University Hospitals of Leicester NHS Trust

Nottingham University Hospitals NHS Trust

Drowning CoMET Guideline

This guideline is for use by healthcare staff, at CoMET undertaking critical care retrieval, transport and stabilisation of children, and young adults.

CoMET is a Paediatric Critical Care Transport service and is hosted by the University Hospitals of Leicester NHS trust working in partnership with the Nottingham University Hospitals NHS Trust.

The guidance supports decision making by individual healthcare professionals and to make decisions in the best interest of the individual patient.

This guideline represents the view of CoMET, and is produced to be used mainly by healthcare staff working for CoMET, although, professionals, working in similar field will find it useful for easy reference at the bedside.

We are grateful to the many existing paediatric critical care transport services, whose advice and current guidelines have been referred to for preparing this document. Thank You.

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Approved By:	**UHL Clinical Policy & Guidelines Committee**
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Version:	(2)
Next Review Date:	**May 2031**

Education and Training

1. Annual Transport team update training days

2. Workshops delivered in Regional Transport Study days/ Outreach

Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Incident reporting	Review related Datix	Abi Hill – Lead Transport Nurse abi.hill6@nhs.net	Monthly	CoMET Lead Governance Meeting
Documentation Compliance	Documentation Audit	Abi Hill – Lead Transport Nurse abi.hill6@nhs.net	3 Monthly	CoMET Lead Governance Meeting

Equality Analysis Assessment

5.1 The Trust recognises the diversity of the staff and local community it serves. Our aim therefore is to provide a safe environment free from discrimination, harassment and victimisation and treat all individuals fairly with dignity and respect and, as far as is reasonably possible, according to their needs.

5.2 As part of its development, an Equality Analysis on this policy have been undertaken and its impact on equality have been reviewed and no detriment was identified.

OR if 5.2 above does not apply seek wording from The Head of Equality on equality@uhl-tr.nhs.uk

EDI Statement

We are fully committed to being an inclusive employer and oppose all forms of unlawful or unfair discrimination, bullying, harassment and victimisation. It is our legal and moral duty to provide equity in employment and service delivery to all and to prevent and act upon any forms of discrimination to all people of protected characteristic: Age, Disability (physical, mental and long-term health conditions), Sex, Gender reassignment, Marriage and Civil Partnership, Sexual orientation, Pregnancy and Maternity, Race (including nationality, ethnicity and colour), Religion or Belief, and beyond.

We are also committed to the principles in respect of social deprivation and health inequalities.

Our aim is to create an environment where all staff are able to contribute, develop and progress based on their ability, competence and performance. We recognise that some staff may require specific initiatives and/or assistance to progress and develop within the organisation.

We are also committed to delivering services that ensure our patients are cared for, comfortable and as far as possible meet their individual needs.

1. Key Words

Drowning, APLS, Hypothermia, Submersion, Immersion

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) **Rebecca Etherington – CoMET Nurse** **Mohammad Zoha – CoMET Consultant**	**Executive Lead** **Gang Xu – Medical Director**
Details of Changes made during review: **Emails updated to reflect nhs.net** **12 lead ECG check for arrhythmia's added to investigations** **Warmed IV fluids changed from 40 degrees to 39 degrees as per APLS guidance** **Load with Levetiracetam changed to if seizing**	

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Clinical History
Drowning:
Respiratory impairment from submersion or immersion in a liquid

Objectives

- Maintain oxygenation, ventilation and circulation
- Minimise secondary brain injury
- Rewarm but avoid hyperthermia

Important points to note

- Immersion time
- Cardio/respiratory arrest? Details of timings and resus start
- Mechanism of immersion and other injuries
- Pre-existing medical condition
- Local team refer to social care, child protection +/- police
- Alcohol/illicit drugs (consider in adolescents)

Considerations
Prophylactic Antibiotics have no role they do not improve outcome & should be restricted to patients demonstrating signs of infection, sepsis or when submersion in grossly contaminated water has occurred.

