Hospital Infection Society

Infection Control Nurses Association

The Third Prevalence Survey of Healthcare Associated Infections in Acute Hospitals

Republic of Ireland Protocol

hpsc

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

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PREVALENCE SURVEY DESIGN

This manual contains the protocol for the prevalence survey of healthcare-associated infections (HCAI) in acute hospitals. This protocol has been adapted from Version 1.2 of the United Kingdom (UK) protocol, which was amended after a pilot in a number of hospitals in the UK using an earlier version of the protocol (1.1).

The study has been designed as a point prevalence survey. This means that, in an ideal world, the information should be completed for the whole hospital on a single day. Completion of the survey on a single day is probably not feasible even for the smallest centres; therefore **at least one ward should be completed on a single day** and the overall hospital as soon as possible within the 12 week study period (1st March 2006 to May 30th 2006).

CHARACTERISTICS OF THE PREVALENCE SURVEY

Data will be collected on all active HCAI (as defined by the CDC definitions of nosocomial infections, Appendix 3) present on the date of survey. Each centre should designate a member of the hospitals infection control team (ICT) to be in charge of the study. This person must ensure the collaboration of the clinical staff as well as hospital management. In addition this person will lead the data collection team, liaise with the Health Services Executive (HSE) support team (i.e. one nurse and one data collector, the nurse is not an infection control nurse) regarding dates of sampling and introduce them to relevant ward staff in order to facilitate data collection.

Patient's notes and other healthcare records need to be available to carry out the survey. Therefore if a patient is in a bed, but not clerked, they should not be included in the survey. If a patient is in a diagnostic unit when the survey is done in their area and they return before the ward is finished they should be included, but otherwise there is no requirement to return to a ward to include missing patients. If a patient is surveyed and transferred to another ward and knowingly encountered a second time, the patient should not be re-surveyed.

POPULATION

Patients of all consultant specialties will be included except for paediatric patients, rehabilitation patients, psychiatric and day-case patients. *Do not include* patients in the survey from the following patient groups:

- Patients on a psychiatry ward, that is, a ward providing care for patients whose primary condition is psychiatric.
- Patient on a rehabilitation ward, that is, a ward for patients whose primary reason for hospitalisation is to receive physical therapy or rehabilitative therapy.
- Patients whose primary reason is not an acute illness, such as those in skilled nursing care or domiciliary sections of the hospital.
- Patients undergoing outpatient surgery also called day surgery or same day surgery.
- Patients seen as outpatients, whether for observation, diagnosis, or therapy (e.g. chemotherapy, dialysis, or cardiac catheterisation).
- Patients in the Emergency Department, this includes 'trolley-waits'.

DATA COLLECTION

How?

The questionnaires should be completed using black/blue ink or ball-point pen, and items have been designed to be completed by placing an **X** within a box or writing numeral(s) in appropriate boxes.

When?

Monday to Friday 9am – 5pm. However, in some units more patients are admitted on Monday for elective procedures. Because this might influence the results, and in order to avoid or at least to minimise bias regarding daily variation, our recommendation is to perform the survey in these units between Tuesday and Friday if possible.

How long?

The information should be completed for each ward/unit **in a single day**.

What is a healthcare-associated infection(HCAI)?

A healthcare-associated (or nosocomial) infection is a localised or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxins that meet the following criterion:

It occurs in the survey population
and
There is no evidence that it was present or incubating at the time of admission to this hospital unless the infection was related to a previous admission to this hospital (i.e. the hospital under surveillance)
and
It meets the criteria for a specific infection site as defined in Appendix 3.

"For most bacterial nosocomial infection, this means that the infection usually becomes evident 48 hours (i.e., the typical incubation period) or more after admission."

What infections will be collected?

- The infections collected will be HCAI active at the time of the survey.
- All active HCAI will be recorded. Special emphasis is placed on four main system infections; primary bloodstream infections, pneumonia, urinary tract infections and surgical site infections. The four main system infections include a number of in-depth questions.

Healthcare-associated infections present on the day of the survey or HCAIs for which the patient is undergoing antimicrobial treatment on the day of the survey should be recorded.

Who will collect the data?

The UK pilot study indicated that a team of three persons was the most efficient way to collect the survey data: these teams comprised a clinical microbiologist, and infection control nurse (ICN) and another individual that completed the survey form as instructed by the microbiologist and the ICN.

In the Republic of Ireland, due to the lack of consultant clinical microbiologists in many institutions, the composition of the team responsible for data collection will vary from one hospital to another. Nonetheless, infection control personnel of the hospital concerned including a clinical microbiologist if present, should be predominantly involved in this study. A designated member of the hospitals ICT will lead the survey in that institution. This person will be assisted by members of the local ICT and HSE support team. In some institutions, the HSE data collector only will be required to complete the suggested team of three. However in many institutions both the HSE data collector and HSE nurse will be required. The role of the team in charge of the patients should also be emphasised.

Confidentiality

The anonymity of patients must be assured by the local ICT's responsible for the study. The questionnaires contain no patient identifiable information. The data extracted will be anonymised before transmission to the Health Protection Surveillance Centre (HPSC), therefore it will not be possible to identify an individual patient from the information transmitted. In addition, HSE data collectors and nurses will have signed confidentiality agreements.

In the UK, it has been confirmed that ethical approval for this survey is not required. In Ireland, the HSE has confirmed that ethical approval is not required in Ireland either.

Questionnaire

The questionnaire is designed to facilitate the task of data collection. It is contained on both sides of an A4 sheet (Pages 7&8).

There are two kinds of responses:

1. Questions with the options YES/NO and Male/Female should be answered by placing an **X** in the appropriate box.

2. A number of questions require numerical codes:

   - Each centre/hospital will have its own identifying code. The codes for participating hospitals will be supplied by the HSE data collectors.
   - The designated ICT member for that institution will determine local ward codes. This is to facilitate local ICT's in interpreting survey results in their own institution.
   - Each specialty is categorised and will have its own identifying codes listed in Appendix 1.
   - Surgical intervention categories (NHSN procedure categories) are listed in Appendix 2.

FIGURE 1. QUESTIONNAIRE – PAGE 1

Serial number 7057030

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Prevalence survey of healthcare associated infections

Please write inside number and date frames or enter [X] in the appropriate box

DO NOT USE A PHOTOCOPY - Each form is uniquely serialised

Survey details

Hospital ☐☐☐☐

Date of survey ☐☐ / ☐☐ / ☐☐☐☐

Consultant speciality ☐☐ *Appendix 1*

Ward speciality ☐☐ *Appendix 1*

Local ward identifier ☐☐ *Code supplied by infection control team*

Patient details

Sex ☐ Male ☐ Female Age ☐☐☐

Date of admission ☐☐ / ☐☐ / ☐☐☐☐

	Yes	No		Yes	No
Indwelling urinary catheter in-situ	☐	☐	→ Urinary catheter within last 7 days	☐	☐
Other bladder instrumentation in-situ	☐	☐	→ Other bladder instrumentation within last 7 days	☐	☐
Peripheral intravascular catheter in-situ	☐	☐	→ Peripheral intravascular catheter within last 7 days	☐	☐
Central intravascular catheter in-situ	☐	☐	→ Central intravascular catheter within last 7 days	☐	☐
Mechanical ventilation	☐	☐	→ Mechanical ventilation within last 7 days	☐	☐
Parenteral nutrition	☐	☐	→ Parenteral nutrition within last 7 days	☐	☐
Currently receiving systemic antibiotics	☐	☐	→ IV antibiotics	☐	☐
Surgery within last 30 days with no implant	☐	☐	→ Procedure category ☐☐		
Surgery within last year involving an implant	☐	☐	→ Procedure category ☐☐		
Other invasive procedure	☐	☐			

Procedure category - Appendix 2

Other information

	Yes	No		Yes	No
Current confirmed/suspected norovirus	☐	☐	Current *C. difficile* diarrhoea	☐	☐

Active healthcare-associated infections

	Yes	No	
Any healthcare-associated infections?	☐	☐	**If 'No' this form is now completed.** **If 'Yes', complete infection-related questions overleaf**

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FIGURE 2. QUESTIONNAIRE - PAGE 2

Serial number

7057030

Active healthcare-associated infections

Definitions Appendix 3

Primary bloodstream infection (BSI) — No ☐ Yes ☐

- MRSA causative organism? — Yes ☐ No ☐
- Central line related? — Yes ☐ No ☐

Pneumonia — No ☐ Yes ☐

Type of pneumonia:

- Clincially defined pneumonia ☐
- Pneumonia with specific laboratory findings ☐
- Pneumonia in immunocompromised patients ☐

- MRSA causative organism? — Yes ☐ No ☐
- Secondary bloodstream infection? — Yes ☐ No ☐
- Ventilator related pneumonia? — Yes ☐ No ☐

Urinary tract infection — No ☐ Yes ☐

Type of UTI

- Symptomatic urinary tract infection ☐
- Asymptomatic bacteriuria ☐
- Other infections of the urinary tract ☐

- MRSA causative organism? — Yes ☐ No ☐
- Secondary bloodstream infection? — Yes ☐ No ☐
- Catheter related — Yes ☐ No ☐

Surgical site infection — No ☐ Yes ☐

Type of SSI

- Superficial incisional ☐
- Deep incisional ☐
- Organ / Space ☐

- MRSA causative organism? — Yes ☐ No ☐
- Secondary bloodstream infection? — Yes ☐ No ☐
- Procedure category ☐☐ *Appendix 2*

Other healthcare associated infections

	No	Yes	MRSA causative organism? Yes	MRSA causative organism? No	Device / Procedure related? Yes	Device / Procedure related? No	Secondary bloodstream infection? Yes	Secondary bloodstream infection? No
Bones & joint	☐	☐	☐	☐	☐	☐	☐	☐
Central nervous system	☐	☐	☐	☐	☐	☐	☐	☐
Cardiovasular system	☐	☐	☐	☐	☐	☐	☐	☐
Eyes, ENT or mouth	☐	☐	☐	☐	☐	☐	☐	☐
Gastrointestinal system	☐	☐	☐	☐	☐	☐	☐	☐
Reproductive tract	☐	☐	☐	☐	☐	☐	☐	☐
Skin & soft tissue	☐	☐	☐	☐	☐	☐	☐	☐
Systemic infection	☐	☐	☐	☐	☐	☐	☐	☐
Lower respiratory tract (not pneumonia)	☐	☐	☐	☐	☐	☐	☐	☐

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TERMS USED

Indwelling urinary catheter:

A drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a closed collection system; also called a Foley catheter. Do not include intermittent catheterisation.

