examination
3. In the absence of any other recognisable cause, the presence of fever (>38°C), localised pain or tenderness, in combination with at least one of the following:
   - Purulent drainage from affected site
   - Organisms identified from blood by a culture or non-culture based microbiologic testing method, and imaging suggestive of infection (if imaging test is equivocal, diagnosis is supported by clinical correlation)

*Organ/space SSI draining through the incision should be reported as a deep incisional SSI
To diagnose urinary tract infection, cases must meet at least the following criteria:

1. The presence of at least one of the following symptoms and signs
   - fever (>38°C)
   - suprapubic tenderness
   - costovertebral angle pain or tenderness
   - urinary frequency
   - urinary urgency #
   - dysuria

   *in combination with:*

2. Urine culture with no more than two species of organisms identified, at least one of which is a bacterium of $\geq 10^5$ CFU/ml.

2. Sepsis

Sepsis is the ‘life threatening organ dysfunction caused by a dysregulated host response to infection’ as laid out in the 2016 publication of the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). This replaces the previous definition of sepsis as the presence of systemic inflammatory response syndrome (SIRS) resulting from an infection. The consensus definitions recommend that the Sequential (Sepsis-related) Organ Failure Assessment (SOFA) criteria to identify sepsis, superseding the SIRS criteria.

In 2016, the NICE guideline on Sepsis: recognition, diagnosis and early management [NG51] was published and clinicians are reminded to ensure that they work in accordance to this guidance.

Tools for sepsis screening

We recommend tools (developed in conjunction with relevant professional bodies) be used to support screening and management of sepsis, available at:

http://sepsistrust.org/clinical-toolkit/

An equivalent tool that conforms to the International Consensus Definitions modified by the Surviving Sepsis Campaign on recognition and diagnosis of sepsis is available at:

http://ccforum.com/content-supplementary/cc11895-s2.pdf

A screening tool specific to women in pregnancy is also available at:

3. References