Course: Key Competences

Background:

In 2007, the Royal College of Paediatrics and Child Health (RCPCH) published a new curriculum for postgraduate medical education, which has been approved by the Postgraduate Medical Education and Training Board [1]. In addition, the RCPCH has devised an assessment strategy that uses multisource feedback tools to map specifically to assessment standards.

By the completion of Level One training, all trainees are expected to be able to initiate therapy in a child presenting with Raised Intracranial Pressure. This scenario/ workshop has been designed to assess competence in management of this key condition of childhood.

Curriculum Elements Addressed:

The management of raised intracranial pressure can be separated into five distinct phases:

- **Assessment**
- **Recognition of the condition**
- **Formulation of differential diagnoses**
- **Investigation**
- **Definitive therapy**

Assessment (Expected)

Brief history from mother
Rapid assessment of ABC
Breathing should be assessed as inadequate and supported
Should call for more senior help
Obtain IV access, take bloods including cultures
Give antibiotics (Cefotaxime or Ceftriaxone)
Check pupils – will find a large R pupil – need to recognise significance
Mannitol 0.5g/kg IV stat

Recognition of condition (Expected)

Signs are of decreased level of consciousness with an enlarged R pupil. Should appreciate importance of dilated pupil.

Formulation of differential diagnosis (Expected)

Candidates should consider meningitis, encephalopathy, post ictal state, toxic ingestion.

[1] A Framework of Competences for Level 1 Training in Paediatrics. http://www.rcpch.ac.uk/Training/Competency-Frameworks

Investigations (Expected)
Cardiovascular monitoring
Pulse oximetry
Laboratory investigations (to include U&Es, FBC, blood and urine cultures)
CT scan urgently once vital signs stabilised
Contra-indication to LP

Definitive Therapy (Expected)

Give oxygen immediately
Recognise hypoventilation
Take over and assist inadequate ventilation (ventilate to low normocarbia)
Call for anaesthetic / PICU/senior assistance
IV access
Give IV antibiotics post blood culture. (Cefotaxime or Ceftriaxone)
Mannitol 0.5g/kg IV over 10 minutes.
If stabilization obtained should get ready for CT scan

Assessment Domains:

	Level of Achievement		
RCPCH Standards	**Good**	**Adequate**	**Poor**
Effective skills in paediatric assessment	☐	☐	☐
Knowledge of common and serious paediatric conditions and their management	☐	☐	☐
Effective initial management of ill-health and clinical conditions in paediatrics, seeking additional advice and opinion as appropriate	☐	☐	☐
Safe practical skills in paediatrics	☐	☐	☐
Advanced Neonatal and Paediatric Life Support Skills	☐	☐	☐
Effective communication and interpersonal skills with colleagues	☐	☐	☐

Scenario: Raised Intracranial Pressure - Child

Learning Objectives: At the end of the session candidates should be able to:

1. **Assess a child with decreased level of consciousness**
2. **Know differential diagnosis for decreased LOC**
3. **Recognise signs of raised intracranial pressure**
4. **Know immediate medical management of a child with raised intracranial pressure**

Faculty Script:

6 year old boy with a 3 day history of headache. Off school for last 2 days. Irritable and slightly confused last night. Felt hot. Checked overnight , no problem noted. This morning mother found him very difficult to rouse and called GP who arranged an ambulance transfer to A+E.

This 6 year old boy has meningitis with raised ICP as manifested by dilate Right pupil at presentation. The main aim of the scenario is the management and particular stabilisation of the patient prior to moving him to CT scan.

Patient Demographics:

Name: **Jake Randall**

Gender: M **Age:** 6years **Weight: 20** kg

Candidate Brief:

Presenting History (Candidate Storyboard):

6 year old boy with a 3 day history of headache. Off school for last 2 days. Irritable and slightly confused last night. Felt hot. Checked overnight , no problem noted. This morning mother found him very difficult to rouse and called GP who arranged an ambulance transfer to A+E.

