

# Drowning in children

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# Paediatric Trauma Guidelines

## Drowning

### Background

Definition = a process resulting in primary respiratory impairment from submersion / immersion in a liquid medium (ILCOR).

Pathology is associated with

- Hypoxia
- Bradycardia and other arrhythmias
- Hypothermia
- Associated injuries including C-spine

### Management

**On arrival to the ED, assess and deal with airway, breathing, circulation and disability as per APLS guidelines**

Respiratory deterioration and chest x-ray changes can be delayed for 4-6 hours after submersion and children who have initially apparently recovered **should be observed for at least 8 hours.**

### Airway (C-spine) and breathing

- protect C-spine if mechanism of injury suggests the possibility of cervical spine injury. Start with manual in-line stabilisation. If this is not possible, use head block and strapping. Get patient off spinal board ASAP. Nurse flat with spine in alignment. Log-roll to move patient.
- If spontaneously breathing administer high flow oxygen
- Intubate and ventilate if:
  - Inadequate respiration or persisting depressed conscious state
  - Falling PaO<sub>2</sub> despite supplemental inspired oxygen
- Measure oxygen saturations, respiratory rate, and blood gas
- Perform CXR

### Circulation

- Assess and monitor heart rate, blood pressure and capillary return
- Insert large bore intravenous cannula

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- Check FBC, electrolytes and creatinine, coagulation screen, blood cultures.
- If circulation is inadequate give fluid and / or blood bolus(es)
- Consider early inotropic support (unless severely hypothermic)

### Disability

- Assess and monitor GCS, pupils and blood sugar
- Check core temperature
- Analgesia

Insert nasogastric or orogastric tube if intubated or depressed conscious level.

Prophylactic antibiotics not recommended.

Secondary survey to ensure any injuries sustained during drowning identified.

May require CT brain / C-spine – discuss with Trauma Team Leader / Radiology.

### Treat hypothermia

- Active core re-warming if core temp below 30° C.
- External re-warming if temp over 30° C.
- Aim temperature rise 0.25-0.5° C per hour.
- Arrhythmias can occur, some refractory to electricity and drugs below 30° C.
  - Restrict to 3 shocks and no drugs.
- Resuscitation should be continued until core temperature is above 32° C or cannot be raised despite active measures.
- Most hypothermic children are also hypovolaemic and will require filling with warm intravenous fluids or blood.

#### Re-warming strategies

##### External

- Remove cold, wet clothing
- Warm blankets
- Bair Hugger blanket
- Infra-red radiant lamp

##### Core

- Warm intravenous fluids to 39° C
- Warm ventilator gases
- Gastric or bladder lavage
- Extracorporeal blood re-warming

#### Adverse prognostic factors

- Immersion time > 10 minutes.
- Time to effective BLS > 10 minutes
- Prolonged time to first respiratory effort
- Persisting coma
- Arterial blood pH < 7.1 despite treatment.

Prolonged resuscitation may be necessary and the decision to stop resuscitation should be taken after all prognostic indicators have been considered.