

DECREASED CONSCIOUSNESS (INFANT)

MODULE: NEUROLOGY

TARGET: ALL PAEDIATRIC TRAINEES; NURSING STAFF

BACKGROUND:

The Royal College of Paediatrics and Child Health (RCPCH) has set standards for training; by the completion of level one training, all trainees are expected to be able to recognise signs of raised intracranial pressure and start initial management appropriately.

INFORMATION FOR FACULTY

LEARNING OBJECTIVES

At the end of the session participants should be able to:

1. Assess a child with decreased level of consciousness
2. Know differential diagnosis for decreased level of consciousness
3. Recognise signs of raised intracranial pressure
4. Know immediate medical management of a child with raised intracranial pressure
5. Know contraindications for lumbar puncture in patient with altered level of consciousness

FURTHER INFORMATION

This patient has a blocked/infected VP shunt.

Participants are expected to manage patient including stabilisation whilst preparing for neuro imaging.

If LP is attempted or there is delay in raised ICP management, move to **Peri – Arrest State** but **DO NOT** allow patient to arrest. Pause scenario and discuss prior to recommencing the scenario and allowing further management of patient.

SCENE SETTING

Location: Paediatric Assessment Unit
 Expected duration of scenario: 15 mins Expected duration of debriefing: 30 mins

EQUIPMENT AND CONSUMABLES

- Mannequin (baby) with right-sided VP shunt on mannequin
- Monitoring
- Resuscitation trolley
- O₂ facemask
- Bag and mask
- Oropharyngeal airway
- IV cannula and sticker fixation
- Intraosseus needle
- 0.9% saline
- 5% saline
- Drug chart
- Obs chart
- SORT Emergency drug chart (if requested – see appendix)
- Printed GP referral letter (below)

PERSONNEL-IN-SCENARIO

ST1-3
 ST4-6
 ED/Paediatric Nurse
 Scarlet's mother

PARTICIPANT BRIEFING

Dr Flannigan, Dr Bedford & Dr Benson



*West Park Healthcare Centre
Oxford
OX4 6BD
Tel: 01865 729549*

Re: Scarlet Richards
6 months old
5kg

Dear Doctor

Thank you for reviewing young Scarlet. She was brought to our practice today with a 48 hour history of not feeding well and being slightly irritable yesterday. Her Mum says she felt “a bit hot” overnight. This morning she was difficult to rouse and she was only responding to voice with me in our surgery.

Gracie was born at 25 weeks and is known to have had hydrocephalus following intraventricular haemorrhage, for which she had a right-sided ventriculo-peritoneal shunt placed 10 weeks ago. She has been well since the procedure. She has not had any immunisations as yet.

I am unsure as to what is causing her to be unwell, but am concerned that she is drowsy.