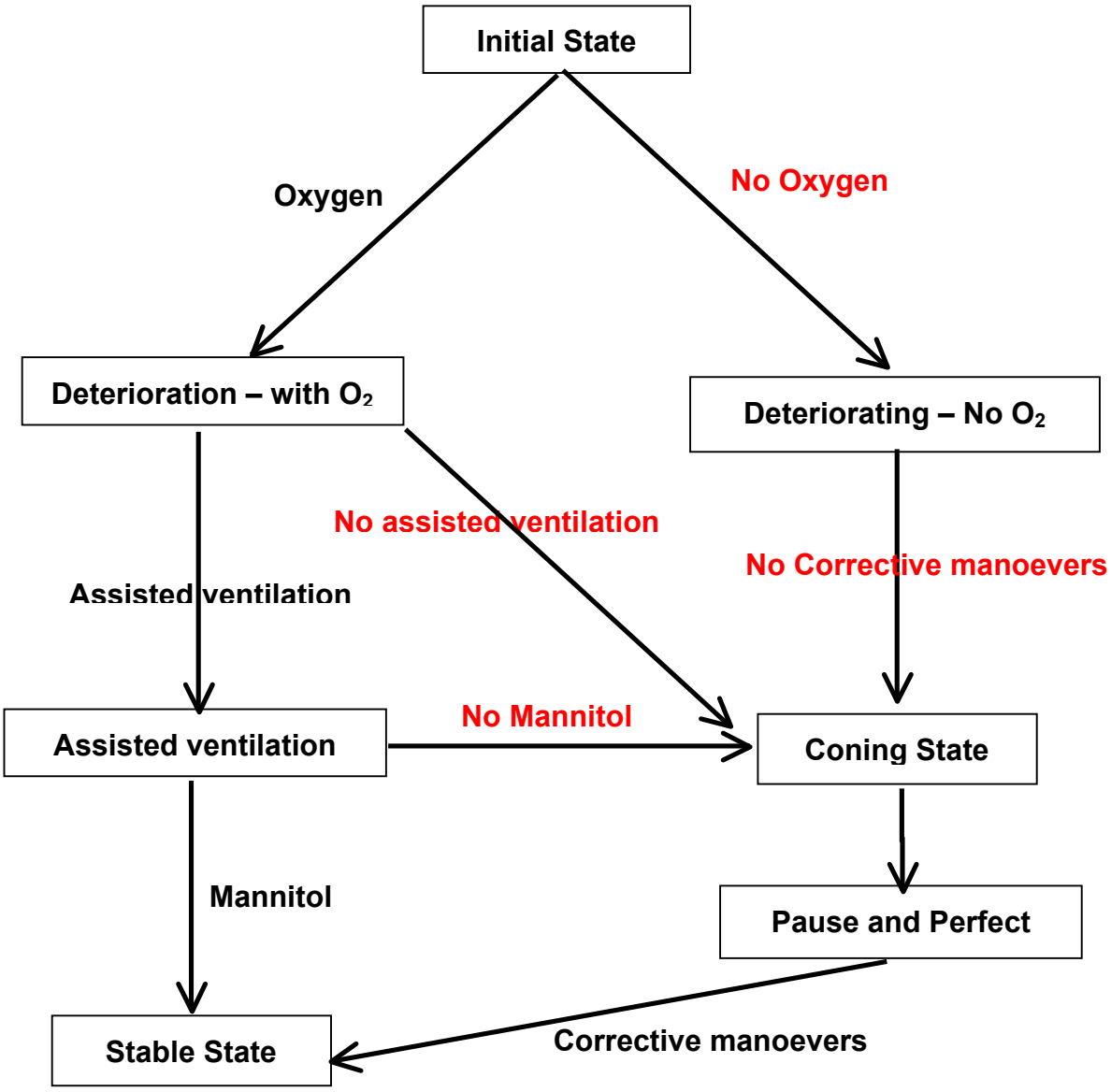
Previous Medical History:

Nil of note

Family Medical History:

Nil of note

Flowchart of Scenario Progression:



Scenario setup and preparation:

Faculty Recommended: **Director** ☒ **Control** ☒

Actor/Confederate(s) ☒

Roles: Parent

Nurse

If you have a multiprofessional group of candidate then you should have a multiprofessional faculty.

Participants:

Medical Roles	**Nursing Roles**	**AHP Roles**
Paediatric SHO		

Location: Children's Assessment Unit / Emergency Department

Simulator: Meti Paed ECS or alternative that has pupils that can change size

Monitor Setup: 3 wave format

Monitor Parameters Required:

ECG ☒	S_aO_2 ☒	RR ☒	$EtCO_2$ ☐	NIBP ☒	ABP ☐
CVP ☐	PAP ☐	ICP ☐	CPP ☐	Temp (P) ☐	Temp (C) ☐
Other:					

Equipment Checklist:

Respiratory:

Nasal Cannula	☐	O_2 Facemask	☒	O_2 Reservoir Facemask	☒
Headbox	☐	Wafting O_2	☐	Nebuliser	☐
Suction	☐	Yankuer	☐	Suction Catheter ☐ size	FG
Self inflating Bag	☒	Ayers T piece	☒	Nasopharyngeal airway	☐
Oropharyngeal Airway	☒	LMA	☐		
Intubated?	☐	ETT position		length 0.00cm at	
Respiratory Support		Non Invasive			
				➔ Settings:	
				Flow	l/min
				Insp O_2	%
				PIP	
				PEEP	
		Invasive			
				➔ Settings:	
				iTime	sec
				Insp O_2	%
				Rate	bpm
				PIP	
				PEEP	

