Infection Definitions

INFECTION SURVEILLANCE FOR NEONATOLOGY

CORE MODULE

VERY LOW BIRTH WEIGHT (VLBW)

VERY PRETERM (VPT)

INFANTS

NeoIPC Project
https://neoipc.org/

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TABLE OF CONTENTS

1 INFECTION DEFINITIONS

1.1 PRIMARY SEPSIS/BLOODSTREAM INFECTION

1.1.1 Clinical sepsis

1. Absence of positive microbiological blood and/or cerebrospinal fluid culture

AND

2. Treatment with FIVE or more days of intravenous antibiotics was initiated*

AND

3. Patient has at least TWO of the following clinical or laboratory features of generalized infection:

- Temperature instability, fever (> 38 °C) or hypothermia (< 36.5 °C)
- New/more frequent bradycardia episodes (<80/min) or unexplained tachycardia (>200/min)
- Impaired peripheral perfusion (Capillary refill time of > 3s or skin mottling or core/peripheral temperature gap > 2 °C)
- New/more frequent episodes of apnoea (>20s) or increase in oxygen demand or ventilatory support
- Enteral feeding intolerance, abdominal distension or ileus
- Irritability, lethargy, apathy or unstable condition
- Unexplained metabolic acidosis (base excess < −10 mmol/L; <−10 mEq/L)
- New and unexplained hyperglycaemia (> 140 mg/dl; > 7.8 mmol/L) or hypoglycaemia (< 40 mg/dl; <2.2 mmol/L)
- At least one of the following laboratory findings:
  - Platelet count of < 100×10^9/L (<100×10^3/µL)
  - WBC < 4×10^9/L or > 20×10^9/L (< 4×10^3/µL or > 20×10^3/µL)
  - CRP > 10 mg/L (> 1 mg/dL)
  - Procalcitonin ≥ 2µg/L (2 ng/mL; 200 ng/dL)
  - I/T-Ratio > 0,2 (ratio of immature granulocytes to total granulocytes)
  - Increased levels of interleukin 6 (IL-6) or IL-8

* Antibiotic treatment for at least five days was initiated. The day of the first dose and the day of the last dose are counted. Days where no dose was administered between the first and the last dose (e.g., skipped doses because of high drug levels in therapeutic drug monitoring) are counted as if a dose had been administered. Days after the last dose are not counted regardless of the patient's measured or assumed drug level. If the infant died, was discharged, or transferred before the end of the five-day course of intravenous antibiotics, this condition is met if treatment was scheduled for five days or more.

1.1.2 LCBSI caused by a recognised pathogen

1. **Recognised pathogen* is recovered from a blood and/or cerebrospinal fluid culture**

* see recognised pathogen list

1.1.3 LCBSI caused by common commensals

1. **The same common commensal is recovered from at least TWO blood culture and/or CSF culture specimen collected on separate occasions**

AND

2. **Patient has at least TWO of the following clinical or laboratory features of generalized infection:**

- Temperature instability, fever (> 38 °C) or hypothermia (< 36.5 °C)
- New/more frequent bradycardia episodes (<80/min) or unexplained tachycardia (>200/min)
- Impaired peripheral perfusion (Capillary refill time of > 3s or skin mottling or core/peripheral temperature gap > 2 °C)
- New/more frequent episodes of apnoea (>20s) or increase in oxygen demand or ventilatory support
- Enteral feeding intolerance, abdominal distension or ileus
- Irritability, lethargy, apathy or unstable condition
- Unexplained metabolic acidosis (base excess < −10 mmol/L; <−10 mEq/L)
- New and unexplained hyperglycaemia (> 140 mg/dl; > 7.8 mmol/L) or hypoglycaemia (< 40 mg/dl; <2.2 mmol/L)
- At least one of the following laboratory findings:
  - Platelet count of < 100×10^9/L (<100×10^3/µL)
  - WBC < 4×10^9/L or > 20×10^9/L (< 4×10^3/µL or > 20×10^3/µL)
  - CRP > 10 mg/L (> 1 mg/dL)
  - Procalcitonin ≥ 2µg/L (2 ng/mL; 200 ng/dL)
  - I/T-Ratio > 0,2 (ratio of immature granulocytes to total granulocytes)
  - Increased levels of interleukin 6 (IL-6) or IL-8