Yours sincerely

Dr Marcus Flannigan
MRCGP

FACULTY BRIEFING**IN-SCENARIO PERSONNEL BRIEFING (NURSE)**

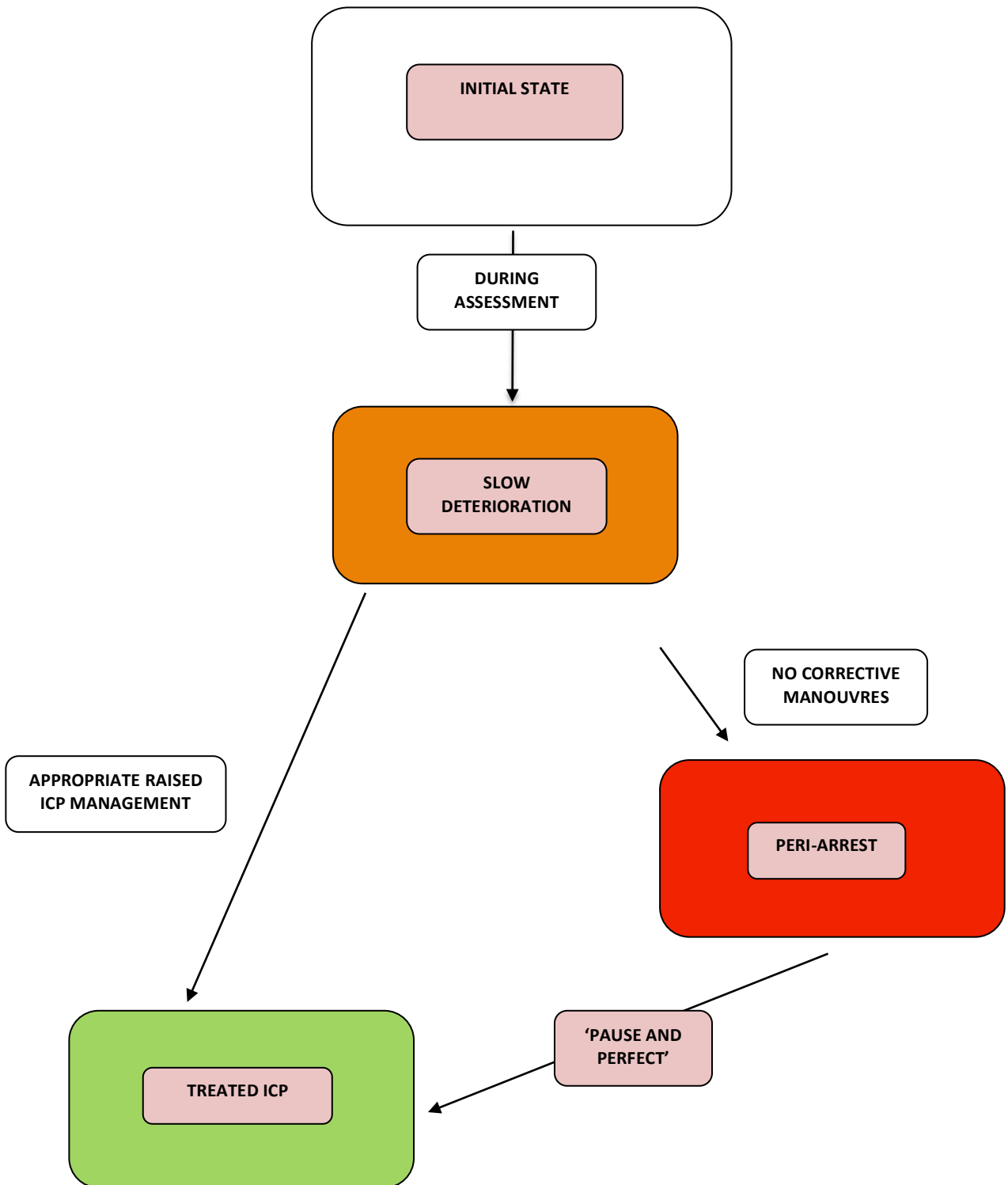
Scarlet was referred to Paediatrics by her GP who was concerned about floppiness. You have done baseline observations and triage, and you are concerned that Scarlet is floppy. You have asked the Paediatric doctor to review her urgently.

IN-SCENARIO PERSONNEL BRIEFING (MOTHER)

Your daughter Scarlet is six-months-old and was born prematurely at 25 weeks gestation. She had a difficult start to life, and was ventilated on SCBU for 2 weeks but does not need home oxygen. She had a bleed in her brain in the first week of life, and then later developed hydrocephalus. She had a VP shunt inserted 10 weeks ago. Since then, she has been well with you at home.

Over the past two days she has been feeding less well and was miserable yesterday. This morning she has been lethargic and floppy. You can't get her to wake up enough to feed properly, so you took her to the GP who sent you to hospital.

CONDUCT OF SCENARIO



INITIAL STATE

VITAL SIGNS					
Rhythm	SR	HR	114/min	BP	90/48
Resp rate	20	SaO ₂	95%	ETCO ₂	
Temp	35.8 °C	AVPU	U (GCS 8)	Pupils	Dilated L pupil
Other	Wt = 5kg				
ASSESSMENT					
Pulses	Normal	Cap refill	2 sec	Skin	No rash
Airway	Normal	Breathing	Normal	Breath sounds	Normal
Work of breathing	Normal	Recession	Normal	Neuro	Unresponsive
Other	Dilated, sluggishly reacting LEFT pupil		Liver edge 2cm below costal margin		
EXPECTED OUTCOMES					
Participants should:	<ul style="list-style-type: none"> - Administer 100% oxygen - Brief history from mother - Rapid assessment of ABC - Recognise decreased conscious level - Call for more senior help - Attempt IV access and send bloods including blood cultures and gas 				
Facilitators should:	<p><u>Provide further information if requested:</u></p> <ul style="list-style-type: none"> - Cap refill 2 sec - Unresponsive - Dilated sluggishly-reacting left pupil - No rash - Liver edge 2cm below costal margin <p><u>Progression:</u></p> <ul style="list-style-type: none"> - During the assessment move to 'Slow Deterioration' 				

