Sepsis – Recognition and emergency management in children

Purpose

This document provides guidance for all staff involved in the care and management of children presenting to an Emergency Department (ED) with suspected or proven sepsis in Queensland.

This guideline has been developed by senior ED clinicians and Paediatricians across the state with specialist input from PICU and Infectious Disease staff, Lady Cilento Children’s Hospital, Brisbane. It has been endorsed for use across Queensland by the Statewide Emergency Care of Children Working Group in partnership with the Queensland Emergency Department Strategic Advisory Panel and the Healthcare Improvement Unit, Clinical Excellence Division.

Key points

- Sepsis is a medical emergency: early recognition and treatment is imperative for survival.
- Sepsis must be considered in every child with acute illness or new onset of organ dysfunction.
- Diagnosis is based on clinical judgement supported by laboratory findings.
- Management includes rapid fluid resuscitation, early consideration of inotropes and administration of appropriate antibiotics; ideally within 15 minutes of presentation.
- Early involvement of the paediatric critical care services (onsite or via RSQ) is essential.

Introduction

Despite advances in prevention and treatment of invasive bacterial infections, sepsis remains a leading cause of childhood morbidity and mortality in Australia. Sepsis is a medical emergency. Without treatment, septic shock carries a mortality rate of more than 80% and even with treatment, overall mortality for septic shock remains around 15-20% in children. Delay in both the initiation of appropriate antibiotics and aggressive treatment of shock leads to significantly increased mortality. Sepsis must be considered in every child with acute illness or new onset of organ dysfunction. The initial presentation can be vague and non-specific, particularly in neonates, making early diagnosis challenging. Management includes rapid fluid resuscitation, early consideration of inotropes and administration of appropriate antibiotics; ideally within the first 15 minutes of presentation. Early involvement of paediatric critical care services (onsite or via Retrieval Services Queensland (RSQ)) is essential.

Definitions

Paediatric sepsis is defined as ‘the systemic inflammatory response syndrome in the presence of, or as the result of, suspected or proven infection’. It is a syndrome shaped by both pathogen and host factors. The most common type of pathogens are bacteria (viruses and fungi can result in a similar presentation), which vary according to host factors, including age, comorbidity and geographic location.
Septic shock is a subset of sepsis in which profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality. It is identified by sepsis and cardiovascular organ dysfunction, acknowledging that hypotension is a late sign in children.

### Assessment

#### Early Recognition

Given the time critical nature of sepsis progressing to organ failure and death, early recognition and prompt treatment is imperative to survival. Sepsis should be suspected in any acute illness, or in any high-risk group (see box below), if there is any change from the patient’s normal pattern of observations.

A diagnosis of sepsis is made using clinical judgement, supported by laboratory testing. There is no single clinical finding or test that is diagnostic. Careful clinical examination with particular attention to vital signs, perfusion and mentation should be conducted. If suspected, initiate investigations and treatment until sepsis is excluded. Validated triage tools for paediatric sepsis are currently being developed but are generally based on the identification of risk factors, abnormal vital signs and/or suggestive clinical features.

#### Children at high risk for sepsis

- Neonates and premature infants
- Unimmunised or incomplete immunisation status
- Malignancy and/or chemotherapy
- Immune deficiency
- Asplenia (surgical or functional e.g. sickle cell disease)
- Long-term steroid use
- Immunosuppressant drug therapy
- Recent surgical procedure (within 6 weeks)
- Intravenous recreational drug use
- Indwelling lines or catheters (e.g. VP shunt or CVAD)

Sepsis presentation varies with age. Infants and neonates commonly present with non-specific symptoms and signs, such as feeding difficulties and/or apnoea. Older children may present with a focus of infection and/or a constellation of features including fever or hypothermia, vomiting, inappropriate tachycardia, altered mental state and reduced peripheral perfusion. Deviations from pre-existing trends in vital signs (see table below) can be a red flag.