Other bladder instrumentation:

Bladder instrumentation other than indwelling urinary catheter (i.e. intermittent catheterisation, urethral dilation, bladder irrigation, cystoscopy, cystourethrography, or suprapubic catheterisation).

Central intravascular catheter:

Vascular access device that terminates at or close to the heart or in one of the great vessels, i.e.

Aorta	Superior vena cava	Inferior vena cava
Brachiocephalic vein	Internal jugular vein	Subclavian vein
Pulmonary artery	External iliac vein	Common femoral vein

Peripheral intravascular catheter:

Vascular access device in place in a peripheral vessel (usually in the hands, wrists, or arms) including peripherally inserted arterial lines.

Ventilator:

A device to assist or control respiration continuously through a tracheostomy or by endotracheal intubation. NOTE: Lung expansion devices such as intermittent positive pressure breathing; nasal positive end-expiratory pressure; continuous nasal positive airway pressure are not considered ventilators unless delivered via tracheostomy or endotracheal intubation.

Parenteral nutrition:

Nutrients provided intravenously.

Secondary bloodstream infection:

The patient has a culture-confirmed bloodstream infection and a related HCAI at another site. An exception is when a vascular access device is present and no other infection site is evident; then the bloodstream infection is considered a primary bloodstream infection.

Implant*:*

A nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, hip prosthesis) that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes. Screws, wires, and mesh that are left in place are considered implants.

Current confirmed/suspected Norovirus*:*

Patient is either proven Norovirus or epidemiologically linked in time and place to one proven case. This includes patients currently under treatment or in isolation (including cohorting) for Norovirus infection.

Current *C. difficile* diarrhoea*:*

Patient has diarrhoea which is positive for *C difficile* toxin.

Operative procedure:

A procedure:

- That is performed on a patient included in prevalence survey
- Takes place in an operating room (may include an operating room, c-section room, interventional radiology room, or cardiac catheterisation lab);
- takes place during an operation (defined as a single trip to the operating room where a surgeon makes at least one incision through the skin or mucous membrane, including laparoscopic approach, and closes the incision before the patient leaves the operating room);
- That is included in Table 3, page 18 (NHSN Operative Procedure Categories).

Note: The National Healthcare Safety Network (NHSN) is an internet application that replaced National Nosocomial Infection Surveillance (NNIS) System (CDC, Atlanta) on 1st October 2005.

Procedure category:

Combinations of clinically similar operative procedures.

Other invasive procedure:

Procedures that do not meet the criteria for a NHSN operative procedure (Table 3). This principally include procedures:

- performed outside the operating room;
- involving no incision e.g. bronchoscopy, gastroscopy;
- skin or mucous membrane incision but no closure, e.g. debridement;
- diagnostic procedure, aspiration, injection or catheterisation;
- not included in NHSN operative procedure categories.

TABLE 1. VARIABLES

Data field	Instructions for data collection
Hospital code	Each hospital will be assigned an identifying code by the HSE data collector.
Date of survey	Enter date the survey is performed using this format: DD/MM/YY.
Consultant specialty	Record the specialty of the consultant in charge of care of the patient, see **Appendix 1** for codes.
Ward specialty	Record the specialty of the ward/unit, this may differ from consultant specialty and provides information on outliers, see **Appendix 1** for codes.
Local ward identifier	Record code supplied by designated member of that institutions ICT to identify ward.
Gender	Check Male or Female to indicate the gender of the patient.
Age	Write age in years.
Date of admission	Enter date patient admitted to this hospital using this format: DD/MM/YY.
Indwelling urinary catheter *in-situ* Urinary catheter within last 7 days	Record if the patient currently has an indwelling catheter in the urinary tract (Yes/No). If a urinary catheter is not *in situ*, record if the patient had a urinary catheter in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.
Other bladder instrumentation *in-situ* Other bladder instrumentation within last 7 days	Record if the patient currently has other bladder instrumentation (Yes/No). If other bladder instrumentation is not *in situ*, record if the patient had other bladder instrumentation in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.
Peripheral intravascular catheter *in-situ* Peripheral intravascular catheter within last 7 days	Record any catheter inserted by peripheral access whether a line is attached or not (Yes/No). If peripheral catheter is not *in-situ*, record if the patient had such a device in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.
Central intravascular catheter *in-situ* Central intravascular catheter within last 7 days	Record any kind of central intravascular catheter (e.g. subclavian, jugular, femoral) (Yes/No). If central intravascular catheter is not *in-situ*, record if the patient had such a device in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.
Mechanical ventilation Mechanical ventilation within last 7 days	Record in the appropriate box if the patient is under mechanical ventilation (Yes/No). If the patient is not currently under mechanical ventilation, record if the patient was under mechanical ventilation in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.

Data field	Instructions for data collection
Parenteral nutrition	Record in the appropriate box if the patient is receiving parenteral nutrition (Yes/No).
Parenteral nutrition within last 7 days	If the patient is not currently receiving parenteral nutrition, record if the patient was receiving parenteral nutrition in the last 7 days (Yes/No). If this cannot be ascertained leave these boxes blank.
Currently receiving systemic antibiotics	Record whether the patient is receiving systemic antibiotics on the day of the survey (Yes/No).
IV antibiotics	If the patient is currently on systemic antibiotics record if the antibiotics are intravenous (Yes/No).
Surgery within the last 30 days with no implant	Record if an operation has been performed in the last 30 days with no implant (Yes/No). The operation does not have to have occurred during this admission.
Procedure category	Record the procedure category code of the most recent procedure with no implant **(Appendix 2)**.
Surgery in the last year involving an implant	Record if an operation has been performed in the last year involving an implant (Yes/No). The operation does not have to have occurred during this admission.
Procedure category	Record the procedure category code of the most recent procedure with an implant **(Appendix 2)**.
Other invasive procedure	Record if the patient had an invasive procedure that does not meet the criteria for a NHSN operative procedure (Yes/No).
Current confirmed/suspected Norovirus	Check Yes if the patient is either proven Norovirus or epidemiologically linked in time and place to one proven case. This includes patients currently under treatment or in isolation (including cohorting) for Norovirus; otherwise check No.
Current *C. difficile* diarrhoea	Check Yes if the patient has diarrhoea which is positive for *C. difficile* toxin; otherwise check No. Note: If the patient has diarrhoea which is positive for *C. difficile* toxin record Gastrointestinal System Infection on page 2 of questionnaire.
Any healthcare associated infections	See definitions of infection as detailed in **Appendix 3**. If the patient has no active healthcare associated infections check No. **The form is now complete and the remaining questions should be ignored.** If the patient has active healthcare associated infection(s) check Yes and complete information for all healthcare associated infection on Page 2 of the questionnaire.

ACTIVE HEALTHCARE ASSOCIATED INFECTIONS – QUESTIONNAIRE PAGE 2 Only record information on this page if patient has active healthcare associated infection(s); otherwise leave blank. Only record supplementary information under active healthcare associated infection(s); otherwise leave blank.	
Data field	**Instructions for data collection**
Primary bloodstream infection	Check Yes if the patient has a primary bloodstream infection; otherwise check No. Please see definitions of infection as detailed in **Appendix 3.**
MRSA causative organism	Check Yes if MRSA is the causative organism; otherwise check No.
Central line related	Check Yes if patient had a central line during the 48-hour period before developing primary bloodstream infection; otherwise check No.
Pneumonia	Check Yes if the patient has pneumonia; otherwise check No. Please see definitions of infection as detailed in **Appendix 3**.
Type of Pneumonia	If the patient has a pneumonia check either: • Clinically defined pneumonia, • Pneumonia with specific laboratory findings, • Pneumonia in immunocompromised patients, whichever criteria are met for this event.
MRSA causative organism	Check Yes if MRSA is the causative organism; otherwise check No.
Secondary bloodstream infection	Check Yes to indicate if the patient with pneumonia has a related secondary bloodstream infection; otherwise check No.
Ventilator associated	Check Yes if the patient with pneumonia had a device to assist or control respiration continuously through a tracheostomy or by endotracheal intubation, inclusive of the weaning period, within the 48-hour period before developing infection, this does not included ventilation during a surgical procedure in the operating theatre. Otherwise check No.
Urinary tract infection (UTI)	Check Yes if the patient has a urinary tract infection; otherwise check No. See definitions of infection as detailed in **Appendix 3.**
Type of UTI	If the patient has a UTI check either: • Symptomatic urinary tract infection; • Asymptomatic bacteriuria; • Other infections of the urinary tract (only an option if the patient did not have an indwelling urinary catheter).
MRSA causative organism	Check Yes if MRSA is the causative organism; otherwise check No.
Secondary bloodstream infection	Check Yes to indicate if the patient with UTI has a related secondary bloodstream infection; otherwise check No.
Catheter related	Check Yes if the patient had an indwelling urinary catheter during the 7-days before developing either symptomatic UTI or asymptomatic bacteriuria.