Vascular Access:

Line Type	Site
Peripheral (1)	R Brachial available when sited
Peripheral (2)	
Central Venous	
Arterial	
Intraosseous	Available when sited

Other Medical Equipment:

Drug Chart	☒	Emergency Drug Sheet	☒	Blood gas	Venous
Blood Results Sheet	☒	X Rays		Imaging	
Other Props:					
Neuro Observation Chart					

IV Fluids:

Setup	Fluid Type
Fluids Running	
Fluids Available (1)	0.9% Saline
Fluids Available (2)	Mannitol
Fluids Available (3)	5% Saline
Other Fluids	

Medications: (route, dose/rate)

Infusions (Running)	Dose	Running Rate (ml/hr)
Nil		

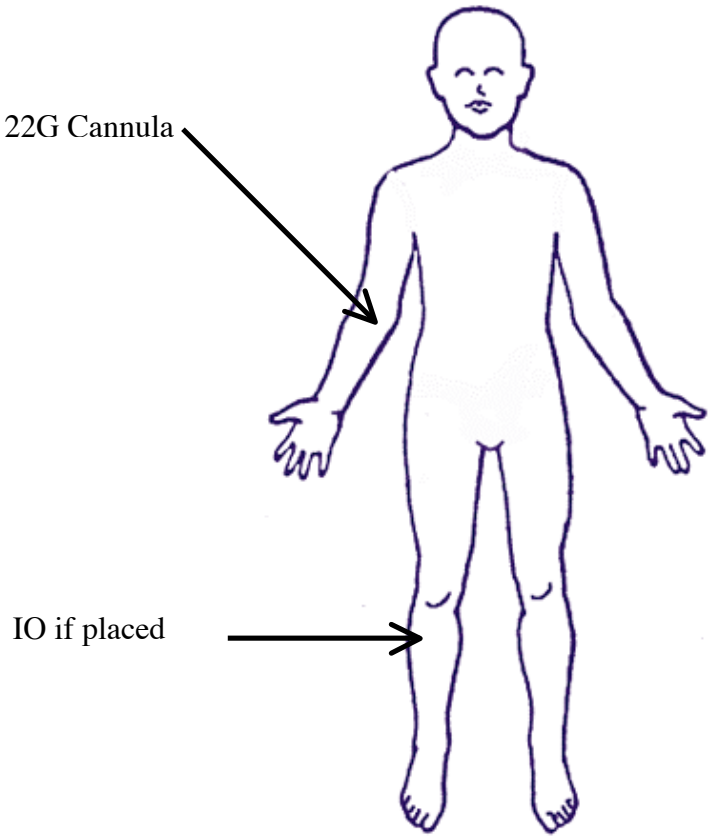
Infusions (Available)	Dose	Running Rate (ml/hr)

Bolus Drugs (Available)	Dose
Mannitol	0.5G/kg
Adrenaline 1:10 000	0.2ml
Atropine	400mcg
Antibiotics	
Thiopentone	2 -5mg/kg
Propofol	2mg/kg
Suxamethonium	2mg/kg
Pancuronium	100mcg/kg

Moulage:

Effect needed

Draw relevant equipment needed on diagram e.g. cannula, wounds etc.



Scenario States:

Name of State	Initial State					Duration			
Vital Signs									
Rhythm	SR	HR	88	SBP	**135**	DBP	**83**	CVP	
Resp Rate	12	SaO_2	88	$ETCO_2$		Temp	38.8	Other	
AVPU	U	GCS	8	Pupils	dilated R	ICP		NIRS	

Asessment					
Periph Pulses	normal	Cap refil	3 – 4sec	Skin	no rash
ECG/Heart	normal heart sounds				
Airway	normal	Breathing	normal		
Air entry	Shallow bilateral	Breath sounds	Normal		
WOB	normal	Recession	none		
Neuro	Unresponsive	Renal		Hepatic	
Other	Dilated R pupil nonreactive				

Results											
Hb	12.2	WCC	22	PLT	36		HCT	0.36		CRP	220
PH/ H+	7.19	$PaCO_2$	61/ 8.1	PaO_2	44/ 5.8	HCO_3	21.6	BE	- 5.9	Lactate	1.7
Na^{2+}	137	K^+	4.4	Cl^-	97	Ur	12.5	Cr	**75**	Glucose	14.6
Ca^{2+}	**2.6**	Mg^{2+}	0.6	PO_4^-	1.5						