Features of a toxic presentation include:

- altered mental state
- tachypnoea, increased work of breathing, grunt, weak cry
- marked/persistent tachycardia
- moderate to severe dehydration
- seizures

It is important to pay attention to concerns expressed by the caregiver, particularly changes in usual behaviour of the child.
Normal range for vital signs by age

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate (bpm)</th>
<th>Minimum Systolic BP (mmHg)</th>
<th>Respiratory Rate (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>100-180</td>
<td>60</td>
<td>40-60</td>
</tr>
<tr>
<td>6mth</td>
<td>100-180</td>
<td>70</td>
<td>30-50</td>
</tr>
<tr>
<td>1yr</td>
<td>100-170</td>
<td>70</td>
<td>20-40</td>
</tr>
<tr>
<td>2yr</td>
<td>100-160</td>
<td>70</td>
<td>20-30</td>
</tr>
<tr>
<td>4yr</td>
<td>80-130</td>
<td>75</td>
<td>20-30</td>
</tr>
<tr>
<td>8yr</td>
<td>70-110</td>
<td>80</td>
<td>16-25</td>
</tr>
<tr>
<td>12yr</td>
<td>60-110</td>
<td>90</td>
<td>16-25</td>
</tr>
<tr>
<td>16yr+</td>
<td>60-100</td>
<td>90</td>
<td>10-16</td>
</tr>
</tbody>
</table>

Septic Shock

Septic shock is the progression of sepsis and can present as either cold or warm shock (see table below). Children with septic shock may have normal blood pressure. Hypotension is often a terminal sign given that children compensate with normal blood pressure, even in the late stages of shock.

**ALERT** – Hypotension is a late, and often terminal, sign in paediatric septic shock.

If patient is in septic shock initiate treatment and contact paediatric critical care specialist (onsite or via RSQ).

Paediatric septic shock presentations

<table>
<thead>
<tr>
<th>Cold Shock</th>
<th>Warm Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>More common in infants and young children</td>
<td>More common in older children (and adults)</td>
</tr>
<tr>
<td>Constricted peripheral systemic vasculature: cold peripheries and prolonged capillary refill time</td>
<td>Characterised by vasoplegia, in which the systemic vascular resistance is low: brisk capillary refill time (‘flash’ capillary refill) and pulses are usually felt to be full or bounding</td>
</tr>
<tr>
<td>Tachycardia is usually present</td>
<td>Tachycardia is usually present</td>
</tr>
<tr>
<td>Blood pressure can be maintained until late</td>
<td>Pulse pressure is high, often due to a low diastolic blood pressure</td>
</tr>
<tr>
<td>Underlying problem is a low cardiac output state, secondary to impaired myocontractility</td>
<td>Hyperdynamic or high cardiac output state associated with shock due to enlargement of the circulation exceeding cardiac output</td>
</tr>
<tr>
<td></td>
<td>Progression to low cardiac output can occur anytime</td>
</tr>
</tbody>
</table>
Clinical findings consistent with insufficient end-organ perfusion:

- **Mental status:** progressive lethargy, drowsiness or obtundation. Alternatively, restlessness and/or agitation are often seen and can be mistaken for “a vigorous child” but reflects compromised cerebral perfusion due to shock. Infants tend to have irritability and/or apnoeas.

- **Skin:** temperature gradient from core to extremities (note that either hyperthermia or hypothermia can be present), mottled colour, prolonged capillary refill time (>2 seconds but note that brisk capillary refill time can be seen in warm shock), petechial or purpuric rash. Purpura fulminans is a widespread non-blanching purpuric rash classically seen in meningococcaemia but may also be associated with severe sepsis from *Pneumococcus*.

- **Cardiovascular:** Tachycardia is usually one of the earliest signs. Mean arterial pressure (MAP) can be maintained and the pulse pressure typically is narrow (vasoconstriction to maintain MAP), but may be high (vasodilation in “warm shock”). There may be evidence of cardiac failure (hepatomegaly, gallop rhythm and jugular venous distension) with myocardial depression. A classic pitfall in the recognition of shock is attributing difficulty in obtaining non-invasive blood pressure due to technical issues rather than recognising the presence of hypotension/hypoperfusion.