Data field	Instructions for data collection
Surgical site infection (SSI)	**Surgical site infections should only be recorded in the hospital where the procedure was performed.** Check Yes if the patient has an SSI; otherwise check No.
Type of SSI	See definitions of infection as detailed in **Appendix 3**. If the patient has an SSI check either check either: • Superficial incisional • Deep incisional • Organ/Space whichever criteria are met for this event.
MRSA causative organism	Check Yes if MRSA is the causative organism; otherwise check No.
Secondary bloodstream infection	Check Yes to indicate if the patient with SSI has a related secondary bloodstream infection; otherwise check No.
Procedure category	Enter the appropriate NHSN operative procedure code related to the SSI (**Appendix 2**).
Other healthcare associated infections	Check Yes for <u>all</u> active healthcare associated infection(s), all others should be checked No: • Bone and Joint; • Central Nervous System; • Cardiovascular System; • Eye, Ear, Nose, Throat, or Mouth; • Gastrointestinal System; • Reproductive Tract; • Skin and Soft Tissue; • Systemic infection • Lower respiratory tract, other than pneumonia.
MRSA causative organism (Record only for active HCAIs)	Check Yes if MRSA is the causative organism (for each active infection); otherwise check No.
Was infection device/procedure related (Record only for active HCAIs)	Check Yes if the patient with an infection had invasive instrumentation or incision related to the infection performed within 48 hours before onset of infection; otherwise check No
Secondary bloodstream infection (Record only for active HCAIs)	Check Yes to indicate if the patient with infection has a related secondary bloodstream infection; otherwise check No.

APPENDIX 1. CONSULTANT AND WARD SPECIALTY CODES

MAIN SPECIALTY CODES are aligned with the specialties recognised in the European Specialist Medical Qualifications Order 1995 and European Primary and Specialist Dental Qualifications Regulations 1998.

Joint Consultant Clinic activity should be recorded against the CONSULTANT SPECIALTY CODE of the CONSULTANT managing the patient on a day to day basis.

Table 2. Consultant and ward specialty codes

Code	Specialty Title	Comments
	Surgical Specialties	
10	GENERAL SURGERY	Includes sub-categories not elsewhere listed e.g. endocrine surgery.
12	TRANSPLANTATION SURGERY	Includes pre- and post-operative care for major organ transplants except heart and lung (see Cardiothoracic Transplantation). Excludes corneal grafts.
13	BREAST SURGERY	Includes treatment for cancer, suspected neoplasms, cysts and post-cancer reconstructive surgery. Excludes cosmetic surgery.
14	COLORECTAL SURGERY	Surgical treatment of disorders of the lower intestine (colon, anus and rectum).
15	HEPATOBILIARY & PANCREATIC SURGERY	Includes liver surgery but excludes liver transplantation see Transplantation Surgery.
16	UPPER GASTROINTESTINAL SURGERY	
17	VASCULAR SURGERY	
20	TRAUMA & ORTHOPAEDICS	
31	ENT	
32	OPHTHALMOLOGY	
33	ORAL SURGERY	
34	RESTORATIVE DENTISTRY	Endodontics, Periodontics and Prosthodontics are all specialties within Restorative Dentistry.
35	ORTHODONTICS	
36	MAXILLO-FACIAL SURGERY	Mouth, jaw and face related surgery.
37	NEUROSURGERY	
38	PLASTIC SURGERY	
39	BURNS CARE	To be used by recognised specialist services only.
40	CARDIOTHORACIC SURGERY	Should only be used where there are no separate services for Cardiac Surgery and Thoracic Surgery.
41	CARDIAC SURGERY	
42	THORACIC SURGERY	
43	CARDIOTHORACIC TRANSPLANTATION	To be used by recognised specialist services only. Includes pre- and post-operative services.

Code	Specialty Title	Comments
	Medical Specialties	
50	GENERAL MEDICINE	Includes sub-categories not elsewhere listed e.g. metabolic medicine.
51	PAIN MANAGEMENT	Complex pain disorders requiring diagnosis and treatment by a specialist multi-professional team.
52	CRITICAL CARE MEDICINE	Also known as Intensive Care Medicine.
53	GASTROENTEROLOGY	
54	ENDOCRINOLOGY	
60	CLINICAL HAEMATOLOGY	
61	HEPATOLOGY	
62	BLOOD AND MARROW TRANSPLANTATION	Includes haemopoietic stem cell transplantation.
63	PALLIATIVE MEDICINE	
64	CLINICAL IMMUNOLOGY	
65	CARDIOLOGY	
70	CLINICAL MICROBIOLOGY	
71	DERMATOLOGY	
72	RESPIRATORY MEDICINE	Also known as Thoracic Medicine.
73	INFECTIOUS DISEASES	
74	TROPICAL MEDICINE	
80	GENITO-URINARY MEDICINE	
81	NEPHROLOGY	
82	MEDICAL ONCOLOGY	The diagnosis and treatment, typically with chemotherapy, of patients with cancer.
83	NEUROLOGY	
84	RHEUMATOLOGY	
85	CARE OF THE ELDERLY	Also known as Geriatric Medicine.
90	OBSTETRICS	The management of pregnancy and childbirth including miscarriages but excluding planned terminations.
91	GYNAECOLOGY	Disorders of the female reproductive system. Includes planned terminations.
99	OTHERS	Others not listed above

APPENDIX 2. NATIONAL HEALTHCARE SAFETY NETWORK (NHSN) OPERATIVE PROCEDURES

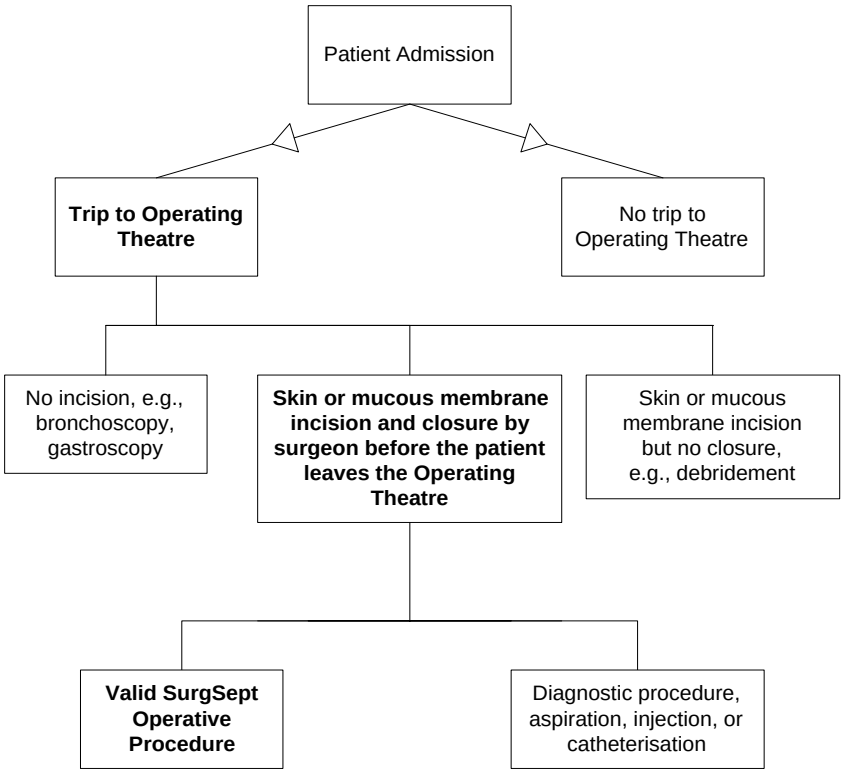


Figure 3. Schematic diagram of the criterion for NHSN operative procedure

Table 3. NHSN Operative Procedure Categories

Code	Operative procedure category	Description
10	Craniotomy	Incision through the skull to excise, repair, or explore the brain; does not include taps or punctures
11	Laminectomy	Exploration or decompression of spinal cord through excision or incision into vertebral structures
12	Spinal fusion	Immobilisation of spinal column
13	Refusion of spine	Refusion of spine
14	Other operations on the nervous system	
15	Ventricular shunt	Ventricular shunt operations, including revision and removal of shunt
16	Other operations on the Eye, Ear, Nose, Mouth, and Pharynx	
17	Neck surgery	Major excision or incision of the larynx and radical neck dissection; does not include thyroid and parathyroid operations.
18	Thyroid and/or parathyroid surgery	Resection or manipulation of thyroid and/or parathyroid
19	Other operations on the endocrine system	

Code	Operative procedure category	Description
20	Heart transplant	Transplantation of heart
21	Cardiac surgery	Open chest procedures on the valves or septum of heart; does not include coronary artery bypass graft, surgery on vessels, heart transplantation, or pacemaker implantation
22	Coronary artery bypass graft with **both** chest and donor site incisions	Chest procedure to perform direct revascularisation of the heart; includes obtaining suitable vein from donor site for grafting.
23	Coronary artery bypass graft with chest incision only	Chest procedure to perform direct vascularisation of the heart using, for example the internal mammary (thoracic) artery
24	Pacemaker surgery	Insertion, manipulation or replacement of pacemaker
25	Thoracic surgery	Noncardiac, nonvascular thoracic surgery; includes pneumonectomy and diaphragmatic or hiatal hernia repair
26	Other operations on the cardiovascular system	
27	Other operations on the respiratory system	
28	Breast surgery	Excision of lesion or tissue of breast including radical, modified, or quadrant resection, lumpectomy, incisional biopsy, or mammoplasty.
29	Other operations on the integumentary system	
30	Spleen surgery	Resection or manipulation of spleen
31	Other operations on the haemic and lymphatic systems	
32	Bile duct, liver or pancreatic surgery	Excision of bile ducts or operative procedures on the biliary tract, liver or pancreas (does not include operations only on gallbladder)
33	Gallbladder surgery	Cholecystectomy and cholecystotomy
34	Liver transplant	Transplantation of liver
40	Herniorrhaphy	Repair of inguinal, femoral, umbilical, or anterior abdominal wall hernia; does not include repair of diaphragmatic or hiatal hernia or hernias at other body sites.
41	Colon surgery	Incision, resection, or anastomosis of the large intestine; includes large-to-small and small-to-large bowel anastomosis; does not include rectal operations
42	Small bowel surgery	Incision or resection of the small intestine; does not include small to- large bowel anastomosis
43	Gastric surgery	Incision or excision of stomach; includes subtotal or total gastrectomy; does not include vagotomy and fundoplication
44	Other operations on the digestive system	
45	Rectal surgery	Operations on rectum
46	Abdominal surgery	Abdominal operations not involving the gastrointestinal tract or biliary system
50	Kidney transplant	Transplantation of kidney
51	Kidney surgery	Resection or manipulation of the kidney with or without removal of related structures
52	Appendix surgery	Operation of appendix (not incidental to another procedure)