STATE: SLOW DETERIORATION

VITAL SIGNS					
Rhythm	SR	HR	96/min	BP	110/56
Resp rate	16	SaO ₂	88%	ETCO ₂	
Temp	35.9	AVPU	U (GCS 8)	Pupils	Dilated L pupil
Other					
ASSESSMENT					
Pulses	Normal	Cap refill	3 sec	Skin	No rash
Airway	Normal	Breathing	Shallow	Breath sounds	Normal
Work of breathing	Normal	Recession	Normal	Neuro	Unresponsive
Other	Dilated, unreactive L pupil				
EXPECTED OUTCOMES					
Participants should:	<ul style="list-style-type: none"> - Recognise desaturation, slowing respiratory rate and inadequacy of ventilation - Start bag-valve-mask ventilation - Crash call (if not already) - Recognise signs of development of raised intracranial pressure (bradycardia, hypertension, blown L pupil) - Give mannitol or hypertonic saline 				
Facilitators should:	<p><u>Provide further information if requested:</u></p> <ul style="list-style-type: none"> - Blood/gas results, emergency drug chart, SORT hypertonic saline guideline - Confirm that L pupil dilated and unreactive <p><u>Progression:</u></p> <ul style="list-style-type: none"> - If treatment appropriate, patient stabilises and can prepare for CT scan Progress to 'Treated ICP' - If participant does not take appropriate corrective measures, or says will perform an LP, move to 'Peri-Arrest' 				

STATE: PERI-ARREST

VITAL SIGNS					
Rhythm	SR	HR	44/min	BP	45/16
Resp rate	Apnoeac	SaO ₂	No trace	ETCO ₂	
Temp	35.5	AVPU	U	Pupils	Dilated L pupil
Other					
ASSESSMENT					
Pulses	Normal	Cap refill	3-4 sec	Skin	Mottled
Airway	Normal	Breathing	Apnoeac	Breath sounds	Normal
Work of breathing	N/A	Recession	N/A	Neuro	Unresponsive
Other	Dilated, unreactive L pupil				
EXPECTED OUTCOMES					
Participants should:	<ul style="list-style-type: none"> - Recognise critical deterioration with signs of raised intracranial pressure - Bag-valve-mask ventilation - Crash call (if not already) - Give mannitol or hypertonic saline 				
Facilitators should:	<p><u>Provide further information if requested:</u></p> <ul style="list-style-type: none"> - Blood/gas results, emergency drug chart, SORT hypertonic saline guideline - Prolonged capillary refill - Confirm that L pupil dilated and unreactive - Skin mottled - Temp 35.5 °C <p><u>Progression:</u></p> <ul style="list-style-type: none"> - If appropriate management (include hyperosmolar Rx), patient improves. Progress to 'Treated ICP' - If inappropriate management, 'Pause and Perfect'. Pause scenario and review lack of patient improvement, discussing possible causes and solutions. Then restart scenario and allow participant to manage patient. 				

STATE: TREATED ICP

VITAL SIGNS					
Rhythm	SR	HR	145/min	BP	95/56
Resp rate	Bagged	SaO ₂	98%	ETCO ₂	
Temp	35.3 °C	AVPU	P (GCS 10)	Pupils	4mm ERL
Other					
ASSESSMENT					
Pulses	Normal	Cap refill	2 sec	Skin	Warm, well perfused
Airway	Normal	Breathing	Bagged	Breath sounds	Normal
Work of breathing	Normal	Recession	Normal	Neuro	Responsive to pain
Other	Pupils now equal, reactive				
EXPECTED OUTCOMES					
Participants should:	<ul style="list-style-type: none"> - Continue to support ventilation - Appreciate that LP is contraindicated - Arrange urgent CT now that patient is more stable - Consider possible causes including blocked/infected shunt, meningitis, trauma 				
Facilitators should:	<p><u>Prompt participant:</u></p> <ul style="list-style-type: none"> - What is needed for patient to move to CT scan / PICU? (monitoring, oxygen, suction, stable airway, appropriate staff) <p><u>Progression:</u></p> <ul style="list-style-type: none"> - Handover to PICU team / CT scan 				

APPENDIX 1 – BLOOD GAS - INITIAL
RADIOMETER ABL SIMULATION SERIES

ABL725 ICU 08 36 C0 12-01-2013
 PATIENT REPORT Syringe - S 195uL Sample# 90396

Identifications

Patient ID	10183755
Patient First Name	Scarlet
Patient Last Name	Richards
Date of Birth	12/09/2012
Sample type	Venous
Operator	Intensive Care

Blood Gas Values

pH	7.14		[7.340 - 7.450]
pCO ²	10.1	kPa	[4.70 - 6.00]
pO ²	5.08	kPa	[10.0 - 13.3]
pO ² (A-a)e		kPa	

Oximetry Values

ctHb	13.3	g/dL	[12.0 - 16.0]
sO ²		%	[95.0 - 98.0]
FO ² Hb		%	[94.0 - 99.0]
FC OHb		%	[- -]
FHHb		%	[- -]
FmetHb		%	[0.2 - 0.6]
Hctc		%	

Electrolyte Values

cK+	4.4	mmo1/L	[3.0 - 5.0]
cNa+	137	mmo1/L	[136 - 146]
cCa ²⁺	1.1	mmoq/L	[1.15 - 1.29]
cCl-	97	mmo1/L	[98 - 106]

Metabolite Values

cGlu	12.1	mmo1/L	[3.5 - 10.0]
cLac	1.7	mmo1/L	[0.5 - 1.6]

