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# Clinical Guidance

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## Paediatric Critical Care: Sepsis

### Summary

This guideline is for staff to use when treating children with sepsis. It also gives advice on interventions, shock, resuscitation and intubation

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Relevant external law, regulation, standards	
<p>This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children. This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Change History		
Date	Change details, since approval	Approved by
September 2021	Routine high flow oxygen no longer advised. Reflect UK resus guidance changes: 10ml/kg bolus not 20ml/kg, balanced crystalloid not saline, adrenaline not dopamine. Updated PICU practice: NIRS, argipressin, ECMO.	

# Sepsis (early management)

Guideline for management of sepsis: patients may have shock +/- meningitis. Focus may be clear (purpura of meningococcal) or occult.

## Initial Intervention

- Intravenous access x 2 within 5 mins or 2 attempts, Intraosseous if IV difficult
- Gas, sugar, B/C, FBC, clotting, U&E, CRP, X match, PCR, consider [PIMS-TS bloods](#)
- **Antibiotics early (confirm allergy status):**
  - < 1 month – IV cefotaxime & IV amoxicillin & aciclovir IV
  - > 1 month – IV ceftriaxone 80mg/kg
  - Add IV vancomycin if indwelling line/VP shunt
  - Add IV clindamycin if features of toxic shock
  - Travel outside UK/risk of Abx resistance/allergy-consult ID
- Evaluate level of consciousness and pupils

## Initial resuscitation

- Shock– tachycardia / poor pulses / obtunded / low BP / lactate
- Titrate O<sub>2</sub> (if required) to maintain saturation 94-98%
  - HFNC / NIV if respiratory failure / hypoxaemia but adequate respiratory drive
  - Bolus 10ml/kg “balanced” crystalloid (e.g Hartmanns)- review HR/BP/cardiac failure signs
  - Use ideal body weight for fluid resuscitation<sup>1</sup>
  - Repeat crystalloid bolus up to 40-60ml/kg, titrate to response

## Fluid refractory shock (shock despite 40-60mls/kg)<sup>3</sup>

- If only peripheral line then start adrenaline (concentration 0.3mg/kg per 50ml up to max of 4mg in syringe)
- If central line or IO then start **adrenaline or noradrenaline** as per below flow chart
  - Intubate and ventilate: **anticipate decompensation**
  - Continue fluid resuscitation if positive response to fluid

## Risk factors and alerts

- Age < 12 months
- Extensive/ rapidly spreading rash<sup>4</sup> (20% with meningococcal sepsis have no rash)
- Recent history of varicella (consider IV aciclovir)/ burns (consider toxic shock)
- Immunosuppression including recent chemotherapy / long-term steroids
- Low platelets/ low wbc / coagulopathy: may be normal initially & rapidly change
- Persistent tachycardia despite fluid therapy
- Hypotension is late sign
- Obtundation and depressed level consciousness

## Rapid reversal of shock improves outcome

### Urgent intervention & reassessment is key

**Exclude cardiac cause (hepatomegaly, cardiomegaly, ECG)**  
**Indwelling line/VP shunt=potential focus- add IV vancomycin**

**Features of Toxic shock- add IV clindamycin**

**Features of PIMS-TS – refer to [PIMS-TS guideline](#)**

**DO NOT PERFORM LUMBAR PUNCTURE<sup>5</sup>**

## Depressed level of consciousness (LOC)

Differential: shock, meningitis, raised ICP

- Treat [seizures](#). Correct hyponatraemia and low sugar
- Raised ICP: relative bradycardia, posturing/seizures, abnormal pupils -may mask shock with relative bradycardia/ hypertension
- Give osmotherapy: 3mL/kg of 2.7% sodium chloride
- Impending herniation: hyperventilate, give further 3 mL/kg 2.7% sodium chloride
- Consider steroids if <12hours since first antibiotics and clinical signs of bacterial meningitis<sup>6</sup> (Dexamethasone 0.15mg/kg IV, max 10mg QDS x 4)