Code	Operative procedure category	Description
60	Abdominal aortic aneurysm repair	Resection of abdominal aorta with anastomosis or replacement
61	Carotid endarterectomy	Carotid endarterectomy
62	Peripheral vascular bypass surgery	Bypass operations on peripheral vessels
63	Shunt for dialysis	Arteriovenostomy for renal dialysis
70	Hip prosthesis	Arthroplasty of hip
71	Knee prosthesis	Arthroplasty of knee
72	Open reduction of fracture	Open reduction of fracture or dislocation of long bones that requires internal or external fixation; does not include placement of joint prosthesis
73	Limb amputation	Total or partial amputation or disarticulation of the upper or lower limbs, including digits
74	Other operations on the musculoskeletal system	
80	Caesarean section	Obstetrical delivery by Caesarean section
81	Abdominal hysterectomy	Removal of uterus through an abdominal incision
82	Ovarian surgery	Operations on ovary and related structures
83	Vaginal hysterectomy	Removal of the uterus through vaginal or perineal incision
84	Other obstetrical operations	
90	Prostate surgery	Suprapubic, retropubic, radical, or perineal excision of the prostate; does not include transurethral resection of the prostate.
91	Other operations on the Genitourinary System	

Table 4. Principle Operative Procedure Selection Lists

- If more than one NHSN operative procedure was performed through a single incision, attempt to determine the procedure that is thought to be associated with the infection.
- If it is not clear (as is often the case when the infection is a superficial incisional SSI) use the NHSN Principal Operative Procedure Selection Lists below to select which operative procedure to report.
- The operative procedures with the highest risk of surgical site infection are listed before those with a lower risk.
- **Therefore if two procedures are carried out, check which procedure has the highest priority (see below) and then use the code appropriate for that procedure according to Table 3.**

The following lists are derived from Table 3, NHSN Operative Procedure Categories.

Priority	**Abdominal Operations**
1	Small bowel surgery
2	Kidney transplant
3	Liver transplant
4	Biliary surgery
5	Rectal surgery
6	Colon surgery
7	Gastric surgery
8	Caesarean section
9	Laparoscopy
10	Ovarian surgery
11	Spleen surgery
12	Appendectomy
13	Abdominal hysterectomy
14	Hernia repair
15	Cholecystectomy
16	Abdominal aortic aneurysm repair
17	Kidney surgery
Priority	**Thoracic Operations**
1	Heart transplant
2	Coronary artery bypass graft and donor site
3	Coronary artery bypass graft, chest only
4	Cardiac surgery
5	Thoracic surgery
Priority	**Neurosurgical (Spine) Operations**
1	Spinal refusion
2	Spinal fusion
3	Laminectomy
Priority	**Neurosurgical (Brain) Operations**
1	Ventricular shunt
2	Craniotomy
Priority	**Neck Operations**
1	Operations on the neck
2	Thyroid surgeries

APPENDIX 3 CDC DEFINITIONS OF NOSOCOMIAL INFECTIONS

Criteria for determining the site of a Healthcare-Associated Infection

Introduction

Before an infection is reported, the person performing surveillance must decide that the clinical, laboratory, and other diagnostic information gathered on the patient satisfy the criteria for a HCAI.

To assist surveillance personnel in making these decisions consistently, this section contains a listing of the major and specific infection sites used and the criteria for determining the presence of an infection at each of the specific sites.

While all participants may not agree with all the criteria, it is important that hospitals consistently use them for reporting infections so rates can be appropriately aggregated and compared.

General Information

Any infection reported must meet the definition of infection of a HCAI, that is, a localised or systemic condition resulting from adverse reaction to the presence of an infectious agent(s) or its toxins. There must be no evidence that it was present or incubating at the time of hospital admission unless the infection was related to a previous admission to this hospital (i.e. the hospital under surveillance).

Two terms are used to describe infection sites: major sites of infection and specific sites of infection.
Specific sites of infection are the infection sites for which criteria have been developed.
Specific sites of infection have been grouped into 13 major site categories to facilitate data analysis. For example, there are three specific sites (or types) of urinary tract infections:

- Symptomatic urinary tract infection;
- Asymptomatic bacteriuria;
- Other infections of the urinary tract;

these are grouped under the major site of Urinary Tract Infection.

For the purposes of the prevalence survey all system infections will be identified at major site level.
Only urinary tract infections, surgical site infections, pneumonia and primary bloodstream infections will be identified to specific site level. For example a deep incisional surgical site infection will be recorded as a surgical site infection (Major site) and as a deep incisional surgical site infection (specific site); whereas an Endocarditis (Specific site) or Mediastinitis (Specific site) will be recorded only as Cardiovascular System Infection (Major site).

Table 5. Listing of Major and Specific Sites of Infection

Major site of Infection	Specific sites of infection		
Bloodstream infection	Laboratory-confirmed		
Pneumonia	Clinically defined pneumonia - PNU1	Pneumonia with specific laboratory findings -PNU 2	Pneumonia in immunocompromised patients - PNU 3
Urinary tract infection	Symptomatic urinary tract infection	Asymptomatic bacteriuria	Other infections of the urinary tract
Surgical site infection	Superficial incisional	Deep incisional	Organ/Space
Bone and joint	Osteomyelitis	Joint or bursa	Disc space
Central nervous system	Intracranial infection	Meningitis or ventriculitis	Spinal abscess without meningitis
Cardiovascular system	Arterial or venous infection	Endocarditis	Myocarditis or pericarditis
	Mediastinitis		
Eye, Ear, Nose, Throat, or Mouth	Conjunctivitis	Eye other than conjunctivitis	Ear Mastoid
	Oral Cavity (mouth, tongue, or gums)	Sinusitis	Upper respiratory tract, pharyngitis, laryngitis, epiglottitis
Gastrointestinal system	Gastroenteritis	Gastrointestinal (GI) tract	Hepatitis
	Intraabdominal, not specified elsewhere		
Reproductive tract	Endometritis	Episiotomy	Vaginal cuff
	Other infections of the male or female reproductive tract		
Skin and soft tissue infection	Skin	Soft tissue	Decubitus ulcer
	Breast abscess or mastitis	Burn	
Systemic infection	Disseminated infection		
Lower respiratory tract infection (other than pneumonia)	Bronchitis, tracheobronchitis, tracheitis, without evidence of pneumonia	Other infections of the lower respiratory tract	

From: Horan TC, Gaynes RP. Surveillance of nosocomial infections. In: *Hospital Epidemiology and Infection Control, 3rd ed.*, Mayhall CG, editor. Philadelphia: Lippincott Williams & Wilkins, 2004:1659-1702.

Major Infection Site: PRIMARY BLOODSTREAM INFECTION (Laboratory-confirmed)

DEFINITION: Primary bloodstream infection (Laboratory-confirmed) must meet at least **one** of the following criteria:

Criterion 1:

Patient has a recognised pathogen cultured from one or more blood cultures
and
organism cultured from blood is *not* related to an infection at another site.

Criterion 2:

Patient has at least *one* of the following signs or symptoms: fever (>38°C), chills, or hypotension
and
at least *one* of the following:

a. Common skin contaminant (e.g., diphtheroids, *Bacillus* sp., *Propionibacterium* sp., coagulase-negative staphylococci, or micrococci) is cultured from two or more blood cultures drawn on separate occasions
b. Common skin contaminant (e.g., diphtheroids, *Bacillus* sp., *Propionibacterium* sp., coagulase-negative staphylococci, or micrococci) is cultured from at least one blood culture from a patient with an intravascular line, and the physician institutes appropriate antimicrobial therapy
c. Positive antigen test on blood (e.g., *Haemophilus influenzae, Streptococcus pneumoniae, Neisseria meningitidis,* or group B *Streptococcus*)

and
signs and symptoms and positive laboratory results are *not* related to an infection at another site.

REPORTING INSTRUCTIONS:

- Report purulent phlebitis confirmed with a positive culture of a catheter tip, but with either negative or no blood culture, as Cardiovascular System Infection.

- Pseudobacteraemias are not nosocomial infections.

NOTE:
PNEUMONIA DEFINITIONS ARE IN APPENDICIES 3A & 3B (PAGES 43 – 48)

Major Infection Site: URINARY TRACT INFECTION

COMMENTS:

- A positive culture of a urinary catheter tip is *not* an acceptable laboratory test to diagnose either a urinary tract infection or bacteriuria.
- Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterisation.

Specific site: Symptomatic urinary tract infection

*DEFINITION: S*ymptomatic urinary tract infection must meet at least **one** of the following criteria:

Criterion 1:

Patient has at least *one* of the following signs or symptoms with no other recognised cause: fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness

and

patient has a positive urine culture, that is, $\geq 10^5$ microorganisms per cm^3 of urine with no more than two species of microorganisms.

