

# South West Paediatric Major Trauma Network

## Drowning in Children:

### Guideline for Initial Management and Transfer



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<b>Date Approved:</b>	June 2019
<b>Date for Review:</b>	June 2021

### **DROWNING: Respiratory impairment following immersion/submersion in a liquid medium.**

#### Prognosticators

**Positive:** GCS >5, cardiac output and spontaneous breathing in ED

**Negative:** age <3yrs, submersion >10mins, time to CPR >10mins, CPR >30mins, time to spontaneous breathing >40mins, core temp <33°C on arrival, pH <7.1 / PaO<sub>2</sub> <8kPa despite treatment

#### PRE-HOSPITAL & CARDIAC ARREST MANAGEMENT

Early bystander CPR dramatically affects chance of survival. If cardiac arrest: APLS algorithm and adjust if hypothermic.

**<30°C:** Aggressively rewarm (see Rewarming); avoid adrenaline/amiodarone and max 3 defib attempts until >30°C

**30-35°C:** Defibrillate as usual; resus drugs every 8 mins. **Continue CPR until >32°C or temp not risen despite active re-warming**

**ASYMPTOMATIC DISCHARGE CRITERIA:** Hourly monitoring. Minimum of 8h obs in hospital: normal RR, HR/pulse & BP, sats >94% in air; return to normal mobility; caregiver willing to return to hospital if deterioration.

**SYMPTOMATIC with SPONTANEOUS BREATHING:** Admit to HDU until obs normal. Hourly monitoring.

B: If sats <94% in air: CXR & O<sub>2</sub>; if sats <94% on oxygen call WATCH: consider HFNC/NIV (+ salbutamol nebs for wheeze) C: 20mls/kg bolus as required.

**A** Maintain airway with C-spine control (Manual In-Line Stabilisation)  
*Indications for intubation: Airway compromise; Inadequate spontaneous breathing; Sats <90% despite high flow oxygen; GCS ≤8*  
 Intubation with cuffed ET tube (Use local checklist: prepare for risk of malignant arrhythmias)  
 Insert gastric tube to drain stomach

**B** Ventilate with "Protective lung strategy"  
 • Optimise PEEP to achieve oxygenation, may need 10+cm H<sub>2</sub>O  
 • Target tidal volumes 6-8mls/kg; limit PIP to 30cmH<sub>2</sub>O  
 • Permissive hypoxia: Sats 88-94%  
 • If struggling, hand ventilate as appropriate

**C** Treat hypotension and hypovolaemia  
 • At least two IV/IO access sites; consider arterial line  
 • 2/3 maintenance fluids of 0.9% saline / plasmalyte / Hartmann's  
**Adrenaline:** Start at 0.1 mcg/kg/min (1ml/h central; 10ml/h peripheral) (<http://www.watch.nhs.uk/drug-sheet/>)

**D** Assess & document (prior to RSI):  
 Pupil size & reactivity; GCS; Focal neurology; Posturing or seizure  
 Avoid seizures: Load Keppra (20mg/kg) or Phenytoin (20mg/kg)

**E** Treat hypothermia, target core temp >35°C (see rewarming)  
 Check glucose (aim > 3mmol/l)  
 Treat with iv co-amoxiclav, only if grossly contaminated liquid

#### OBJECTIVES:

- Maintain oxygenation/ventilation & circulation
- Minimise Secondary Brain Injury
- Rewarm but avoid hyperthermia

#### COMMUNICATION & TRANSPORT

Paediatric Trauma Team Leader (Consultant ED PMTC)

Call: 0300 0300 789, choose Option 2

**PTTL must include WATCH consultant on conference call**

**WATCH WILL UNDERTAKE TRANSFER TO PICU**

#### RAPID SEQUENCE INDUCTION Use local RSI checklist

Suggested Induction: Ketamine 1-2 mg/kg +/-

Fentanyl 1-3 micrograms/kg

Muscle relaxant: Rocuronium 1-2 mg/kg

Maintenance: Morphine, midazolam and rocuronium infusions

#### NEUROPROTECTION

Aim to ventilate to End-Tidal CO<sub>2</sub> of 4.0 - 4.5 kPa

Analgesia, sedation, muscle relaxants.

Head midline (protect C-spine but no collar). Head up to 30°

**Critical ICP:** ↓HR, ↑BP, dilated pupil

Bolus Hypertonic saline 3ml/kg of 5% or 5ml/kg of 2.7%

Subsequent doses 1-3ml/kg, do not exceed [Na<sup>+</sup>]

>150mmol/l

#### INVESTIGATIONS: (consider medical cause of drowning,

e.g. arrhythmias, long QT, seizures, intoxication, NAI)

Bloods: ABG; FBC, coagulation; U&Es, glucose, LFTs, CRP, CK. Consider drug/alcohol screen.

Radiology: CXR, CT head & c-spine (+/- chest)

12-lead ECG

#### RE-WARMING

Passive external: careful handling; remove wet clothes; warm blankets

Active external: Air blanket re-warmer; radiant heat

Active internal: Warmed intravenous fluids (40-44°C); Pleural/bladder (10ml/kg)/stomach/peritoneal lavage