- **Respiratory:** rate is increased to compensate for metabolic acidosis including lactic acidosis (Kussmaul breathing). Acute respiratory distress syndrome (ARDS) may develop with progressive worsening of respiratory distress (tachypnoea, increased work of breathing) and focal chest signs (reduced breath sounds, inspiratory crepitations, and expiratory wheeze).

- **Renal:** Reduced urine output

**Toxic Shock Syndrome**

Toxic shock syndrome is a potentially life-threatening subset of paediatric sepsis, caused by superantigens from toxin-producing strains of *Staphylococcus aureus* or *Streptococcal pyogenes*. Symptoms may include high fever, vomiting, diarrhoea, myalgia, confusion, collapse and usually a widespread erythematous rash. It can occur in any patient. It is important to distinguish this entity as treatment requires the addition of Lincomycin IV and possibly Intragam IV for their antitoxin properties. [Click here](#) for CHQ antimicrobial sepsis guidelines or refer to local protocols.

**Meningitis (see Meningitis Guideline)**

Meningitis should be considered in children with suspected sepsis as it can result in serious complications, such as raised intracranial pressure (ICP). More specific features may include photophobia, headache, nuchal rigidity, seizures, posturing and a bulging fontanelle (<3 months of age). Possible signs of raised ICP include fluctuating consciousness despite resuscitation, hypertension, bradycardia, abnormal pupils, posturing, seizures or focal neurology.

**Investigations**

No single laboratory test will confirm or refute the diagnosis of sepsis. There is currently no evidence to support the use of a specific biomarker for sepsis diagnosis. Biomarkers may be of more use to decide if antibiotics can be stopped at 48 hours. Clinical findings and host factors should direct specific microbiological sampling. However, despite adequate microbiological sampling, in some children with sepsis the pathogen is not identified (culture-negative sepsis).
Investigations in paediatric sepsis

<table>
<thead>
<tr>
<th>Investigation type</th>
<th>Findings in paediatric sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood culture</strong></td>
<td>Prioritise over other blood tests, take as soon as possible when suspect bacteraemia, prior to antibiotics but should not delay antibiotics.</td>
</tr>
<tr>
<td></td>
<td>Culture sensitivity is proportional to the volume of blood taken</td>
</tr>
<tr>
<td></td>
<td>• minimum of 1 mL in neonatal aerobic culture bottle (yellow top)</td>
</tr>
<tr>
<td></td>
<td>• minimum of 4 mL in standard aerobic culture bottle (green top)</td>
</tr>
<tr>
<td></td>
<td>If the child has a CVAD, blood cultures should be taken from each lumen as per protocol.</td>
</tr>
<tr>
<td><strong>Blood gas</strong></td>
<td>Markers of possible sepsis:</td>
</tr>
<tr>
<td>(usually venous in ED setting)</td>
<td>• base deficit &gt; 5.0 mEq/L</td>
</tr>
<tr>
<td></td>
<td>• lactate &gt; 2.4 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Do NOT attribute increased lactate to difficult venepuncture in this setting. Glucose &lt; 3 mmol/L associated with glycogen depletion and stress response.</td>
</tr>
<tr>
<td><strong>Full blood count</strong></td>
<td>WCC can be high or low in early sepsis but not sensitive or specific.</td>
</tr>
<tr>
<td></td>
<td>Platelet count &lt;80,000uL in sepsis or disseminated intravascular coagulation (DIC).</td>
</tr>
<tr>
<td><strong>C reactive protein</strong></td>
<td>More readily available but less specific than procalcitonin.</td>
</tr>
<tr>
<td></td>
<td>Low value does not exclude early sepsis.</td>
</tr>
<tr>
<td><strong>Electrolytes and creatinine</strong></td>
<td>Often deranged, raised creatinine in sepsis related renal failure.</td>
</tr>
<tr>
<td><strong>Liver function tests</strong></td>
<td>Increased bilirubin or alanine aminotransferase (ALT).</td>
</tr>
<tr>
<td><strong>Coagulation studies</strong></td>
<td>Derangement in the context of sepsis and thrombocytopenia indicative of DIC.</td>
</tr>
<tr>
<td><strong>Urine sample</strong></td>
<td>Collection may not be possible until after fluid resuscitation. Do not withhold antibiotic treatment if significant delay in obtaining sample.</td>
</tr>
<tr>
<td><strong>Lumbar puncture</strong></td>
<td>Only in alert child with no signs of raised ICP or coagulopathy. Usually contraindicated in established sepsis until stable. Do not withhold antibiotic treatment if significant delay in obtaining sample. Can do WCC and PCR for meningitis diagnosis on CSF from delayed LP.</td>
</tr>
<tr>
<td><strong>Radiography</strong></td>
<td>Consider CXR for respiratory distress or signs on examination. Other imaging as directed by the focus of infection e.g. septic joint.</td>
</tr>
</tbody>
</table>
Management