OR

1. **A common commensal is recovered from ONE blood culture and/or CSF culture specimen**

AND

2. **At least one of the following laboratory findings:**
   - WBC < 4×10^9/L or > 20×10^9/L (< 4×10^3/µL or > 20×10^3/µL)
   - CRP > 10 mg/L (> 1 mg/dL)
   - Procalcitonin ≥ 2µg/L (2 ng/mL; 200 ng/dL)
   - I/T-Ratio > 0,2 (ratio of immature granulocytes to total granulocytes)
   - Increased levels of interleukin 6 (IL-6) or IL-8

AND

3. **Patient has at least TWO of the following clinical or laboratory features of generalized infection:**
   - Temperature instability, fever (> 38 °C) or hypothermia (< 36.5 °C)
   - New/more frequent bradycardia episodes (<80/min) or unexplained tachycardia (>200/min)
   - Impaired peripheral perfusion (Capillary refill time of > 3s or skin mottling or core/peripheral temperature gap > 2 °C)
   - New/more frequent episodes of apnoea (>20s) or increase in oxygen demand or ventilatory support
   - Enteral feeding intolerance, abdominal distension or ileus
   - Irritability, lethargy, apathy or unstable condition
   - Unexplained metabolic acidosis (base excess < −10 mmol/L; <−10 mEq/L)
   - New and unexplained hyperglycaemia (> 140 mg/dl; > 7.8 mmol/L) or hypoglycaemia (< 40 mg/dl; <2.2 mmol/L)
   - Platelet count of < 100×10^9/L (<100×10^3/µL)

OR

1. **A common commensal is recovered from ONE blood culture and/or CSF culture specimen**

AND

2. **Treatment with five or more days of intravenous antibiotics was initiated***

AND

3. **Patient has at least TWO of the following clinical or laboratory features of generalized infection:**
   - Temperature instability, fever (> 38 °C) or hypothermia (< 36.5 °C)
   - New/more frequent bradycardia episodes (<80/min) or unexplained tachycardia (>200/min)
   - Impaired peripheral perfusion (Capillary refill time of > 3s or skin mottling or core/peripheral temperature gap > 2 °C)
   - New/more frequent episodes of apnoea (>20s) or increase in oxygen demand or ventilatory support
   - Enteral feeding intolerance, abdominal distension or ileus
   - Irritability, lethargy, apathy or unstable condition
   - Unexplained metabolic acidosis (base excess < −10 mmol/L; <−10 mEq/L)
   - New and unexplained hyperglycaemia (> 140 mg/dl; > 7.8 mmol/L) or hypoglycaemia (< 40 mg/dl; <2.2 mmol/L)
   - At least one of the following laboratory findings:
     - Platelet count of < 100×10^9/L (<100×10^3/µL)
     - WBC < 4×10^9/L or > 20×10^9/L (< 4×10^3/µL or > 20×10^3/µL)
     - CRP > 10 mg/L (> 1 mg/dL)
     - Procalcitonin ≥ 2µg/L (2 ng/mL; 200 ng/dL)
     - I/T-Ratio > 0,2 (ratio of immature granulocytes to total granulocytes)
     - Increased levels of interleukin 6 (IL-6) or IL-8

*If the infant died, was discharged, or transferred prior to the completion of five days of intravenous antibiotics, this condition would still be met if the intention were to treat for five or more days.

1.2 NECROTIZING ENTEROCOLITIS (NEC)

NEC surveillance criteria consist of either a combination of radiological findings and clinical signs or a diagnosis based on surgical evidence. The NEC dataset includes information on whether the patient has an intestinal perforation. However, this is not one of the surveillance definition criteria. This means that you should not report cases where you have surgical evidence of intestinal perforation without evidence of primary necrosis or pneumatosis intestinalis (e.g. spontaneous bowel perforation) as NEC.