Cardiac arrest
Resuscitation using **APLS Guidelines** (Adjust if hypothermic)

C-Spine Control
Assume cervical spine injury until proven otherwise

Investigations & Biochemistry to consider

- Chest x-ray
- ECG
- Further trauma imaging
- Toxicity Screen
- CT scan/MRI brain
- Blood gas including Glucose
- FBC, U+E, LFT's, Coagulation, CK, serum osmolality
- Sputum culture
- 12 lead ECG check for arrhythmia

Refer to CoMET if:

- Required cardiopulmonary resuscitation and has achieved ROSC
- Ongoing cardiovascular instability
- Signs of respiratory failure (hypoxia, high CO2 or increased work of breathing)
- Abnormal blood gases on arrival
- Reduced or altered level of consciousness
- Hypothermia

Clinical Signs

- Respiratory compromise
- Evidence of hypoxic brain injury
- Signs of trauma (head and cervical spine)
- Hypothermia
- Cardiac arrhythmia
- Rhabdomyolysis from shivering

Rewarming

Warm if core temperature <30°C
Hypothermia slows metabolism, reduces oxygen consumption and the inflammatory response. Hypothermia in a cardiac arrest situation in drowning is usually secondary to the arrest and not the immersion. Prolonged, profound hypothermia may make resuscitation and rewarming impossible.

Rewarm rapidly to 32 degrees and then **0.25 - 0.5°C per hour to 35°C.** Measure central temperature (rectal or oesophageal).

External rewarming measures – if temperature > than 30°C

- Remove wet clothes and increase room temperature. Apply warm blankets, forced air blankets (Bair hugger) or transwarmers, infared radiant lamp

Invasive rewarming measures – if temperature <than 30°C

- Warmed intravenous fluids (38°C-39°C), warm humidified gases via the ventilator, bladder/pleural/gastric lavage, haemo-filtration or ECMO

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Airway/Breathing

- 15 l/min O2 via non re-breath mask (sats target >94%)
- Insert NG tube (have on free drainage)
- Consider antibiotics (not routinely given)
- CXR may be normal initially
- Can trial NIV/HFNCO2 (@2L/kg/min) if signs of respiratory distress
- May require intubation using cuffed ETT for respiratory failure or to allow post cardiac-arrest care
- Initial settings - PEEP 8, Vt 6-8 ml/kg and limit PIP <30
- Monitor end tidal CO2 and blood gases
- Risk of ARDS (high FiO2) **– Re-discuss with CoMET consultant** who may try increased PEEP (10-12cmH2O), increased Ti or proning

Circulation

- Obtain IV/IO Access x 2 +/- arterial line

Summary of resus in hypothermia:

- **<30°C - NO** Adrenaline or Amiodarone and **MAXIMUM** 3 shocks.

- **30°C-35°C-** Defibrillate as usual, resus drugs every 8 minutes. Continue CPR until >32°C or temperature has not risen despite active rewarming. When applying defib pads: Always check contact area is dry
- Arrhythmias are common and may require treatment (discuss with CoMET consultant)
- Hypotension - treat with fluid boluses (10ml/kg Plasmalyte 148) and consider inotropic support
- If inotropic support is required always deliver via IO or central line due to accumulation in peripheral circulation in the hypothermic child.
- Insert urinary catheter to monitor urine output and fluid balance

Disability

- Assess GCS, neurology and pupil size/reaction
- C-spine protection until cleared
- **NB. Reduced GCS may not always be due to drowning it is important to exclude other causes**

- If intubated and ventilated provide adequate sedation and neuromuscular blockade

- **If CPR > 1 minute + comatose + ventilated → Neuro protect** (30° head up tilt, EtCo2 target 4.5-5 kPa, SpO2 >94%, normoglycaemia ≥ 3mmol/L, Hb > 80)
- If seizing load with Levetiracetam (40mg/kg, max 2.5g)
- Perform CT head scan (Post ROSC when stable)
- If signs of raised ICP – discuss with **CoMET consultant**. First line - 2.7% sodium chloride (3-5mls/kg over 30 mins) aiming for sodium between 145-150mmol/l. Repeated doses can be used.

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