Criterion 2:

Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness

and

at least *one* of the following:

a. Positive dipstick for leukocyte esterase and/or nitrate
b. Pyuria (urine specimen with ≥ 10 WBC/mm^3 or ≥ 3 WBC/high power field of unspun urine)
c. Organisms seen on Gram stain of unspun urine
d. At least *two* urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or *S. saprophyticus*) with $\geq 10^2$ colonies/ mL in nonvoided specimens
e. $\leq 10^5$ colonies/mL of a single uropathogen (gram-negative bacteria or *S. saprophyticus*) in a patient being treated with an effective antimicrobial agent for a urinary tract infection
f. Physician diagnosis of a urinary tract infection
g. Physician institutes appropriate therapy for a urinary tract infection

Specific site: Asymptomatic bacteriuria

DEFINITION: An asymptomatic bacteriuria must meet at least one of the following criteria:

Criterion 1:

Patient has had an indwelling urinary catheter within 7 days before the culture

and

patient has a positive urine culture, that is, $\geq 10^5$ microorganisms per cm^3 of urine with no more than two species of microorganisms

and

patient has *no* fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness.

Criterion 2:

Patient has *not* had an indwelling urinary catheter within 7 days before the first positive culture

and

patient has had at least *two* positive urine cultures, that is, $\geq 10^5$ microorganisms per cm^3 of urine with repeated isolation of the same microorganism and no more than two species of microorganisms

and

patient has *no* fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness.

Specific site: Other infections of the urinary tract

DEFINITION: Other infections of the urinary tract (kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric spaces) must meet at least one of the following criteria:

Criterion 1:

Patient has organisms isolated from culture of fluid (other than urine) or tissue from affected site.

Criterion 2:

Patient has an abscess or other evidence of infection seen on direct examination, during a surgical operation, or during a histopathological examination.

Criterion 3:

Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), localised pain, or localised tenderness at the involved site

and

at least *one* of the following:

a. Purulent drainage from affected site
b. Organisms cultured from blood that are compatible with suspected site of infection
c. Radiographic evidence of infection, for example, abnormal ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), or radiolabel scan (gallium, technetium)
d. Physician diagnosis of infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space
e. Physician institutes appropriate therapy for an infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space

Major Infection Site: SURGICAL SITE INFECTION

NOTE:

- **Surgical site infections should only be recorded in the hospital where the procedure was performed. Therefore if the patient under surveillance has a surgical site infection but the procedure was performed in another hospital it is NOT recorded as a surgical site infection in this prevalence survey**
- If more than one NHSN operative procedure was performed through a single incision, attempt to determine the procedure that is thought to be associated with the infection.
- If it is not clear (as is often the case when the infection is a superficial incisional SSI) use the NHSN Principal Operative Procedure Selection Lists (Table 4) to select which operative procedure to report.
- If a patient has several NHSN operative procedures prior to an infection, report the operative procedure code of the operation that was performed most closely in time prior to the infection date, unless there is evidence that the infection is associated with a different operation.

Specific site: Superficial incisional surgical site infection

DEFINITION: A superficial SSI must meet the following criteria:

Infection occurs within 30 days after the operative procedure
and
involves only skin and subcutaneous tissue of the incision
and
patient has at least *one* of the following:

a. Purulent drainage from the superficial incision
b. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
c. At least one of the following signs or symptoms of infection:
a. pain or tenderness, localised swelling, redness, or heat, *and* superficial incision is deliberately opened by surgeon, *unless* incision is culture-negative
d. Diagnosis of superficial incisional SSI by the surgeon or attending physician

REPORTING INSTRUCTIONS:

- Do *not* report
    a. a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) as an infection.
    b. a localised stab wound infection as SSI; instead report as skin or soft tissue infection, depending on its depth.
- Episiotomy is not an NHSN operative procedure. Report infection of the episiotomy site as Reproductive Tract Infection.
- Report infected burn wound as Skin and Soft Tissue Infection.
- If the incisional site infection involves or extends into the fascial and muscle layers, report as a deep incisional SSI.
- Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

Specific site: Deep incisional surgical site infection

DEFINITION:

A deep incisional SSI must meet the following criteria:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure
and
involves deep soft tissues (e.g., fascial and muscle layers) of the incision
and
patient has at least *one* of the following:

a. Purulent drainage from the deep incision but not from the organ/space component of the surgical site
b. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (>38°C) or localised pain or tenderness, *unless* incision is culture-negative
c. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathological or radiological examination
d. Diagnosis of a deep incisional SSI by a surgeon or attending physician

REPORTING INSTRUCTIONS:

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

Specific site: Organ/space surgical site infection

DEFINITION: An organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. An example is appendectomy with subsequent subdiaphragmatic abscess.

An organ/space SSI must meet the following criteria:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure
and
infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure
and
patient has at least *one* of the following:

a. Purulent drainage from a drain that is placed through a stab wound into the organ/space
b. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/ space
c. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathological or radiological examination
d. Diagnosis of an organ/space SSI by a surgeon or attending physician.

REPORTING INSTRUCTIONS:

- Occasionally, an organ/space infection drains through the incision. Such infection generally does not involve reoperation and is considered a complication of the incision. Therefore, it is classified as a deep incisional SSI.

Major Infection Site: BONE AND JOINT INFECTION

Specific site: Osteomyelitis

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

Criterion 1: Patient has organisms cultured from bone.

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

Criterion 3: 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, for example, abnormal findings on x-ray, CT, MRI, radiolabelled scan (gallium, technetium, etc.)

Specific site: Joint or bursa

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

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

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

Criterion 3: Patient has at least *two* of the following signs 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 chemistries of joint fluid compatible with infection and *not* explained by an underlying rheumatologic disorder
d. Radiographic evidence of infection, for example, abnormal findings on x-ray, CT, MRI, radiolabelled scan (gallium, technetium, etc.)

Specific site: Disc space

DEFINITION: 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 vertebral disc space infection seen during a surgical operation or histopathological 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, MRI, radiolabelled 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. influenzae, S. pneumoniae, N. meningitidis,* or group B *Streptococcus*)

Major Infection Site: Central Nervous System Infection

Specific site: Intracranial infection (brain abscess, subdural or epidural infection, encephalitis)

DEFINITION: Intracranial infection must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from brain tissue or dura.

Criterion 2: Patient has an abscess or evidence of intracranial infection seen during a surgical operation or histopathological examination.

Criterion 3: Patient has at least *two* of the following signs or symptoms with no other recognised cause: headache, dizziness, fever (>38°C), localising neurological signs, changing level of consciousness, or confusion
and
if diagnosis is made ante mortem, physician institutes appropriate antimicrobial therapy
and
at least *one* of the following:

a. Organisms seen on microscopic examination of brain or abscess tissue obtained by needle aspiration or by biopsy during a surgical operation or autopsy
b. Positive antigen test on blood or urine
c. Radiographic evidence of infection, for example, abnormal findings on ultrasound, CT, MRI, radionuclide brain scan, or arteriogram
d. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

Specific site: Meningitis or ventriculitis

DEFINITION: Meningitis or ventriculitis must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from cerebrospinal fluid (CSF).

Criterion 2: Patient has at least *one* of the following signs of symptoms with no other recognised cause: fever (>38°C), headache, stiff neck, meningeal signs, cranial nerve signs, or irritability
and
if diagnosis is made ante mortem, physician institutes appropriate antimicrobial therapy
and
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
c. Organisms cultured from blood
d. Positive antigen test of CSF, blood, or urine
e. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

Specific site: Spinal abscess without meningitis

DEFINITION: An abscess of the spinal epidural or subdural space, without involvement of the CSF or adjacent bone structures, must meet at least one of the following criteria:

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

Criterion 2: Patient has an abscess in the spinal epidural or subdural space seen during a surgical operation or at autopsy of evidence of an abscess seen during a histopathological 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 ante mortem, physician institutes appropriate antimicrobial therapy
and
at least *one* of the following:

a. Organisms cultured from blood
b. Radiographic evidence of a spinal abscess, for example, abnormal findings on myelography, ultrasound, CT, MRI, or other scans (gallium, technetium, etc.)

Major Infection Site: Cardiovascular System Infection

Specific site: Arterial or venous infection

DEFINITION: Arterial or venous infection must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from arteries or veins removed during a surgical operation
and
blood culture *not* done or *no* organisms cultured from blood.

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

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

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

REPORTING INSTRUCTIONS:
- Report intravascular infections with organisms cultured from the blood as Primary Bloodstream Infection.

Specific site: Endocarditis involving either a natural or prosthetic heart valve

DEFINITION: Endocarditis of a natural or prosthetic heart valve must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from valve or vegetation.

Criterion 2: Patient has *two* or more of the following signs or symptoms with no otherrecognised 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
if diagnosis is made ante mortem, physician institutes appropriate antimicrobial therapy
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 culture is 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 *Streptococcus*)
e. Evidence of new vegetation seen on echocardiogram

Specific site: Myocarditis or pericarditis

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

Criterion 1: Patient has organisms cultured from pericardial tissue or fluid obtained by needle aspiration or during a surgical operation.

Criterion 2: 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 electrocardiogram (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, MRI, or angiography

Specific site: Mediastinitis

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

Criterion 1: Patient has organisms cultured from mediastinal tissue or fluid obtained during a surgical operation or needle aspiration.

Criterion 2: Patient has evidence of mediastinitis seen during a surgical operation of histopathological examination.

Criterion 3: 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

Major Infection Site: Eye, Ear, Nose, Throat, or Mouth Infection

Specific site: Conjunctivitis

DEFINITION: Conjunctivitis must meet at least one of the following criteria:

Criterion 1: Patient has pathogens cultured from purulent exudate obtained from the conjunctiva or contiguous tissues, such as eyelid, cornea, meibomian glands, or lachrymal glands.