1. **At least of ONE the following radiological signs (imaging technologies: X-ray, CT, MRI, ultrasound):**
   - Pneumoperitoneum,
   - Pneumatosis intestinalis,
   - Portal venous gas (Hepatobiliary gas),
   - Fixed bowel loops (≥ 24h)

AND

2. **At least ONE of the following clinical signs:**
   - Abdominal distention
   - Abdominal discoloration or shiny/reddish skin tone,
   - Repeated occult (guaiac test) or visible blood in stool (no anal fissure),
   - Increasing/pronounced vomiting (e.g. bilious or bloody)
   - Increased gastric residuals from previous feeding
   - Bilious gastric aspirate (not from transpyloric feeding tube)

OR

1. **At least of ONE the following surgical or pathological findings:**
   - Extensive bowel necrosis (> 2 cm of bowel affected)
   - Pneumatosis intestinalis

1.3 PNEUMONIA

1. **At least ONE of the following imaging findings (imaging technologies: X-ray, CT, MRI, ultrasound) shows <u>new changes</u> suggestive of pneumonia, such as infiltrate, shadowing, opacification, increased density, fluid in the intrapleural cavity or interlobar fissure**

AND

2. **New initiation of respiratory support or escalation of existing level of respiratory support for ≥ 2 days* after at least 2 days of stability or improvement**

AND

3. **At least FOUR of the following clinical or laboratory criteria:**

- Organisms identified[+] from respiratory tract
- New/more frequent bradycardia episodes (<80/min) or unexplained tachycardia (>200/min)
- New or more frequent tachypnoea (>60/min) or new or more frequent apnoea (> 20 s)
- Purulent tracheal aspirate
- New or more frequent symptoms of respiratory distress (retraction, nasal flaring, grunting, chest indrawing)
- Temperature instability or fever (>38 °C) or hypothermia (<36.5 °C)
- Increased respiratory secretion (more frequent endotracheal suctioning required)
- CRP > 10 mg/L (> 1 mg/dL) or increased levels of interleukin 6 (IL-6) or IL-8[#]
- I/T - ratio > 0.2

* New initiation of respiratory support or escalation of existing level of respiratory support that does not improve within less than two days:

- □ Increase in need for FiO_2 ≥ 0.25 (25 points) within 24 hours (daily minimum FiO_2 values must be taken into account) OR,
- □ begin of non-invasive ventilatory support (excluding switch from invasive ventilation) OR,
- □ begin of invasive mechanical ventilation (including switch from non-invasive ventilatory support)

<u>….that does not improve within less than 2 days…:</u> The above-mentioned condition should not improve within two days.
<u>…after at least 2 days of stability or improvement:</u> A stable or improving baseline period of at least two days is required before the above condition occurs.

[+] At least one organism (see below) has been identified from respiratory tract by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, NOT Active Surveillance Culture/Testing (ASC/AST)):

- □ Fungal or bacterial pathogen from secretions of <u>lower</u> respiratory tract OR,
- □ Viral gene, antigen or antibody from secretions of <u>upper or lower</u> respiratory tract (e.g. EIA, FAMA, shell vial assay, PCR)

[#] Interleukin should be used as a parameter when laboratory specifications for a pathological value have been fulfilled.

1.4 SURGICAL SITE INFECTION (SSI)

1.4.1 Superficial incisional SSI

Surgical site infections involving only the skin and subcutaneous tissue belong to this category.

1. First symptoms occur within 30 days after the operation

AND

2. Infection involves only skin and subcutaneous tissue of the incision

AND

3. Patient has at least ONE of the following:

a. Purulent drainage from the superficial incision.

b. Organism(s) identified from an aseptically obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).

c. Superficial incision that is deliberately opened by a surgeon, physician* or physician designee and culture or non-culture-based testing of the superficial incision or subcutaneous tissue is not performed. A culture or non-culture-based test from the deep soft tissues of the incision that has a negative finding does not meet this criterion.

AND

Patient has at least one of the following signs or symptoms: localized pain or tenderness, localized swelling, erythema or heat.

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

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

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

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

1.4.2 Deep incisional SSI

Surgical site infections involving deep soft tissues of the incision (for example, fascial and muscle layers) belong to this category.