Refer to the flowchart in Appendix 1 for a summary of the recommended emergency management of paediatric sepsis.

Failure to recognise sepsis and the delay in appropriate treatment are common themes in reviews of sepsis related mortality in children. Early aggressive treatment should ensue once sepsis is suspected, with the aim of decreasing tachycardia, improving peripheral perfusion and restoring a normal level of consciousness.

Seek senior emergency/paediatric advice as per local escalation protocols if sepsis is suspected.

Contact paediatric critical care specialist (onsite or via RSQ) for septic child with insufficient response to fluids or needing inotropes/intubation (see box with triggers for escalation).

Interventions within the first 15 minutes:

- Delivery of supplemental oxygen and respiratory support with an appropriate device
- Intravenous or intraosseous access should be immediately obtained and bloods sent
- Umbilical line access can be considered in newborns up to 2 weeks of life
- Initial bloods should include blood cultures, venous blood gas and glucose
- Further bloods can be obtained if possible, including full blood count, C reactive protein, biochemistry and coagulation profile
- Urgent doses of broad spectrum antibiotics should be given via the IV or IO route
- If there is no IV or IO access within 15 minutes, intramuscular Ceftriaxone 50mg/kg (maximum 2 grams BD) should be administered and assistance sought.
- Once IV access is obtained, the full antibiotic IV doses should be provided (see antibiotic guidelines and antibiotic dosing for neonates).
- If > 3 months of age and meningitis is suspected, give Dexamethasone IV 0.15mg/kg prior to or just after the first dose of antibiotics. If not given at this time, corticosteroids can be given up to an hour after initial antibiotics, but do not delay antibiotics if they are not available.
- Immediate fluid resuscitation starting with 20mL/kg of sodium chloride 0.9% (normal saline) to be pushed in <5 minutes using 50mL syringe with a staff member dedicated to pushing fluids, with the goal to restore normal circulating volume and physiological parameters.
- Titrate to response: decrease in heart rate and the improvement of end-organ perfusion. Repeat as necessary, evaluating for signs of fluid overload.
- Commence inotropes if normal physiological parameters are not restored after giving >40mL/kg of fluids or anytime if hypotension is present
- Echocardiography can guide fluid administration and commencement of inotropes

Triggers for escalation to paediatric critical care (onsite or via RSQ)

- tachycardia not improving after 40mL/kg fluid boluses
- reduced level of consciousness
- hypotension
- coagulopathy/DIC
- lactate >4 mmol/L
- inotropes
Ongoing care

Airway and Breathing

- Give high concentration supplemental oxygen
- Initial delivery can be via a Hudson mask non-rebreather with escalation as required
- Maintain the patient’s airway with positioning and airway adjuncts
- Consider high-flow nasal cannulae as an alternative transitory support in awake and responsive patients
- Give PEEP through a T-piece (anaesthetic) bag while preparing for intubation for children that are grunting, obtunded, or hypoxic despite supplemental oxygen.
- Consider inserting a nasogastric tube for gastric distension, which can otherwise impede ventilation
- Intubation may be required for additional respiratory support or airway protection in a child with reduced conscious state, and children in shock (to facilitate the insertion of lines, and support of cardiac function). For QH staff, refer to the Management of Paediatric Septic Shock Guideline.

