Septic shock and sepsis-associated organ dysfunction in children

RECOGNITION

Assess with ABCDE approach

A, B assessment

- Airway, RR, work of breathing, oxygen saturations, breath sounds, recognition respiratory distress/failure.
- Open airway and start high-flow oxygen via non-rebreather mask with reservoir or BMV as appropriate.

C assessment

- HR, CRT, BP, peripheral and central perfusion, rhythm recognition; recognition circulatory failure/shock.
- Establish IV/IO access (take blood cultures, full blood count, blood glucose, urea and electrolytes, lactate*, blood gas and other bloods as indicated**) and give fluid resuscitation as below.

D assessment

- AVPU score; recognition of altered mental status secondary to poor perfusion.

E assessment

- Rash, temperature (high or low).

Sepsis is diagnosed if there is evidence of infection as cause of the acute illness (suspected or proven) plus at least two of the following: core temperature < 36°C or > 38.5°C; white cell count elevated or depressed for age; inappropriate tachycardia; altered mental state; reduced peripheral perfusion.

10–15 MIN

Initial resuscitation

- If no signs fluid overload (hepatomegaly, crackles at lung bases) then give 10 mL kg^{-1} balanced crystalloids*** IV bolus over 5–10 min and re-assess after each bolus up to 40–60 mL kg^{-1} or until perfusion improved.
- Therapeutic end points: CRT < 2 s; normal BP for age; UO > 1 mL kg^{-1} h^{-1}, normal pulses, normal mental state.
- Watch for signs of fluid overload; if present stop bolus therapy and start inotropic support.
- Correct hypoglycaemia and hypocalcaemia.
- Start broad-spectrum antibiotics; seek and aggressively control any infection source.
- Call for more senior help and an anaesthetist urgently; call PICU for bed +/- PICU transfer team.
- If mechanical ventilation is required, then cardiovascular instability during intubation is less likely after appropriate cardiovascular resuscitation.

15–60 MIN

Fluid refractory shock?

Start IV/IO inotrope infusion; central (preferable) or peripheral IV (clinical signs unreliable at differentiating 'warm' and 'cold' shock in children).

Adrenaline 0.05–0.3 mcg kg^{-1} min^{-1} (use more dilute infusion if peripheral)

and/or

Noradrenaline via central IV or IO, starting infusion rate 0.05 mcg kg^{-1} min^{-1}

Titrate inotropes upwards according to clinical response and haemodynamic effects using haemodynamic monitoring (where possible)****

Use ketamine +/- atropine IV/IO/IM to gain central access and airway if needed.

Fluid and catecholamine-resistant shock?

Further management as per Paediatric Intensive Care/retrieval service advice.

Warm shock – high cardiac output with low systemic vascular resistance.	**Cold shock** – low cardiac output with high systemic vascular resistance.	**Fluid in mL kg^{-1} should be dosed for ideal body weight (max bolus 500 mL)**

* lactate measurements are useful if available as they have prognostic ability if measured serially.

** Other bloods that may be indicated: coagulation studies, liver function tests, magnesium levels or any others indicated by the child's clinical picture.

*** Balanced (buffered) fluids are used in preference to 0.9% sodium chloride, but if not available, 0.9% sodium chloride should be used.

**** These are starting dose ranges for these inotropes, and increases may be necessary but should be guided by PICU retrieval team/senior clinicians. Choice of inotropes is dictated by clinician preference, response to treatment and monitored parameters, and again decisions should be made in conjunction with PICU teams.