Sepsis and Shock

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Aim

This guideline describes the signs and symptoms of sepsis and shock in the neonate and the specific management required.

Risk

Symptoms of sepsis and shock are often non-specific. Delays in recognition and/or management of sepsis and shock can place neonates at increased risk of deterioration and adverse events. A standardised approach to assessment and management aims to minimise these risks.

Sepsis

Key Points

- Always consider sepsis in every sick infant.
- Symptoms are often non-specific and include respiratory distress, apnoea, seizures, hypotonia/lethargy, temperature instability, poor skin perfusion, metabolic acidosis, abdominal distension, feed intolerance and/or septic skin lesions.
- As pathogens and antibiotic choices vary with type of sepsis, differentiate between **early-onset sepsis** (EOS; vertical transmission; onset <72h) and **late-onset sepsis** (LOS; postnatally acquired; onset >72h) as pathogens and management may differ

- Obtain maternal Group B Streptococcus (GBS) status and any evidence of colonisation with resistant organisms (e.g. MRSA, ESBL).
- Pathogens include:
    1. Gram positive organisms: Group B Streptococcus, Group A Streptococcus, Listeria, pneumococcus.
    2. Gram negative organisms: E. coli, Klebsiella sp., Enterobacter sp, Haemophilus sp.
- Also refer to Neonatal Guideline - Sepsis: Neonatal and Recognising and Responding to Clinical Deterioration.

Management

- If in shock then manage as per shock management protocol below.
- Take blood culture, and then administer broad-spectrum antibiotics. **Do not withhold antibiotics if blood culture cannot be taken.**
- Early onset sepsis (EOS): Benzylpenicillin or Amoxicillin and Gentamicin cover most neonatal infections
- Late onset sepsis (LOS):
    1. Consider Benzylpenicillin or Amoxicillin and Gentamicin.
    2. In some situations broader cover may be required (e.g. Piperacillin/Tazobactam or Meropenem) and depends on other organ pathology and/or recent colonization or maternal exposure
    3. Consider Vancomycin and Gentamicin in case of prolonged hospital care or risk of Staphylococcus aureus infection. Discuss with on call consultant regarding the choice of antibiotic if in doubt.
- For suspected meningitis, add Cefotaxime +/- Aciclovir (especially when seizures are present).
- For neonates with septic shock discuss with the infectious diseases physician on call to consider broadening antibiotics
- Bring the placenta back for histology and culture, if available.
- Lumbar punctures and suprapubic urine aspiration are not necessary on transport.

Shock

Shock is a complex syndrome resulting from failure of the circulatory system to meet the oxygen and nutrient needs of the tissues and to remove toxic metabolites. Primary aim is to restore adequate perfusion to vital organs by early recognition (anticipation), appropriate resuscitation (ABCD), aggressive stabilisation, and treatment of the underlying cause.

Phases of Shock

Phase of Shock	Features	Clinical Signs
Compensated	Perfusion to vital organs preserved	Pallor, tachycardia cool skin, decreased capillary refill
Uncompensated	Compensatory mechanisms fail Anaerobic metabolism Lactic acidaemia	Very Pale, very slow capillary refill, tachycardia, acidotic breathing, reduced or absent urine output, depressed cerebral state
Irreversible	Extensive irreversible damage of vital organs	-----

Types of Shock and Aetiology

Type	Physiology	Examples
Cardiogenic	Defect of pump	Asphyxia, hypoxia, cardiomyopathy, arrhythmia
Hypovolemic	Inadequate blood volume	haemorrhage, dehydration
Distributive	Abnormal vascular beds	Sepsis/infection Vasodilators
Obstructive	Flow restriction	Pneumothorax, pericardial effusion
Dissociative	Inadequate oxygen capacity	Severe anemia (acute blood loss)

Shock Management

1. Oxygenation and ventilation

- Supplemental oxygen as required to maintain SaO_2 > 95% (non-cardiac); discuss optimal SaO_2 for suspected cyanotic heart disease with NETS WA consultant and/or cardiologist.
- Intubation and ventilation may be required to optimise oxygenation and ventilation

2. Perfusion

- UVC should be inserted if IV access is difficult; UAC is desirable if requiring inotropes, long transport (if transport will not be delayed significantly).
- Volume expansion with normal saline 10-20mL/kg. Reassess after each bolus. If 40mL/kg has been given consider the need for other fluid (blood, FFP) or inotropic support.

- **Avoid over-vigorous fluid resuscitation** can impede cardiac function, especially in cardiac failure/dysfunction such as asphyxia, congenital heart disease, arrhythmias (e.g., SVT).
- O-negative blood (if available) can be used in emergencies, where blood loss is evident.
    - Please take blood pre-transfusion for cross match and Newborn Screening Test, if time permits.
- Inotrope support (controversial which (if any) agent to use):
    - Dobutamine: has α and β adrenergic effects. Dose: 5-15 mcg/kg/min.
    - Dopamine: has dose-dependent dopaminergic, α and β adrenergic effects. Dose: 2-15 mcg/kg/min.
    - Adrenaline: has α and β adrenergic effects. Intense vasoconstriction at high doses. Reserve when unresponsive to other inotropes (e.g., fulminant sepsis).
    - Noradrenaline has predominantly alpha adrenergic effects.
- Noradrenaline and adrenaline are preferred inotropes in children with septic shock (Weiss SL et al. Intensive Care Med. 2020 Feb;46(Suppl 1):10-67). However, evidence to guide the choice of inotropes in neonates is limited.
- In severe intractable arterial hypotension consider Hydrocortisone IV.
- Correct acidosis by optimising ventilation, perfusion, and energy substrates first. Consider a sodium bicarbonate infusion if acidosis refractory.

3. Energy substrates and fluids.

- Term babies: 60mL/kg/day IV (10% glucose).
- Preterm babies (<34 weeks): 70-80 mL/kg/day IV (7.5% glucose) .
- Very preterm (<27 weeks)/ low birth weight babies: 80-100 mL/kg/day IV (5% glucose).

4. Antibiotics and antiviral agents

- Consider starting on broad spectrum antibiotic as above, and discuss with the on-call consultant / infectious diseases consultant regarding choice of antibiotics. +/- Aciclovir (especially when seizures are present and any suspicion of viral etiology).

Related CAHS internal policies, procedures and guidelines
Neonatal Medication Protocols Neonatology Clinical Guidelines • Blood and Blood Product Administration • Recognising and Responding to Clinical Deterioration. • Sepsis: Neonatal NETS WA Guidelines • Resuscitation: Newborn

This document can be made available in alternative formats on request.

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