Expected Outcomes:	
Participants should:	• Brief history from mother • Rapid assessment of ABC • Breathing should be assessed as inadequate and supported • Should call for more senior help • Obtain IV access, take bloods including cultures • Give antibiotics (Cefotaxime or Ceftriaxone) • Check pupils – will find a large R pupil – need to recognise significance • Mannitol 0.5g/kg IV stat
Facilitators should:	Give feedbck on perfusion If O_2 not administered move to **Deterioration no O2 state** If no O_2 and ventilation not assisted move to **Coning State** **If** O_2 administered and ventilation assisted move to **Stable State**

Name of State	Deterioration – No Oxygen					Duration			
Vital Signs									
Rhythm	SR	HR	62	SBP	**145**	DBP	**98**	CVP	
Resp Rate	8	SaO_2	76	$ETCO_2$		Temp	38.9	Other	
AVPU	U	GCS	8	Pupils	R dilated	ICP		NIRS	

Asessment					
Periph Pulses	normal	Cap refil	3	Skin	mottled
ECG/Heart	Normal heart sounds				
Airway	clear	Breathing	shallow and bradipnoeic		
Air entry	reduced	Breath sounds	normal		
WOB	normal	Recession	none		
Neuro	Unresponsive	Renal		Hepatic	
Other	Dilated unresponsive R pupil				

Results												
Hb	12.2	WCC	22	PLT	36	HCT	0.36	CRP	220			
PH/ H+	7.19	$PaCO_2$	61/ 8.1	PaO_2	44/ 5.8	HCO_3	21.6	BE	- 5.9	Lactate	1.7	
Na^{2+}	137	K^+	4.4	Cl^-	97	Ur	12.5	Cr	**75**	Glucose	14.6	
Ca^{2+}	**2.6**	Mg^{2+}	0.6	PO_4^-	1.5							

Expected Outcomes:	
Participants should:	• Brief history from mother • Rapid assessment of ABC • Breathing should be assessed as inadequate and supported • Should call for more senior help • Obtain IV access, take bloods including cultures • Give antibiotics (Cefotaxime or Ceftriaxone) • Check pupils – will find a large R pupil – need to recognise significance • Mannitol 0.5g/kg IV stat
Facilitators should:	If candidate still does not take appropriate corrective measures, pause scenario and review progress or lack of improvement whilst identifying potential interventions before restrting scenario and allowing them to manage patient. **If** O_2 administered and ventilation assisted move to **Stable State**

Name of State	Deterioration – with Oxygen					Duration	
Vital Signs							
Rhythm	SR	HR	70	SBP	**140**	DBP	**87**	CVP	
Resp Rate	10	SaO_2	96	$ETCO_2$		Temp	38.9	Other	
AVPU	U	GCS	8	Pupils	R dilated	ICP		NIRS	

Asessment					
Periph Pulses	Good	Cap refil	3	Skin	mottled
ECG/Heart	Normal heart sounds				
Airway	clear	Breathing	normal pattern		
Air entry	reduced	Breath sounds	normal		
WOB	normal	Recession	none		
Neuro	Unresponsive	Renal		Hepatic	
Other	Dilated unresponsive R pupil				

Results												
Hb	12.2	WCC	22	PLT	36	HCT	0.36		CRP	220		
PH/ H+	7.19	$PaCO_2$	61/ 8.1	PaO_2	44/ 5.8	HCO_3	21.6	BE	- 5.9	Lactate	1.7	
Na^{2+}	137	K^+	4.4	Cl^-	97	Ur	12.5	Cr	**75**	Glucose	14.6	
Ca^{2+}	**2.6**	Mg^{2+}	0.6	PO_4^-	1.5							

Expected Outcomes:

Participants should:	• Breathing should be assessed as inadequate and supported • Should call for more senior help • Obtain IV access, take bloods including cultures • Give antibiotics (Cefotaxime or Ceftriaxone) • Check pupils – will find a large R pupil – need to recognise significance • Mannitol 0.5g/kg IV stat
Facilitators should:	

Name of State	Assisted Ventilation					Duration			
Vital Signs									
Rhythm	SR	HR	82	SBP	**135**	DBP	**83**	CVP	
Resp Rate	bagged	SaO_2	96	$ETCO_2$		Temp	38.3	Other	
AVPU	A	GCS	15	Pupils	R dilated	ICP		NIRS	

Asessment					
Periph Pulses	Good	Cap refil	3	Skin	mottled
ECG/Heart	Normal heart sounds				
Airway	clear	Breathing	normal pattern		
Air entry	good	Breath sounds	normal		
WOB	normal	Recession	none		
Neuro	Unresponsive	Renal		Hepatic	
Other	Dilated unresponsive R pupil				