**ALERT – Child may arrest from cardiovascular collapse on RSI/intubation**

Avoid drugs with negative inotropy e.g., midazolam or propofol. Have the arrest dose of adrenaline IV ready (0.1mL/kg of 1:10,000).

- Adequately pre-oxygenate child and have haemodynamics optimised with concomitant fluid resuscitation and inotrope infusion prior to intubation.
- Reduce the induction drug dose in a child with significant cardiovascular compromise (i.e. 50% of weight based dose).
- Ketamine (0.5 – 1mg/kg) and/or Fentanyl (1-2mcg/kg) for induction (less cardiodepressant) and Rocuronium (1.2mg/kg) for muscle relaxation are generally a suitable combination for rapid sequence induction in sepsis.

Circulation

- Profound fluid loss from the intravascular space occurs due to capillary leak from the systemic inflammatory response
- Fluid resuscitation is aimed at restoring normal physiological parameters, particularly heart rate and blood pressure
- Only isotonic fluids should be rapidly infused - preferably sodium chloride 0.9% (normal saline) (as is readily available). Alternatively use Hartmanns solution or 4% human albumin. Hypotonic fluids should never be used as bolus therapy.
- Possible advantage in using colloids (e.g. 4% human albumin) but currently insufficient evidence to support routine use
- Administer fluids as a rapid bolus (20mL/kg) and repeat as necessary being mindful of the development of fluid overload (inspiratory crepitations, hepatomegaly, and/or gallop rhythm)
- Consider inotropes in fluid-refractory shock, to be started as early as within 15 minutes of presentation (has been shown to improve outcomes)
- First-line choice is adrenaline starting at 0.05-0.1mcg/kg/min (maximum 1mcg/kg/min), which can be administered temporarily via a peripheral IV or IO line before central access is gained in a suitable environment. (Alternative: dopamine starting dose 5-10mcg/kg/min)
- Aliquots of adrenaline IV can be given as 1mcg/kg (i.e. 0.1mL/kg of a 1:100,000 adrenaline solution) if infusion is being prepared and the patient remains in shock. A 1:100,000 adrenaline solution can be prepared by diluting 1mL of 1:10,000 adrenaline solution (i.e. 100 micrograms of adrenaline) with 9mL of sodium chloride 0.9% (normal saline)
Other considerations

- Administer hydrocortisone IV (1mg/kg) in child with suspected or proven adrenal insufficiency.\(^8,25\) Consider in fluid and inotrope resistant shock (limited data on efficacy).
- Consider alternative diagnoses in all patients, especially neonates who may have a metabolic or cardiogenic (congenital duct dependent lesions or acquired cardiac failure e.g. myocarditis).
- Electrolyte disturbance (e.g. hypocalcaemia) is common in critically ill children with sepsis and can contribute to poor cardiac function. Replacement should be in accordance with local guidelines.

When to escalate care

<table>
<thead>
<tr>
<th>Service</th>
<th>Reason for contact by clinician</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Paediatric service</td>
<td>For specialist paediatric advice and assistance with local transfers as per local arrangements.</td>
<td>As per local arrangements</td>
</tr>
</tbody>
</table>
| Children’s Advice and Transport Coordination Hub (CATCH) | For access to specialist paediatric advice and assistance with inter-hospital transfer of non-critical patients into and out of Lady Cilento Children’s Hospital.  
For assistance with decision making regarding safe and appropriate inter-hospital transfer of children in Queensland.  
For QH staff, click here for the QH Inter-hospital transfer request form. | (07) 3068 4510 24 hours CATCH website |
| Telehealth Emergency Management Support Unit (TEMSU) | For access to generalist and specialist acute support and advice via videoconferencing, as per locally agreed pathways, in regional, rural and remote areas in Queensland. | TEMSU QHEPS website 24 hours |
| Retrieval Services Queensland (RSQ)              | For access to telehealth support for, and to notify of, critically unwell patients requiring transfer in Queensland.  
For any patients requiring aeromedical transfer in Queensland.                                                                                       | RSQ QHEPS website 24 hours    |

