ED CARE AND TRANSFER OF THE INTUBATED NEUROCRITICAL* PATIENT

(* suspected severe brain injury whether traumatic or medical aetiology including stroke / SAH / OOHA with ROSC and low GCS)

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1. POST-INTUBATION ED CARE - CHECKLIST

MAINTAIN MOMENTUM TO DEFINITIVE CARE

Maintain cerebral perfusion pressure	Site arterial line pre-CT only if time allows	
	BELOW ARE TARGETS FOR UNDIFFERENTIATED PATIENT, POST CT PLEASE REFER TO PHYSIOLOGICAL TARGETS OVERLEAF	
	No trauma/ medical brain injury	Target MAP 90mmHg
	Primarily traumatic brain injury	Target MAP 80mmHg pending CT. Increase to 90mmHg if CT proves no significant extra-cranial bleeding injuries
	Polytrauma patient with brain injury and uncontrolled bleeding	Apply Damage Control Resuscitation principles (refer to latest guidelines available via the TraumaNetwork)
Neuroprotective ventilation	$EtCO_2$ 4.0 - 4.5 kPA initially Early ABG performed – titrate minute ventilation to $PaCO_2$ 4.5 – 5.0 kPa PaO_2 13kPa - consider 5cm H_2O PEEP (max 10 cm H_2O if necessary - use caution if hypovolaemic)	
Optimise clotting	Anticoagulation reversed if indicated If trauma patient presenting within 3hrs : consider 1g Tranexamic acid bolus over 10 minutes followed by infusion (1g over 8 hrs)	
Control intracranial pressure	Endotracheal tube taped Position 15-30 degree head-up tilt maintaining spinal precautions as indicated (max tilt of ED trolley = 15 degrees, put on bed end first) Verbalise and action - anaesthesia with infusions of both opiate & propofol. Ensure good neuromuscular blockade Urinary catheter passed at first reasonable opportunity (this may be in theatre / angio / ICU) – essential if ventilated / mannitol **Imminent coning**: Hyperventilate to target $EtCO_2$ 3.5 kPa Give 125ml 5% hypertonic saline over 15 minutes (+/- 200ml 20% Mannitol if no hypovolaemia)	
Minimise cerebral metabolic oxygen demand	If seizure has occurred: 1st line load with Leviteracetam 60mg/kg IV (max 4.5g) over 10mins 2nd line phenytoin 20mg/kg IV (max 2g) at 25-50mg/min	
Maintain normothermia and normoglycaemia	Blood glucose 6-10mmol/L Tympanic temperature 36 – 37	
Other injuries	Pneumothorax excluded / treated if present – chest drain secure & functioning. Beware risk of tension if IPPV Active intrathoracic or intra-abdominal bleeding excluded Pelvic and / or long bone fractures splinted Consider Gastric tube - check position	

2. TRANSFER OF INTUBATED PATIENT FROM ED - CHECKLIST

Maintenance of anaesthesia (TIVA) during transfer

1) Alfentanil (or Remifentanil) by infusion
2) Propofol (TCI not essential)
3) Neuromuscular blockade –bolus or infusion

Maintain target MAP : use fluids + vasopressors

Hypotension?
- Metaraminol by infusion
- Ephedrine + / or Metaraminol boluses
- Noradrenaline by infusion - central or peripheral as appropriate

Hypertension ?
- Consider increasing opiate and propofol dose rates +/- bolus
- Labetolol or GTN given carefully to lower BP only if hypertension persists despite adequate anaesthesia and analgesia.

OTHER CONSIDERATIONS

Arterial line helpful for ABG and if using vasopressors

Is patient appropriately resuscitated pre-move?

Ensure blood cross-matched

IV fluids - **avoid** IV dextrose/glucose

2 x reliable > 18g cannulae in situ

GCS and pupils monitored & recorded

Compare EtCO2 with PaCO2 and adjust ventilation as necessary

PREPARATION, PACKAGING & TRANSFER

Transferring team appropriately trained & experienced?

Transfer trolley, mattress and blankets

Adequate equipment and PPE

Sharps disposal plan

Monitor & Ventilator (Hamilton or Oxylog)

Enough pumps / syringe drivers

Use Drager brand ventilator tubing if using Oxylog (better for EtCO2 control)

Portable Suction & Defibrillator

Battery life of equipment known + charging cables

Oxygen requirement calculation done (below)

Check Oxygen cylinders full

Medical and nursing notes

Transfer documentation

Exact destination determined ?

= Hospital + Building + Entrance + Department

Telephone numbers of receiving unit

Name and contact details of receiving doctor / team

Call receiving team when leaving

BIS if concerns re: awareness - get from theatre

If need TCI pumps or Remifentanil – get from theatre

DEFINITIVE TARGETS DURING TRANSFER - POST CT DIAGNOSIS (adapt if damage control parameters required)

Physiological Targets for Patients with Brain Injury	Traumatic Brain Injury (inc traumatic SAH)	Intracerebral haematoma / haemorrhagic stroke	Acute Ischaemic Stroke	Spontaneous Subarachnoid Haemorrhage	Post-ROSC with low GCS
Systolic blood pressure (mmHg)	**110 – 150** **Aim MAP>90**	**140**	**< 180 / 105** **and** **> 130 Systolic** **Avoid precipitous drops**	**110 - 160**	**>100** **Aim MAP>65**
PaCO2 (kPa)	**4.5 – 5.0**	**4.5 – 5.0**	**4.5 – 5.0**	**4.5 – 5.0**	**4.5 - 6.0**
	If impending uncal herniation, a brief period of $PaCO_2$ 3.5 may be required to decrease ICP				
Oxygenation	**13 kPA**	**13 kPa**	**SpO2 > 95%**	**13 kPA**	**10-13 kPa** **SpO2 94-98 %**

MINIMUM OXYGEN REQUIREMENT

2 x [(Transfer time in mins x Minute Vol X FiO2) + Ventilator driving gas]

EXAMPLE
90 minute journey on FiO2 0.5 Vt 500ml x 12 breaths/min

= 2 x [(90 min x 6l/min x 0.5) + (0.5l/min for Oxylog 3000 x 90 min)]
= 2 x [(270) + (45)] = 2 x [315] = 630 litres

D cylinder = 340 litres E cylinder = 680 litres

References: Nathanson MH et al. On behalf of The Association of Anaesthetists and Neuro Anaesthesia and Critical Care Society. Guidelines for safe transfer of the brain-injured patient: trauma and stroke. Anaesthesia 2019 ;75(2):234-246.
Scotstar / EMRS CG005.v1Head Injury, Resuscitation Council UK.Advanced Life Support 8th Edition 2021 NB: variation from physiological parameters from these references guidelines occurs where superseded by NHS Lothian guidelines.