Results											
Hb	12.2	WCC	22	PLT	36	HCT	0.36	CRP	220		
PH/ H+		$PaCO_2$		PaO_2		HCO_3		BE		Lactate	
Na^{2+}		K^+		Cl^-		Ur		Cr		Glucose	
Ca^{2+}		Mg^{2+}		PO_4^-							

Expected Outcomes:	
Participants should:	• Should call for more senior help • Obtain IV access, take bloods including cultures • Give antibiotics (Cefotaxime or Ceftriaxone) • Check pupils – will find a large R pupil – need to recognise significance • Mannitol 0.5g/kg IV stat
Facilitators should:	

Name of State	Stable State					Duration	
Vital Signs							
Rhythm	SR	HR	105	SBP	132	DBP	76	CVP	
Resp Rate	bagged	SaO_2	98	$ETCO_2$		Temp	37	Other	
AVPU	P	GCS	10	Pupils	4 ERL	ICP		NIRS	
Asessment							
Periph Pulses	Good	Cap refil	2	Skin	warm well perfused		
ECG/Heart	Normal heart sounds						
Airway	clear	Breathing	normal pattern				
Air entry	good	Breath sounds	normal				
WOB	normal	Recession	none				
Neuro	Pain responsive	Renal		Hepatic			
Other	Pupils equal						
Results							
Hb	12.2	WCC	22	PLT	36	HCT	0.36	CRP	220
PH/ H+		$PaCO_2$		PaO_2		HCO_3		BE		Lactate	
Na^{2+}		K^+		Cl^-		Ur		Cr		Glucose	
Ca^{2+}		Mg^{2+}		PO_4^-							

Expected Outcomes:	
Participants should:	Arrange CT scan urgently once vital signs stabilised Appreciate that LP contra-indicated Get ready for CT scan
Facilitators should:	

Name of State	Coning State					Duration			
Vital Signs									
Rhythm	Erratic	HR	42	SBP	**76**	DBP	**49**	CVP	
Resp Rate	apnoea	SaO_2	no trace	$ETCO_2$		Temp	38.9	Other	
AVPU	U	GCS	6	Pupils	Fixed dilated	ICP		NIRS	

Asessment					
Periph Pulses	palpable	Cap refil	4	Skin	cool mottled
ECG/Heart	normal heart sounds				
Airway	clear	Breathing	slow		
Air entry	good	Breath sounds	normal		
WOB	normal	Recession	nil		
Neuro	Unresponsive	Renal		Hepatic	
Other	Both pupils fixed dilated				

Results											
Hb	12.2	WCC	22	PLT	36	HCT	0.36	CRP	220		
PH/ H+		$PaCO_2$		PaO_2		HCO_3		BE		Lactate	
Na^{2+}		K^+		Cl^-		Ur		Cr		Glucose	
Ca^{2+}		Mg^{2+}		PO_4^-							

Expected Outcomes:

Participants should:	• Recognise deteriorated neurological state • Rapid assessment of ABC • Breathing should be assessed as inadequate and supported • Should call for more senior help • Obtain IV access, take bloods including cultures • Give antibiotics (Cefotaxime or Ceftriaxone) • Check pupils – will find a large R pupil – need to recognise significance • Mannitol 0.5g/kg IV stat • Initiate management cerebral oedema prior to CT scan
Facilitators should:	If candidate still does not take appropriate corrective measures, pause scenario and review progress or lack of improvement whilst identifying potential interventions before restrting scenario and allowing them to manage patient.

Educational Material:

In any child seen with altered level of consciousness raised ICP needs to be considered in the differential. In general the child is more likely to come to harm due to raised ICP than the underlying condition.

Etiology of raised intracranial pressure	
Pathological process	**Examples**
Localised mass lesions	Traumatic haematomas (extradural, subdural, intracerebral) Neoplasms (primary or metastasis) Abscess Focal oedema secondary to trauma, infarction, tumour
Disturbance of CSF circulation	Obstructive hydrocephalus (blocked shunt) Communicating hydrocephalus
Obstruction major venous sinus	Depressed fractures overlying major venous sinuses Cerebral venous thrombosis
Diffuse brain oedema or swelling	Encephalitis, meningitis, diffuse head injury, subarachnoid hemorrhage, Reye's syndrome, lead encephalopathy, near drowning
Idiopathic	Benign intracranial hypertension

Diagnosis
Raised intracranial pressure (ICP) may develop insidiously or present acutely as a result of a wide range of pathologies.