Related documents

Guidelines
- Febrile illness
- Management of Paediatric Septic Shock
- Management of Fever in a Paediatric Oncology Patient

References


Guideline approval

<table>
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<th>Document ID</th>
<th>CHQ-GDL-60010-Sepsis</th>
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<th>Approval date</th>
<th>Effective date</th>
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<td>Queensland Emergency Care Children Working Group</td>
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Keywords
Sepsis, shock, critical ill, bacterial, emergency, SIRS, deteriorating child, toxic shock syndrome, meningitis, CVAD, nosocomial, paediatric, emergency, guideline, children, 60010

Accreditation references
NSQHS Standards (1-8): 1, 4, 8

Disclaimer
This guideline is intended as a guide and provided for information purposes only. The information has been prepared using a multidisciplinary approach with reference to the best information and evidence available at the time of preparation. No assurance is given that the information is entirely complete, current, or accurate in every respect.

The guideline is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guideline, taking into account individual circumstances may be appropriate.

This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:

- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making in partnership with healthcare practitioners including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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Inotropes & further considerations

**First 60 minutes**

<table>
<thead>
<tr>
<th>Immediate actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attach cardiorespiratory monitoring</td>
</tr>
<tr>
<td>Assess airway and administer oxygen</td>
</tr>
<tr>
<td>Initial assessment</td>
</tr>
</tbody>
</table>

**First 15 minutes**

Establish vascular access
- Insert IO if two attempts at IV fail
- Consider UVC in neonate under 2 weeks of life
- Take bloods:
  - BC, VBG with lactate and glucose (priority)
  - FBC, CRP, UEC, LFT, +/- Coags, +/- Grp and hold
- Administer antibiotics IV (Box C)
  - Ceftriaxone IM 50 mg/kg (max 2 g) if delayed
  - Give full dose/s of antibiotic/s IV once access established

**First 30 minutes**

IV fluid administration with Sodium Chloride 0.9%
- 20 mL/kg bolus over ~ 5 min
- Repeat 20 mL/kg boluses to a maximum of 40-60 mL/kg within first hour
- Each time reassess response
- Aim: improved HR, mentation, perfusion
- Overload: hepatomegaly, crepitations
- Prepare Adrenaline – both infusion and 1:100,000 solution for aliquot doses

**First 60 minutes**

Inotropes & further considerations
- Seek Paediatric Critical Care input as per Box D
- Adrenaline infusion:
  - 1 mL 1:1,000 with 49 mL Glucose 5%,
  - commence 0.05-0.0 microgram/kg/min
  - (can be initially low dose via peripheral IV)
- If delay in infusion: Adrenaline bolus 0.1 mL/kg of 1:100,000 (1 microgram/kg)
- Consider further IV fluid boluses
- Consider early intubation (Box E)
- Correct hypoglycaemia (2 mL/kg Glucose 10%)/hypocalcaemia
- Consider Hydrocortisone IV 1 mg/kg (max 50mg)

**Box A. Toxic features**
- Altered mental state
- Tachypnoea, increased WOB, grunt, weak cry
- Marked/persistent tachycardia
- Moderate to severe dehydration
- Seizures

**Box B. Risk factors for sepsis**
- Age less than 3 months
- Indwelling medical device
- Aboriginal/Torres Strait Islander/Pacific Islander/Maori
- Immunocompromised/asplenia/neutropenia/incomplete immunisation
- Recent trauma or surgery/invasive procedure/wound within 6 weeks
- Chronic disease or congenital disorder

**Box C. Initial antibiotic doses**

**Age less than 2 months**

Sepsis where meningitis possible or bacterial meningitis:
- Ampicillin/Amoxycillin IV 50 mg/kg
- PLUS Cefotaxime IV 50 mg/kg