## Ongoing support

- Exclude other sites of infection eg necrotising fasciitis
- Ventilation: may need to ↑PEEP if pulmonary oedema/ poor oxygenation
- Monitor: core temp, arterial BP/ gas, CVP, lactate, central venous sats, NIRS
- Optimise haemoglobin (maintain Hb > 100g/l; oxygen delivery) and correct clotting abnormalities
- Ongoing volume resuscitation may be required in addition to inotropes
- Consider cooling to 36-37°C if pyrexia causing compromise, surface cooling or cold fluid (boluses can be cooled to 4°C - produces rapid cooling)
- Observe urine output/electrolytes and correct abnormalities. Check CK.
- At risk of pressure sores-consider pressure relieving mattress on admission
- Consider immunoglobulin (IVIg) in toxic shock
- Liaise with ID if concerns regarding Abx resistance or rationalisation
- May require urgent CVVH on arrival to PICU
- PICU: Consider milrinone if cold shock or cardiac impairment
- PICU: Consider argipressin if warm shock despite escalating noradrenaline
- ECMO has a role for refractory sepsis<sup>7</sup>- better outcomes if due to cardiac dysfunction rather than vasoplegia

## Public Health

- Refer to [website regarding notifiable diseases](#) and prophylaxis
- Common notifiable diseases: invasive group A Strep, meningococcal, acute meningitis/encephalitis
- [Prophylaxis if meningococcal confirmed or probable:](#)
  - Household contacts during the 7 days before onset of illness (+ offer vaccination – see full guidance)
  - Health workers exposed to resp secretions in first 24 h of treatment
  - Treat with oral ciprofloxacin (all ages and in pregnancy)
- If meningococcal, patient no longer infectious after 24 h of treatment

## References

1: <https://www.sccm.org/SurvivingSepsisCampaign/Guidelines/Pediatric-Patients> 2: Baines: Arch Dis Child:2000;83, 510-13. 3: Dellinger: Crit Care Med 2004 32 (3) 858-73. 4: Baines: Br J Anaesth 2003;90 1, 72-83. 5: Rennick: BMJ 1993; 306, 6883, 953-955. 6: NICE Clinical Guideline CG102, 2010. 7: Ramanathan K. Crit Care. 2020 Dec 7;24(1):684.

## Gain central access if possible (USS guidance preferable).

Adrenaline safe to give peripherally  
 Noradrenaline ideally via central line/IO

**Warm shock**  
 Wide pulse pressure

**Cold shock**  
 Narrow pulse pressure

Start **noradrenaline base**  
**0.1 micrograms/kg/min**  
 Titrate to response  
 (max 1microgram/kg/min)

Start **adrenaline**  
**0.1 micrograms/kg/min**  
 Titrate to response  
 (max 1microgram/kg/min)

## No or minimal response = catecholamine resistant shock

- Ensure inotrope dose/delivery correct
- Exclude other causes (pericardial effusion, pneumothorax, ongoing blood loss, intracranial event)
- Give hydrocortisone IV 2mg/kg bolus<sup>2</sup>

**Low BP, warm shock**  
 -Add adrenaline

**Low BP, cold shock**  
 -Maximise adrenaline  
 -consider 2<sup>nd</sup> agent

## Intubation: other indications

- Hypoxia (sats<92% despite oxygen)
- Altered level of consciousness
- Signs of raised ICP

## INTUBATION

- **Early intubation for shock improves outcome<sup>3</sup>**
- Most experienced practitioner to intubate
- Cuffed ETT (except neonates)
- Induction of anaesthesia may cause cardiovascular instability: consider ketamine, avoid propofol
  - NG tube and aspirate stomach
  - Pre-oxygenate for 3 minutes
  - Ongoing volume resuscitation throughout
  - Inotrope infusing (prepare boluses of phenylephrine/ “weak adrenaline” if experienced in this)
  - Cardiac arrest drugs available
  - Capnography required
- Avoid nasal intubation if coagulopathy or low platelets
- May require high PEEP if pulmonary oedema