The signs and symptoms of raised ICP vary with age.
Classical symptoms include;

- Headache Classically morning headache present on waking
- Headache that wakes patient from sleep is also very suspicious
- Vomiting
- Visual disturbance
- Change in behaviour or mood
- Fluctuating level of consciousness
- Ataxia or other motor disturbance
- Abnormal pupils (may be noted by relatives)
- Seizures

Mild or chronically raised ICP may produce subtle signs and it is important to have a high index of suspicion and take a thorough history in children at risk.

Severely raised ICP is indicated by the following signs and symptoms

- Cushing's response (bradycardia and hypertension)
    - This is a pre-terminal sign due to impending herniation of the brainstem requiring immediate action (neurosurgical review and likely scan).

- Papilledema (late sign) in the presence of any decrease in conscious level
  - This constitutes an emergency and immediate help should be sought with managing the patient.
- Sunsetting – eyes deviated medially and inferiorly
  - Signifies critically raised intracranial pressure. Requires immediate action (scan and neurosurgical review).

If any of the following are present, investigation and management (in conjunction with paediatric Intensivists and neurosurgeons) as to the cause of the problem should be urgently undertaken:

- Conscious level reduced to GCS ≤8 (or responding to Pain or less on the AVPU scale)
- Abnormal respiratory pattern (hyperventilation, irregular resps or apnoeas).
- Abnormal pupils (unilaterally or bilaterally dilated or unresponsive pupils).
- Abnormal posture (decorticate, decerebrate or complete flaccidity)
- Abnormal doll's eyes (oculocephalic) response

Management

The immediate management of raised ICP is aimed at preventing further brain injury whilst the underlying cause is identified and definitive management instituted.

- Assess and manage A,B,C, D. Provide high flow oxygen
- Document GCS initially and frequently reassess
- Take blood for full blood count, clotting and electrolytes
- Check blood sugar and capillary blood gas. Manage glucose abnormalities.
- Take paired urine/blood sample for **urgent** assessment of osmolality. (This may help differentiate cause of the raised ICP.)
- Tilt patient 20–30° head up.
- Consider **Mannitol** if cause is likely to be related to head injury, intra-cranial bleed or fungal infection.
  - 0.25 g/kg IV over 30 minutes = 1.25 ml/kg of 20% solution.
  - May need to be repeated
  - May be contraindicated in some patients – discuss before use
- Prescribe antibiotics +/- antivirals +/- antifungals if any suspicion of infection
- Prescribe antipyretics if febrile

Urgent contrast enhanced CT scanning is needed once patient has been resuscitated and is stable. CT scanning cannot diagnose raised intracranial pressure, but may indicate the cause of the clinically defined problem.

MRI may subsequently be required to define further the nature of any problem that has been identified. An out-of-hours MRI is rarely necessary.

DO NOT PERFORM LP IN CHILD WITH REDUCED LEVEL OF CONCIOUSNESS UNLESS A SCAN HAS EXCLUDED A BRAIN LESION AND DISCUSSED WITH CONSULTANT.

Neurological Observation Chart

Name:																														**CR Number:**	
Date																															
Time																															
COMA SCALE	Eyes Open	Eye opening 4																													
		Eye opening 3																													
		Eye opening 2																													
		Eye opening 1																													
	Best verbal/grimace	Verb/Grim 5																													
		Verb/Grim 4																													
		Verb/Grim 3																													
		Verb/Grim 2																													
		Verb/Grim 1																													
	Best motor (Best arm)	Motor 6																													
		Motor 5																													
		Motor 4																													
		Motor 3																													
		Motor 2																													
		Motor 1																													
Coma Score out of 15																															
1	Temperature	40																												40	
		39.5																												39.5	
2		38.5																												38.5	
		37.5																												37.5	
3		36.5																												36.5	
		35.5																												35.5	
4	BP	200																												200	
		180																												180	
5		160																												160	
		140																												140	
6		120																												120	
		100																												100	
7	Pulse	80																												80	
		60																												60	
		40																												40	
8		20																												20	
	Oxygen sats Capillary refill																														
PUPILS	Right	Size																												+ reaction - no reaction S - sluggish C - closed	
		Reaction																													
	Left	Size																													
		Reaction																													
LIMBS	Arms	Normal power																												Record Right (R) & Left (L) seperately if different	
		Mild weakness																													
		Severe weakness																													
		Spontaneously																													
		Painful stimuli																													
		No response																													
	Legs	Normal power																												Record strength & move	
		Mild weakness																													
		Severe weakness																													
		Spontaneously																													
		Painful stimuli																													
		No response																													

Bristol PICU Drug Sheet

Name	Jake Randall				
Date of Birth		August	2006		
Weight	20 kg	Height		cm (SA	0.79 m2)
Age	6 years		(SA estimated from weight alone. Enter height for accurate SA)		