Sepsis (source unknown but bacterial meningitis excluded):
- Ampicillin/Amoxycillin IV 50 mg/kg
- PLUS Gentamicin IV:
  - Birth to 1 month: 5 mg/kg
  - 1 to 2 months: 7.5 mg/kg

**Age greater than 2 months**

Sepsis with or without bacterial meningitis:
- Cefotaxime IV 50 mg/kg (maximum 2 g)
- OR Ceftriaxone IV 100 mg/kg (maximum 4 g)

If documented cephalosporin anaphylaxis:
- Ciprofloxacin IV 10 mg/kg (maximum 400 mg)
- PLUS Vancomycin IV 15 mg/kg (maximum 750 mg)

If septic shock requiring inotropes:
- Cefotaxime IV 50 mg/kg (max 2 g) (OR Ceftriaxone IV 100 mg/kg (max 4 g))
- PLUS Vancomycin IV 15 mg/kg (maximum 750 mg)
- PLUS Gentamicin IV
  - 1 month to 10 years of age: 7.5 mg/kg (maximum 560 mg)
  - More than 10 years of age: 7 mg/kg (maximum 640 mg)

If risk factors for nmMRSA:
- ADD Lincomycin IV 15 mg/kg (maximum 1.2 g)

If risk factors for multi-resistant MRSA:
- ADD Vancomycin IV 15 mg/kg (maximum 750 mg)

Consult CHQ Antibiocard for ongoing doses. Review and rationalise antimicrobial therapy based on clinical condition and microbiology results.

**Box D. Triggers for escalation to Paediatric Critical Care**
- No improvement after 40 mL/kg fluid administration
- Inotropes
- Reduced level of consciousness
- Hypotension
- Lactate > 4 mmol/L

**Box E. Intubation/RSI**
- Potential for deterioration/cardiac arrest
- Prepare Adrenaline bolus dose 1mL of 1:10,000 made up to 10 mL with Sodium Chloride 0.9% at dose 0.1 mL/kg
- Use RSI drugs to optimise physiology
- Ketamine IV 0.5 – 1 mg/kg
- +/- Fentanyl IV 1 – 2 microgram/kg
- Rocuronium IV 1.2 mg/kg

**Brief Overview**

**0 minutes**
- Recognition
  - Fever greater than 38.5°C or hypothermia
  - Looks sick or toxic (Box A)
  - Irritable or drowsy
  - Poor perfusion/purpura/petechiae
  - Close attention to vital signs and risk factors (Box B)

**First 5 minutes**
- Immediate actions
  - Attach cardiorespiratory monitoring
  - Assess airway and administer oxygen

**First 15 minutes**
- Establish vascular access
  - Insert IO if two attempts at IV fail
  - Consider UVC in neonate under 2 weeks of life

**First 30 minutes**
- IV fluid administration with Sodium Chloride 0.9%
  - 20 mL/kg bolus over ~ 5 min
  - Repeat 20 mL/kg boluses to a maximum of 40-60 mL/kg within first hour

**First 60 minutes**
- Inotropes & further considerations
  - Seek Paediatric Critical Care input as per Box D
  - Adrenaline infusion:
    - 1 mL 1:1,000 with 49 mL Glucose 5%,
    - commence 0.05-0.0 microgram/kg/min
    - (can be initially low dose via peripheral IV)
  - If delay in infusion: Adrenaline bolus 0.1 mL/kg of 1:100,000 (1 microgram/kg)
  - Consider further IV fluid boluses

**Abbreviations**

- IO = Intra Osseous
- UVC = Umbilical Venous Catheter
- BC = Blood Culture
- VBG = Venous Blood Gas
- FBC = Full Blood Count
- CRP = C Reactive Protein
- UEC = Urea, Electrolytes & Creatinine
- LFT = Liver Function Tests
- IV = Intravenous
- HR = Heart Rate
- WOB = Work of Breathing
- RSI = Rapid Sequence Induction

**Contact**
- Seek urgent senior emergency/paediatric advice as per local practice
- Contact Retrieval Services Queensland (RSQ) on 1300 799 127 if no Paediatric Critical Care facility onsite

**CHQ Antibiotic Card**