Criterion 2: Patient has pain or redness of conjunctiva or around eye
and
at least *one* of the following:
a. WBCs and organisms seen on Gram stain of exudate
b. Purulent exudate
c. Positive antigen test [e.g., enzyme-linked immunosorbent assay (ELISA) or immunofluorescence (IF) for *Chlamydia trachomatis,* herpes simplex virus, adenovirus) on exudate or conjunctival scraping
d. Multinucleated giant cells seen on microscopic examination of conjunctival exudate or scrapings
e. Positive viral culture
f. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

REPORTING INSTRUCTIONS:
- Do not report chemical conjunctivitis caused by silver nitrate (AgNO3) as a nosocomial infection.
- Do not report conjunctivitis that occurs as a part of a more widely disseminated viral illness (e.g., measles, chickenpox).

Specific site: Eye, other than conjunctivitis

DEFINITION: An infection of the eye, other than conjunctivitis, must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from anterior or posterior chamber of vitreous fluid.

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: eye pain, visual disturbance, or hypopyon
and
at least *one* of the following:
a. Physician's diagnosis of an eye infection
b. Positive antigen test on blood (e.g., *H. influenzae, S. pneumoniae*)
c. Organisms cultured from blood

Specific site: Ear and mastoid

DEFINITION: Ear and mastoid infections must meet the following applicable criteria:

Otitis externa must meet at least one of the following criteria:

Criterion 1: Patient has pathogens cultured from purulent drainage from ear canal.

Criterion 2: Patient has at least *one* of the following signs or symptoms with no other recognised cause: fever (>38°C), pain, redness, or drainage from ear canal
and
organisms seen on Gram stain of purulent drainage.

Otitis media must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from fluid from middle ear obtained by tympanocentesis or at surgical operation.

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C) pain in the eardrum, inflammation, retraction or decreased mobility of eardrum, or fluid behind eardrum.

Otitis interna must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from fluid from inner ear obtained at surgical operation.

Criterion 2: Patient has a physician's diagnosis of inner ear infection.

Mastoiditis must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from purulent drainage from mastoid.

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), pain, tenderness, erythema, headache, or facial paralysis
and
at least *one* of the following:
a. Organisms seen on Gram stain of purulent material from mastoid
b. Positive antigen test on blood

Specific site: Oral cavity (mouth, tongue, or gums)

DEFINITION: Oral cavity infections must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from purulent material from tissues of oral cavity.

Criterion 2: Patient has an abscess or other evidence of oral cavity infection seen on direct examination, during a surgical operation, or during a histopathological examination.

Criterion 3: Patient has at least *one* of the following signs or symptoms with no other recognised cause: abscess, ulceration, or raised white patches on inflamed mucosa, or plaques on oral mucosa
and at least *one* of the following:
a. Organisms seen on Gram stain
b. Positive potassium hydroxide (KOH) stain
c. Multinucleated giant cells seen on microscopic examination of mucosal scrapings
d. Positive antigen test on oral secretions
e. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen
f. Physician diagnosis of infection and treatment with topical or oral antifungal therapy

Specific site: Sinusitis

DEFINITION: Sinusitis must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from purulent material obtained from sinus cavity.

Criterion 2: Patient has at least *one* of the following signs or symptoms with no other recognised cause: fever (>38°C), pain or tenderness over the involved sinus, headache, purulent exudate, or nasal obstruction
and at least *one* of the following:
a. Positive transillumination
b. Positive radiographic examination

Specific site: Upper respiratory tract, pharyngitis, laryngitis, epiglottitis

DEFINITION: Upper respiratory tract infections must meet at least one the following criteria:

Criterion 1: Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), erythema of pharynx, sore throat, cough, hoarseness, of purulent exudate in throat
and at least *one* of the following:
a. Organisms cultured from the specific site
b. Organisms cultured from blood
c. Positive antigen test on blood or respiratory secretions
d. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen
e. Physician's diagnosis of an upper respiratory infection

Criterion 2: Patient has an abscess seen on direct examination, during a surgical operation, or during a histopathological examination.

Major Infection Site: Gastrointestinal System Infection

Specific site: Gastroenteritis

DEFINITION: Gastroenteritis must meet at least one of the following criteria:

Criterion 1: Patient has an acute onset of diarrhoea (liquid stools for more than 12 hours) with or without vomiting or fever (>38°C) and no likely non-infectious cause (e.g., diagnostic tests, therapeutic regimen, acute exacerbation of a chronic condition, or psychological stress).

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: nausea, vomiting, abdominal pain, or headache
and at least *one* of the following:

a. An enteric pathogen is cultured from stool or rectal swab
b. An enteric pathogen is detected by routine or electron microscopy
c. An enteric pathogen is detected by antigen or antibody assay on blood or faeces
d. Evidence of an enteric pathogen is detected by cytopathic changes in tissue culture (toxin assay)
e. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

Specific site: GI tract
(oesophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis

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

Criterion 1: Patient has an abscess or other evidence of infection seen during a surgical operation or 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 or KOH 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 pathologic findings on radiological examination
e. Evidence of pathologic findings on endoscopic examination (e.g., *Candida o*esophagitis or proctitis)

Specific site: Hepatitis

DEFINITION: Hepatitis must meet the following criterion:

Patient has at least *two* of the following signs or symptoms with no other recognised cause:
fever (>38°C), anorexia, nausea, vomiting, abdominal pain, jaundice, or history of transfusion within the previous 3 months
and
at least *one* of the following:

a. Positive antigen or antibody test for hepatitis A, hepatitis B, hepatitis C, or delta hepatitis
b. Abnormal liver function tests (e.g., elevated alanine/ aspartate aminotransferases, bilirubin)
c. Cytomegalovirus detected in urine or oropharyngeal secretions

REPORTING INSTRUCTIONS:

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

Specific site: Intraabdominal

including gallbladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, subphrenic or subdiaphragmatic space, or other intraabdominal tissue or area not specified elsewhere

DEFINITION: Intraabdominal infections must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from purulent material from intraabdominal space obtained during a surgical operation or needle aspiration.

Criterion 2: Patient has abscess or other evidence of intraabdominal infection seen during a surgical operation or histopathological examination.

Criterion 3: 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, for example, abnormal findings on ultrasound, CT, MRI, or radiolabel scans (gallium, technetium, etc.) or on abdominal x-ray

REPORTING INSTRUCTION:

- Do not report pancreatitis (an inflammatory syndrome characterised by abdominal pain, nausea, and vomiting associated with high serum levels of pancreatic enzymes) unless it is determined to be infectious in origin.

Major Infection Site: Reproductive Tract Infection

Specific site: Endometritis

DEFINITION: Endometritis must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from fluid or tissue from endometrium obtained during surgical operation, by needle aspiration, or by brush biopsy.

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), abdominal pain, uterine tenderness, or purulent drainage from uterus.

REPORTING INSTRUCTION:

- Report postpartum endometritis as a nosocomial infection unless the amniotic fluid is infected at the time of admission or the patient was admitted 48 hours after rupture of the membrane.

Specific site: Episiotomy

DEFINITION: Episiotomy infections must meet at least one of the following criteria:

Criterion 1: Postvaginal delivery patient has purulent drainage from the episiotomy.

Criterion 2: Postvaginal delivery patient has an episiotomy abscess.

REPORTING INSTRUCTION:

- Episiotomy is not a NHSN operative procedure; do not report as an SSI.

Specific site: Vaginal cuff

DEFINITION: Vaginal cuff infections must meet at least one of the following criteria:

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

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

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

REPORTING INSTRUCTION:

- Most vaginal cuff infections are SSI Organ/Space.
- Report only late onset (>30 days after hysterectomy) Reproductive Tract Infection.

Specific site: Other infections of the male or female reproductive tract *(epididymis, testes, prostate, vagina, ovaries, uterus, or other deep pelvic tissues, excluding endometritis or vaginal cuff infections)*

DEFINITION: Other infections of the reproductive tract must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from tissue or fluid from affected site.

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

Criterion 3: 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

Major Infection Site: Skin and Soft Tissue Infection

Specific site: Skin

DEFINITION: Skin infections must meet at least one of the following criteria:

Criterion 1: Patient has purulent drainage, pustules, vesicles, or boils.

Criterion 2: Patient has at least *two* of the following signs or symptoms with no other recognised cause: pain or tenderness, localised swelling, redness, or heat
and at least *one* of the following:

a. Organisms cultured from aspirate or drainage from affected site; if organisms are normal skin flora (e.g., coagulase negative staphylococci, micrococci, diphtheroids) they must be a pure culture
b. Organisms cultured from blood
c. Positive antigen test performed on infected tissue or blood (e.g., herpes simplex, varicella zoster, *H. influenzae*, *N. meningitidis*)
d. Multinucleated giant cells seen on microscopic examination of affected tissue
e. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

COMMENT:
Nosocomial skin infections may be the result of exposure to a variety of procedures performed in the hospital.

- Superficial incisional infections after surgery are identified separately as SSI.
- Other skin infections associated with important exposures are identified with their own sites and are listed in the section on reporting instructions.

Specific site: Soft tissue

(necrotizing fasciitis, infectious gangrene, necrotizing cellulitis, infectious myositis, lymphadenitis, or lymphangitis)

DEFINITION: Soft tissue infections must meet at least one of the following criteria:

Criterion 1: Patient has organisms cultured from tissue or drainage from affected site.

Criterion 2: Patient has purulent drainage at affected site.

Criterion 3: Patient has an abscess or other evidence of infection seen during a surgical operation or histopathological examination.

Criterion 4: Patient has at least *two* of the following signs of symptoms at the affected site with no other recognised cause: localised pain or tenderness, redness, swelling, or heat
and at least *one* of the following:

a. Organisms cultured from blood
b. Positive antigen test performed on blood or urine (e.g., *H. influenzae, S. pneumoniae, N. meningitidis*, group B *Streptococcus, Candida* sp.)
c. Diagnostic single antibody titre (IgM) or fourfold increase in paired sera (IgG) for pathogen

Specific site: Decubitus ulcer, including both superficial and deep infections

DEFINITION: Decubitus ulcer infections must meet the following criterion:

Patient has at least *two* of the following signs or symptoms with no other recognised cause: redness, tenderness, or swelling of decubitus wound edges

and

at least *one* of the following:

a. Organisms cultured from properly collected fluid or tissue (see comments)
b. Organisms cultured from blood

COMMENTS:

- Purulent drainage alone is not sufficient evidence of an infection.
- Organisms cultured from the surface of a decubitus ulcer are not sufficient evidence that the ulcer is infected. A properly collected specimen from a decubitus ulcer involves needle aspiration of fluid or biopsy of tissue from the ulcer margin.