Resuscitation Doses		
Adenosine	0.67 ml (100 mcg/kg). Can use up to 1.7ml (250mcg/kg)	
Adrenaline	2 ml 1:10000 (subsequent doses 1:10000)	
Atropine	400 mcg (20 mcg/kg)	= 0.7 ml (600mcg/ml)
Bicarb 8.4%	20 mmol - give and reassess	(20 ml of 8.4%)
Ca Gluc 10%	10 ml - give and reassess	
Lignocaine	20 mg (1mg/kg) = 2 ml of 1%	
Naloxone	200 mcg (10 mcg/kg)	= 0.5 ml (400mcg/ml)

100% fluid requirement = 60 ml/hr

Sedation Infusions		Standard Regime	Calculation	1 ml/hr =
Morphine	1mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	20 mg/50ml	20 mcg/kg/hr
Midazolam	5mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	100 mg/50ml	100 mcg/kg/hr
Vecuronium	3mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	60 mg/50ml	60 mcg/kg/hr
Atracurium	15mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	300 mcg/kg/hr
Fent/Vec	Mix 10	mg Vecuronium in 20ml Fentanyl (50 mcg/ml)	N/A	
Fentanyl	neat	(50mcg/ml)	2 to 4 ml/hr (5 to 10 mcg/kg/hr)	
Thiopentone	neat	(25mg/ml) Bolus: 5mg/kg = 4 ml	Infusion: 0.8 to 4.8 ml/hr (1 to 6 mg/kg/hr)	

Cardiac Infusions		Standard Regime	Calculation	1 ml/hr =
Dopamine	15mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	5 mcg/kg/min
Dobutamine	15mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	300 mg/50ml	5 mcg/kg/min
Adrenaline	0.3mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	6.0 mg/50ml	0.1 mcg/kg/min
Noradrenaline	0.3mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	6.0 mg/50ml	0.1 mcg/kg/min
Argipressin	3 Units/kg	made up to 50ml with Dex 5% / Saline 0.9%	60.0 U/50ml	0.001 U/kg/min
Milrinone	1.5mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	30 mg/50ml	0.5 mcg/kg/min
Dinoprostone (PGE2 / Prostaglandin)	30mcg/kg	made up to 50ml with Dex 5% / Saline 0.9%	N/A	N/A
Epoprostenol (Prostacyclin)	neat	(10mg/ml)	500 mcg/50ml	8.333 ng/kg/min
SNP	neat	(1 mg/ml)	50 mg/50ml	0.83 mcg/kg/min
GTN	neat	(1 mg/ml)	50 mg/50ml	0.83 mcg/kg/min
Amiodarone	15mg/kg	made up to 25ml with Dex 5% only	300 mg/25ml	10 mcg/kg/min
Lignocaine	neat	1% Lignocaine	1 to 6 ml/hr	(0.5 - 3.0 mg/kg/hr)
High K+	20mmol	made up to 40ml with Saline 0.9%	4 to 10 ml/hr	(0.1 - 0.25 mmol/kg/hr)

Bronchodilators		Standard Regime	Calculation	
Peripheral				
Salbutamol	10 mg	made up to 50ml with Dex 5% / Saline 0.9%	0.3 ml/kg/hr = 1mcg/kg/min	
Aminophylline	500 mg	made up to **500ml** with Dex 5% / Saline 0.9%	Run at **1ml/kg/hr**	
Central				**1 ml/hr =**
Salbutamol	neat	(1 mg/ml)	50 mg/50ml	0.8 mcg/kg/min
Aminophylline	50mg/kg	made up to 50ml with Dex 5% / Saline 0.9%	1000 mg/50ml	1.0 mg/kg/hr

Bolus Drugs		
Aciclovir	400	mg (500mg/m2, 8h)
Adenosine	1	mg, to max 5mg
Ceftriaxone	1.6	g (80mg/kg, 12h)
Dex 10%	100	ml bolus for hypoglycaemia
Lorazepam	2.0	mg
Mannitol	50	ml of 20% = 0.5g/kg
Mg SO4 50%	4.0	ml, slow iv
Phenobarb	300	mg, iv over 30 mins
Phenytoin	360	mg, iv over 30 mins

Intubation Drugs		
Atropine	400 mcg (20 mcg/kg)	(0.67 ml)
Fentanyl	100 mcg (5 mcg/kg)	(2 ml)
Ketamine	40 mg (2mg/kg)	(4 ml)
Midazolam	2 mg (100mcg/kg)	(0.4 ml)
Pancuronium	2 mg (100mcg/kg)	(1 ml)
Propofol	2 ml of 1% = 1mg/kg	
Suxamethonium	40 mg (2mg/kg)	(0.8 ml)
Thiopentone	4 ml = 5 mg/kg	
Vecuronium	2 mg (100mcg/kg)	(1 ml)