1. **First symptoms occur within 30 or 90[#] days after the operation**

   AND

2. **Infection involves deep soft tissues of the incision (for example, fascial and muscle layers)**

   AND

3. **Patient has at least ONE of the following**:

   a. Purulent drainage from the deep incision.

   b. A deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, physician* or physician designee

      AND

      Organism(s) identified from the deep soft tissues of the incision by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)) or culture or non-culture based microbiologic testing method is not performed. A culture or non-culture-based test from the deep soft tissues of the incision that has a negative finding does not meet this criterion.

      AND

      Patient has at least one of the following signs or symptoms: Temperature instability, fever (> 38 °C) or hypothermia (< 36.5 °C); localized pain or tenderness.

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

[#] Follow-up of 90 days applies when an implant was left in place.

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

1.4.3 Organ/space SSI

Surgical site infections involving any part of the body deeper than the fascial/muscle layers that is opened or manipulated during the operative procedure belong to this category.

1. **First symptoms occur within 30 or 90[#] days after the operation**

AND

2. **Infection involves any part of the body deeper than the fascial/muscle layers that is opened or manipulated during the operative procedure**

AND

3. **Patient has at least ONE of the following**:

    a. Purulent drainage from a drain that is placed into the organ/space (for example, closed suction drainage system, open drain, T-tube drain, CT-guided drainage).

    b. Organism(s) identified from fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)).

    c. An abscess or other evidence of infection involving the organ/space that is detected on gross anatomical or histopathologic exam, or imaging test evidence suggestive of infection.

[#] Follow-up of 90 days applies when an implant was left in place.

1.5 SECONDARY BLOODSTREAM INFECTION (OPTIONAL)

Within NeoIPC surveillance, it is possible to record bloodstream infections secondary to pneumonia, NEC, and SSIs. Collecting data on secondary BSI is optional; therefore, it is possible to select **"Unknown"** if you are not following patients for secondary BSI.

To assign a secondary bloodstream infection to a pneumonia, NEC, or an SSI, the following criteria must be met:

1. The blood specimen is collected in the period between 3 days prior and 13 days after the day of primary infection (day of primary infection=first symptoms or first positive culture at the primary infection site).

And,

2. At least one organism from the blood specimen matches an organism identified from the primary infection site.

2 ABBREVIATIONS

3GCR:	Multi drug resistant gram-negative pathogen resistant to 3rd generation Cephalosporins
AB	Antibiotic
ASA	American Society of Anaesthesiologists
BE	Base Excess
BSI	Bloodstream Infection
BW	Birthweight
CDC	Centers for Disease Control and Prevention
CMV	Cytomegalovirus
CRP	C-reactive Protein
CSF	Cerebrospinal Fluid
CT	Computer Tomography
CVC	Central Venous Catheter
ECMO	Extracorporeal Membrane Oxygenation
ESBL	Extended spectrum beta-lactamase
GA	Gestational Age
HIS	Hospital Information System
HIV	Human Immunodeficiency Virus
ICHI	International classification of health interventions
INV	Invasive Ventilation
IPC	Infection Prevention and Control
KC	Kangaroo care
LCBSI	Laboratory Confirmed Bloodstream Infection
MDRO	Multidrug Resistant Organism
MRSA	Methicillin-resistant Staphylococcus aureus
NEC	Necrotizing Enterocolitis
NICU	Neonatal intensive care unit
NIV	Non-invasive Ventilation
OP	Operative Procedure
PDMS	Patient Data Management System
PICC	Peripherally Inserted Central Venous Catheter
PLT	Platelet
PVC	Peripheral Venous Catheter
RCT	Randomised Controlled Trial
SSI	Surgical Site Infection
UAC/UVC	Umbilical Artery Catheter/ Umbilical Venous Catheter
VAE	Ventilator Associated Event
VAP	Ventilator Associated Pneumonia
VLBW	Very Low Birthweight
VPT	Very Preterm
VRE	Vancomycin-resistant Enterococcus
WBC	White Blood Cells

3 IMPRINT

NeoIPC Project

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