Specific site: Burn

DEFINITION: Burn infections must meet one of the following criteria:

Criterion 1: Patient has a change in burn wound appearance or character, such as rapid eschar separation; dark brown, black, or violaceous discoloration of the char; or oedema at wound margin

and histological examination of burn biopsy shows invasion of organisms into adjacent viable tissue.

Criterion 2: Patient has a change in burn wound appearance or character, such as rapid eschar separation; dark brown, black, or violaceous discoloration of the eschar; or oedema at wound margin

and at least *one* of the following:

a. Organisms cultured from blood in the absence of other identifiable infection
b. Isolation of herpes simplex virus, histological identification of inclusions by light or electron microscopy or visualisation of viral particles by electron microscopy in biopsies or lesion scrapings

Criterion 3: Patient with a burn has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C) or hypothermia (<36°C), hypotension, oliguria (<20 cm^3/hr), hyperglycaemia at previously tolerated level of dietary carbohydrate, or mental confusion

and at least *one* of the following:

a. Histological examination of burn biopsy shows invasion of organisms into adjacent viable tissue
b. Organisms cultured from blood
c. Isolation of herpes simplex virus, histological identification of inclusions by light or electron microscopy, or visualisation of viral particles electron microscopy in biopsies or lesion scrapings

Specific site: Breast abscess or mastitis

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

Criterion 1: Patient has a positive culture of affected breast tissue or fluid obtained by incision and drainage or needle aspiration.

Criterion 2: Patient has a breast abscess or other evidence of infection seen during a surgical operation or histopathological examination.

Criterion 3: Patient has fever (>38°C) and local inflammation of the breast *and* physician's diagnosis of breast abscess.

COMMENT:

- Breast abscesses occur most frequently after childbirth. Those that occur within 7 days after childbirth should be considered nosocomial.

Major Infection Site: SYSTEMIC (DISSEMINATED) INFECTION

DEFINITION: Systemic (disseminated) infection is infection involving multiple organs or systems, without an apparent single site of infection, usually of viral origin, and with signs or symptoms with no other recognised cause and compatible with infectious involvement of multiple organs or systems.

REPORTING INSTRUCTIONS:

- This code should be used primarily for viral infections involving multiple organ systems (e.g., measles, mumps, rubella, varicella, erythema infectiosum). These infections often can be identified by clinical criteria alone. Do not use this code for nosocomial infections with multiple metastatic sites, such as with bacterial endocarditis; only the primary site of these infections should be reported.

- **Do not report fever of unknown origin as Systemic (disseminated) infection**.

Major Infection Site: Lower Respiratory Tract Infection (other than pneumonia)

Specific site: Bronchitis, tracheobronchitis, bronchiolitis, tracheitis, without evidence of pneumonia

DEFINITION: Tracheobronchial infections must meet at least one of the following criteria:

Patient has *no* clinical or radiographic evidence of pneumonia
and
patient has at least *two* of the following signs or symptoms with no other recognised cause: fever (>38°C), cough, new or increased sputum production, rhonchi, wheezing
and
at least *one* of the following:

a. Positive culture obtained by deep tracheal aspirate or bronchoscopy
b. Positive antigen test on respiratory secretions

REPORTING INSTRUCTION:

- Do not report chronic bronchitis in a patient with chronic lung disease as an infection unless there is evidence of an acute secondary infection, manifested by change in organism.

Specific site: Other infections of the lower respiratory tract

DEFINITION: Other infections of the lower respiratory tract must meet at least one of the following criteria:

Criterion 1: Patient has organisms seen on smear or cultured from lung tissue or fluid, including pleural fluid.

Criterion 2: Patient has a lung abscess or empyema seen during a surgical operation or histopathological examination.

Criterion 3: Patient has an abscess cavity seen on radiographic examination of lung.

REPORTING INSTRUCTIONS:

- Report concurrent lower respiratory tract infection and pneumonia as Pneumonia.

APPENDIX 3A CRITERIA FOR DEFINING NOSOCOMIAL PNEUMONIA

General comments applicable to all pneumonia specific site criteria

a. Physician's diagnosis of pneumonia alone is *not* an acceptable criterion for nosocomial pneumonia.

b. When assessing a patient for presence of pneumonia, it is important to distinguish between changes in clinical status resulting from other conditions such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, and so forth. Also, care must be taken when assessing intubated patients to distinguish between tracheal colonisation, upper respiratory tract infections (e.g., tracheobronchitis), and early onset pneumonia. Finally, it should be recognised that it may be difficult to determine nosocomial pneumonia in the elderly, infants, and immunocompromised patients because such conditions may mask typical signs or symptoms associated with pneumonia. Alternate specific criteria for the elderly, infants and immunocompromised patients have been included in this definition of nosocomial pneumonia.

c. Pneumonia resulting from gross aspiration (e.g., in the setting of intubation in the emergency room or operating room) is considered nosocomial if it meets any specific criteria and was not clearly present or incubating at the time of admission to the hospital.

d. Positive Gram stain for bacteria and positive KOH mount for elastin fibres and/or fungal hyphae from appropriately collected sputum specimens are important clues that point toward the aetiology of the infection. However, sputum samples are frequently contaminated with airway colonisers and, therefore, must be interpreted cautiously. In particular, *Candida* is commonly seen on stain but infrequently causes nosocomial pneumonia.

Abbreviations
BAL—bronchoalveolar lavage
EIA—enzyme immunoassay
FAMA—fluorescent-antibody staining of membrane antigen
IFA—immunofluorescent antibody
LRT—lower respiratory tract
PCR—polymerase chain reaction
PMN—polymorphonuclear leukocyte
RIA—radioimmunoassay

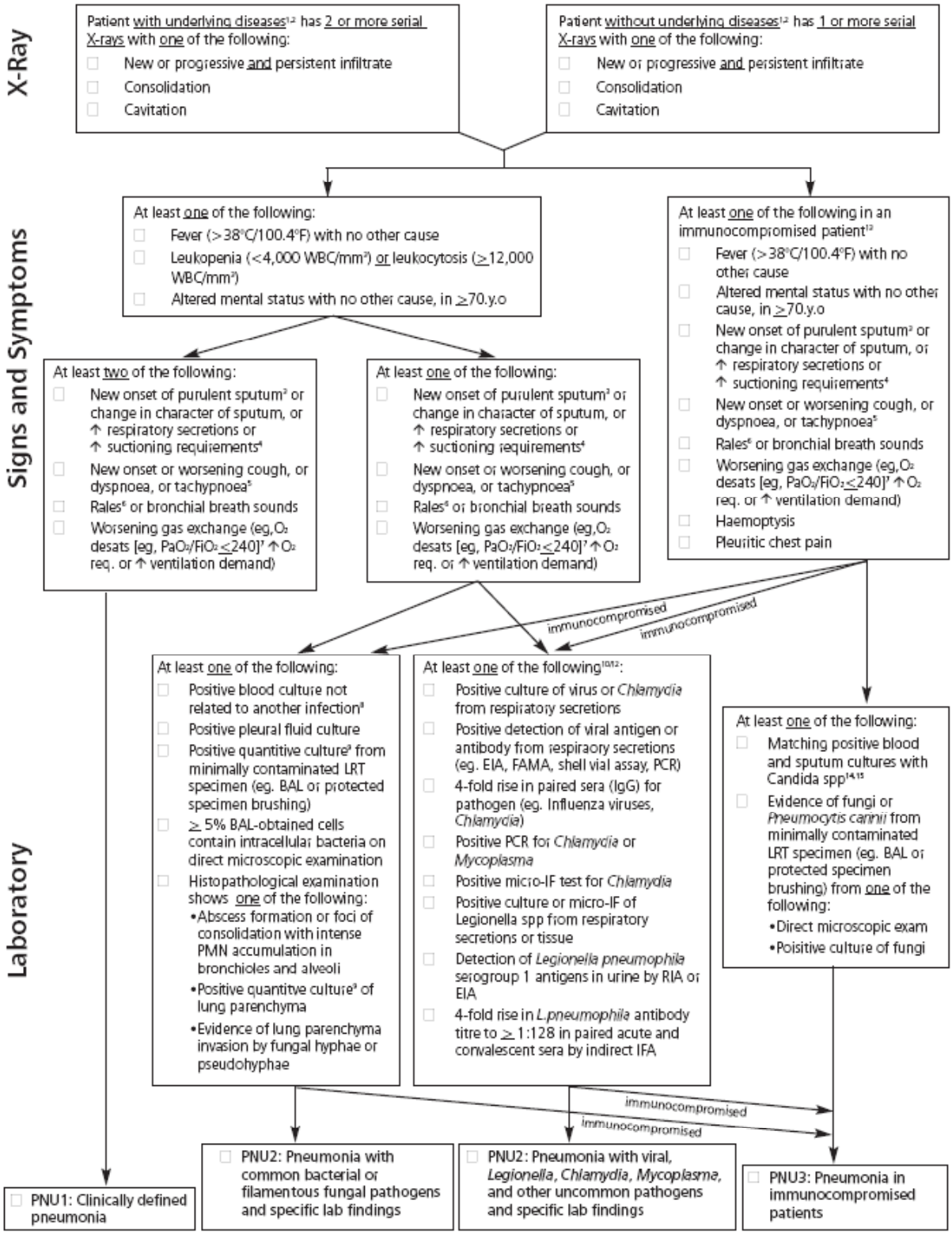
Reporting Instructions

There is a hierarchy of specific site categories within the major site pneumonia.
Even if a patient meets criteria for more than one specific site, report only one:

- **If a patient meets criteria for both PNEU1 and PNEU2, report PNEU2.**
- **If a patient meets criteria for both PNEU2 and PNEU3, report PNEU3.**
- **If a patient meets criteria for both PNEU1 and PNEU3, report PNEU3.**

- Report concurrent lower respiratory tract infection (e.g., abscess or empyema) and pneumonia with the same organism(s) as pneumonia.
- Report acute bronchitis, tracheitis, tracheobronchitis, or bronchiolitis without pneumonia as Lower Respiratory Tract Infection (other than pneumonia).