Drug sheet developed by Bristol PICU 1997-2008: This Version 10.2 (queries to: stephen.marriage@ubht.nhs.uk)

Name: Jake Randall
Request: 123-456

Serum/plasma

Magnesium	0.60	mmol/L	(0.70-1.00)
Calcium	2.10	mmol/L	(2.25-2.80)
Calcium (corrected)	2.60	mmol/L	(2.25-2.80)
Phosphate	1.50	mmol/L	(1.30-2.00)
Bilirubin	12	umol/L	(< 17)
Alkaline phosphatise	175	IU/L	(70-250)
Alanine aminotransferase	35	IU/L	(5-40)
Total protein	46	g/L	(62-80)
Albumin	20	g/L	(29-55)
Globulin	26	g/L	(22-36)

Serum/plasma

Creatinine	75	umol/L	(28-60)
Urea	12.50	mmol/L	(1.4-5.4)
Sodium	137	mmol/L	(133-143)
Potassium	4.60	mmol/L	(3.7-5.2)
Chloride	97	mmol/L	(95-105)
Bicarbonate	21	mmol/L	(21-34)
Anion gap	24	mmol/L	(6-14)
C-reactive protein	220	mg/L	(< 10)

COAGULATION SCREEN

Prothrombin time	18.00 s	(9.5-12.0)
INR	1.50	
Aptt time	63.00 s	(20.0-45.0)
Aptt ratio	1.60	

Hb:12.20g/dL (11.5-16.5)Plt:36 10*9/L(150-400)Wbc: 22.00 10*9/L(5.00-19.00)

Rbc	10*12/L	: 4.60 (3.00-5.40)	Neut	10*9/L	:	18.40	(3.00-9.00)
Hct	1/1	: 0.36 (0.33-0.53)	Lymp	10*9/L	:	2.80	(3.00-16.00)
MCV	fL	: 98.0 (92.0-116.0)	Mono	10*9/L	:	1.00	(0.30-1.00)
MCH	pg	: 32.0 (30.0-36.0)	Eosi	10*9/L	:	0.00	(0.20-1.00)
MCHC	g/dL	: 35.0 (29.0-37.0)	Baso	10*9/L	:	0.00	(< 0.11)
Hypo	%	: 2.00					

RapidSystems™

VENOUS SAMPLE
1:00
System Name Emergency Dept
System ID 2376-25327
Patient ID 1483564N
Lst Name Randall
Operator JONESR

ACID/BASE	37.0 °C	
pH	7.19	
pCO_2	61.3	mmHg
pO_2	43.7	mmHg
HCO_3^- act	22.7	mmol / L
HCO_3^- std	21.6	mmol / L
BE (B)	-5.9	mmol / L
BE (ecf)	-6.2	mmol / L

CO-OXIMETRY		
HCt	38.3	%
tHb	12.4	g / dL
sO_2	60.7	%
FO_2Hb	80.3	%
FCOHb	17.7	%
FMetHb	1.2	%
FHHb		%

OXYGEN STATUS	37.0 °C	
ctO2(a)		mL/dL

ELECTROLYTES		
Na^+	137.0	mmol / L
K^+	4.4	mmol / L
Ca^{++}	1.1	mmol / L
Cl^-	97.0	mmol / L

METABOLITES		
Glu	14.6	mmol / L
Lac	1.7	mmol / L

pAtm	754	mmHg

Rapidsystems™

VENOUS SAMPLE
1:00
System Name Emergency Dept
System ID 2376-25327
Patient ID 1483564N
Lst Name Randall
Operator JONESR

ACID/BASE	37.0 °C	
pH	7.19	
pCO_2	8.1	kPa
pO_2	5.8	kPa
HCO_3^- act	22.7	mmol / L
HCO_3^- std	21.6	mmol / L
BE (B)	-5.9	mmol / L
BE (ecf)	-6.2	mmol / L

CO-OXIMETRY		
HCt	38.3	%
tHb	12.4	g / dL
sO_2	60.7	%
FO_2Hb	80.3	%
FCOHb	17.7	%
FMetHb	1.2	%
FHHb		%

OXYGEN STATUS	37.0 °C	
ctO2(a)		mL/dL

ELECTROLYTES		
Na^+	137.0	mmol / L
K^+	4.4	mmol / L
Ca^{++}	1.1	mmol / L
Cl^-	97.0	mmol / L

METABOLITES		
Glu	14.6	mmol / L
Lac	1.7	mmol / L

pAtm	754	mmHg