FIGURE 4. PNEUMONIA FLOW DIAGRAM



APPENDIX 3B PNEUMONIA ALGORITHMS

Table 6. Algorithms for Clinically Defined Pneumonia (PNEU1)

RADIOLOGY	AND SIGNS/SYMPTOMS
Two or more serial chest radiographs with at least *one* of the following[1,2]: New or progressive *and* persistent infiltrate Consolidation Cavitation *NOTE: In patients without underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable[1]*	at least *one* of the following: • Fever (>38°C or >100.4°F) with no other recognised cause • Leukopaenia (< 4,000 WBC/mm^3) or leukocytosis (≥ 12,000 WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognised cause *and* At least *two* of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnoea, or tachypnoea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O2 desaturations [e.g., PaO2/FiO2 ≤ 240][7], increased oxygen requirements, or increased ventilation demand)

Table 7. Algorithms for Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings (PNEU2)

RADIOLOGY	SIGNS/SYMPTOMS	LABORATORY
Two or more serial chest radiographs with at least *one* of the following[1,2]: • New or progressive *and* persistent infiltrate • Consolidation • Cavitation NOTE: In patients without underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), *one definitive* chest radiograph is acceptable[1].	At least *one* of the following: • Fever (>38°C or >100.4°F) with no other recognised cause • Leukopaenia (< 4,000 WBC/mm^3) *or* leukocytosis (≥ 12,000 WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognised cause *and* At least *one* of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnoea, or tachypnoea[5] • Rales6 or bronchial breath sounds • Worsening gas exchange (e.g., O2 desaturations [e.g., PaO2/FiO2 ≤ 240][7], increased oxygen requirements, or increased ventilation demand)	At least *one* of the following: • Positive growth in blood culture[8] not related to another source of infection • Positive growth in culture of pleural fluid • Positive quantitative culture[9] from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing) • ≥ 5% BAL-obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram stain) • Histopathological exam shows at least *one* of the following evidences of pneumonia: Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli Positive quantitative culture[9] of lung parenchyma Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae

Table 8. Algorithms for Pneumonia with Viral, *Legionella*, *Chlamydia*, *Mycoplasma*, and Other Uncommon Pathogens and Specific Laboratory Findings (PNEU2)

Radiology	Signs/symptoms	Laboratory
Two or more serial chest radiographs with at least *one* of the following[1,2]: • New or progressive *and* persistent infiltrate • Consolidation • Cavitation NOTE: In patients without underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), *one definitive* chest radiograph is acceptable[1].	At least *one* of the following: • Fever (>38°C or >100.4°F) with no other recognised cause • Leukopaenia (< 4,000 WBC/mm^3) *or* leukocytosis (≥ 12,000 WBC/mm^3) • For adults ≥ 70 years old, altered mental status with no other recognised cause *and* At least *one* of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, dyspnoea, or tachypnoea5 • Rales6 or bronchial breath sounds • Worsening gas exchange (e.g., O2 desaturations [e.g., PaO2/FiO2 ≤ 240][7], increased oxygen requirements, or increased ventilation demand)	At least *one* of the following[10–12]: • Positive culture of virus or *Chlamydia* from respiratory secretions • Positive detection of viral antigen or antibody from respiratory secretions (e.g., EIA, FAMA, shell vial assay, PCR) • Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, *Chlamydia*) • Positive PCR for *Chlamydia* or *Mycoplasma* • Positive micro-IF test for *Chlamydia* • Positive culture or visualisation by micro-IF of *Legionella* spp. from respiratory secretions or tissue • Detection of *Legionella pneumophila* serogroup 1 antigens in urine by RIA or EIA • Fourfold rise in *L. pneumophila* serogroup **1** antibody titre to ≥ 1 : 128 in paired acute and convalescent sera by indirect IFA

Table 9. Algorithm for Pneumonia in Immunocompromised Patients (PNEU3)

Radiology	Signs/symptoms	Laboratory
Two or more serial chest radiographs with at least *one* of the following[1,2]: • New or progressive *and* persistent infiltrate • Consolidation • Cavitation NOTE: In patients without underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), *one definitive* chest radiograph is acceptable[1].	PNU3 Patient who is immunocompromised[13] has at least *one* of the following: • Fever (>38°C or >100.4°F) with no other recognised cause • For adults ≥ 70 years old, altered mental status with no other recognised cause • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnoea, or tachypnoea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O2 desaturations [e.g., PaO2/FiO2 ≤ 240][7], increased oxygen requirements, or increased ventilation demand) • Haemoptysis • Pleuritic chest pain	At least *one* of the following: • Matching positive blood and sputum cultures with *Candida* spp.[14,15] • Evidence of fungi or *Pneumocytis carinii* from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing) from *one* of the following: – Direct microscopic exam – Positive culture of fungi Any of the following from: LABORATORY CRITERIA DEFINED UNDER PNU2

1. Occasionally, in nonventilated patients, the diagnosis of nosocomial pneumonia may be quite clear on the basis of symptoms, signs, and a single definitive chest radiograph. However, in patients with pulmonary or cardiac disease (e.g., interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other non-infectious conditions (e.g., pulmonary oedema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest radiographs must be examined to help separate infectious from non-infectious pulmonary processes. To help confirm difficult cases, it may be useful to review radiographs on the day of diagnosis, 3 days prior to the diagnosis and on days 2 and 7 after the diagnosis. Pneumonia may have rapid onset and progression but does not resolve quickly. Radiographic changes of pneumonia persist for several weeks. As a result, rapid radiograph resolution suggests that the patient does *not* have pneumonia but rather a non-infectious process such as atelectasis or congestive heart failure.
2. Note that there are many ways of describing the radiographic appearance of pneumonia. Examples include, but are not limited to, air-space disease, focal opacification, and patchy areas of increased density. Although perhaps not specifically delineated as pneumonia by the radiologist, in the appropriate clinical setting these alternative descriptive wordings should be seriously considered as potentially positive findings.
3. Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain ≥25 neutrophils and ≤10 squamous epithelial cells per low power field (X100). If your laboratory reports these data qualitatively (e.g., many WBCs or few squames), be sure their descriptors match this definition of purulent sputum. This laboratory confirmation is required because written clinical descriptions of purulence are highly variable.
4. A single notation of either purulent sputum or change in character of the sputum is not meaningful; repeated notations over a 24-hour period would be more indicative of the onset of an infectious process. Change in character of sputum refers to the colour, consistency, odour, and quantity.
5. In adults, tachypnoea is defined as respiration rate >25 breaths per minute.
6. Rales may be described as crackles.
7. This measure of arterial oxygenation is defined as the ratio of the arterial tension (PaO2) to the inspiratory fraction of oxygen (FiO2).
8. Care must be taken to determine the aetiology of pneumonia in a patient with positive blood cultures and radiographic evidence of pneumonia, especially if the patient has invasive devices in place such as intravascular lines or an indwelling urinary catheter. In general, in an immunocompetent patient, blood cultures positive for coagulase negative staphylococci, common skin contaminants, and yeasts will not be the etiologic agent of the pneumonia.
9. Refer to Table A-2.1 for threshold values of bacteria from cultured specimens. An endotracheal aspirate is not a minimally contaminated specimen. Therefore, an endotracheal aspirate does not meet the laboratory criteria.
10. Once laboratory-confirmed cases of pneumonia due to respiratory syncytial virus (RSV), adenovirus, or influenza virus have been identified in a hospital, clinician's presumptive diagnosis of these pathogens in subsequent cases with similar clinical signs and symptoms is an acceptable criterion for presence of nosocomial infection.
11. Scant or watery sputum is commonly seen in adults with pneumonia due to viruses and *Mycoplasma* although sometimes the sputum may be mucopurulent.
12. Few bacteria may be seen on stains of respiratory secretions from patients with pneumonia due to *Legionella* spp, *Mycoplasma*, or viruses.
13. Immunocompromised patients include those with neutropaenia (absolute neutrophil count <500/mm^3), leukaemia, lymphoma, HIV with CD4 count <200, or splenectomy; those who are in their transplant hospital stay; and those who are on cytotoxic chemotherapy, high dose steroids, or other immunosuppressives daily for >2 weeks [e.g., >40mg of prednisone or its equivalent (>160mg hydrocortisone, >32mg methylprednisolone, >6mg dexamethasone, >200mg cortisone)].
14. Blood and sputum specimens must be collected within 48 hours of each other.
15. Semi quantitative or nonquantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable. If quantitative culture results are available, refer to algorithms that include such specific laboratory findings.

TABLE 10. Threshold values for cultured specimens used in the diagnosis of pneumonia

Specimen Collection/Technique	Values
Lung parenchyma	$\geq 10^4$ CFU/g tissue
Bronchoscopically (B) obtained specimens	
Bronchoalveolar lavage (B-BAL)	$\geq 10^4$ CFU/mL
Protected BAL (B-PBAL)	$\geq 10^4$ CFU/mL
Protected specimen brushing (B-PSB)	$\geq 10^3$ CFU/mL
Nonbronchoscopically (NB) obtained (blind) specimens	
NB-BAL	$\geq 10^4$ CFU/mL
NB-PSB	$\geq 10^3$ CFU/mL