Oxygen Status

ctO ² c		vol%
p50c		kPa

Acid Base Status

cBase(Ecf)c	-5.9	mmo1/L
cHCO ³⁻ (P,st)c	20.7	mmo1/L

APPENDIX 3 – EMERGENCY DRUG CHART

Date Dec 20, 2012

**Southampton
Oxford
Retrieval
Team**

DRUG CALCULATOR

WEIGHT 5 Kg

Enter weight and click calculate

Calculate
Print

<p>Emergency</p> <p>Adrenaline 1:10,000 0.5 ml (0.1 ml/kg)</p> <p>Atropine 600mcg/ml 0.17 ml (20mcg/kg, min 100mcg)</p> <p>Atropine <u>100</u>mcg/ml 1 ml (20mcg/kg min 100mcg)</p> <p>Sodium Bicarbonate 8.4% 5 ml (1 ml/kg)</p> <p>Calcium Gluconate 10% 2.5 ml (0.5 ml/kg)</p> <p>Cardiac</p> <p>Cardioversion (sync) 5 Joules (1J/kg) (use 2J/kg if fails)</p> <p>Shockable rhythm (async) 20 Joules (4J/kg)</p> <p>Adenosine 500 mcg (100 mcg/kg)</p> <p>Amlodarone Load 25 mg (5 mg/kg over 30 minutes to 4hrs)</p> <p>Neuro</p> <p>Lorazepam 0.5 mg (0.1 mg/kg)</p> <p>Midazolam Buccal 0.5 mg (0.1 mg/kg)</p> <p>Phenytoin 100 mg (20 mg/kg over 20 minutes)</p> <p>Phenobarbitone 100 mg (20 mg/kg)</p> <p>Paraldehyde PR 2 ml (0.4 ml/kg, mix 1:1 with oil)</p> <p>3% Saline 15 ml (3ml/kg)</p> <p>Mannitol 10% 25 ml (5ml/kg, equivalent to 0.5g/kg)</p>	<p>Respiratory</p> <p>Magnesium Sulphate 200 mg (40 mg/kg over 20 minutes)</p> <p>Salbutamol load 75 mcg (15 mcg/kg over 10 minutes)</p> <p>Hydrocortisone 20 mg (4 mg/kg, max 100mg)</p> <p>Aminophylline load 25 mg (5 mg/kg over 20 minutes)</p> <p>Adrenaline 1:1000 Nebulised 2.5 ml (0.5 ml/kg, max 5 mls) Make up to 5 ml with saline</p> <p>Anaesthesia</p> <p>Ketamine 10 mg (2mg/kg)</p> <p>Thiopentone 5 to 25 mg (1-5mg/kg)</p> <p>Fentanyl 10 to 25 mcg (2-5mcg/kg)</p> <p>Morphine 0.5 mg (0.1 mg/kg)</p> <p>Rocuronium 5 mg (1mg/kg)</p> <p>Atracurium 2.5 mg (0.5mg/kg)</p> <p>Vecuronium 0.5 mg (0.1mg/kg)</p> <p>Suxamethonium 7.5 mg (1.5mg/kg)</p> <p>Anaphylaxis</p> <p>Adrenaline IM 0.15 ml of 1:1000</p>
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Infusions Calculations based on Southampton PICU infusions guidelines (2011)

Dopamine (central)	75 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	5 mcg/kg/min
Dopamine (peripheral)	7.5 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.5 mcg/kg/min
Adrenaline	1.5 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.1 mcg/kg/min
Noradrenaline	1.5 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	0.1 mcg/kg/min
Milrinone	10 mg In 50ml of 0.9% Saline or 5% Glucose	0.75 ml / hr =	0.5 mcg/kg/min
Dinoprostone (Prostin E2)	50 mcg In 50ml of 0.9% Saline or 5% Glucose	1.5 ml / hr =	5 ng/kg/min
Morphine	5 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	20 mcg/kg/hr
Midazolam	5 mg In 50ml of 0.9% Saline or 5% Glucose	1 ml / hr =	20 mcg/kg/hr
Salbutamol	10 mg In 50ml of 0.9% Saline or 5% Glucose	1.5 ml / hr =	1 mcg/kg/min
Aminophylline	250 mg In 250ml of 0.9% Saline or 5% Glucose	5 ml / hr =	1 mg/kg/hr

It is the prescribers responsibility to ensure the correct dose is prescribed Compiled by Tom Bennett - May 2012



DEBRIEFING

POINTS FOR FURTHER DISCUSSION

Raised ICP needs to be considered in the differential of any child seen with altered level of consciousness. 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

Cushing's response (bradycardia and hypertension) is a pre-terminal sign, caused by impending herniation of the brainstem. It requires immediate action.

Specific management of raised ICP:

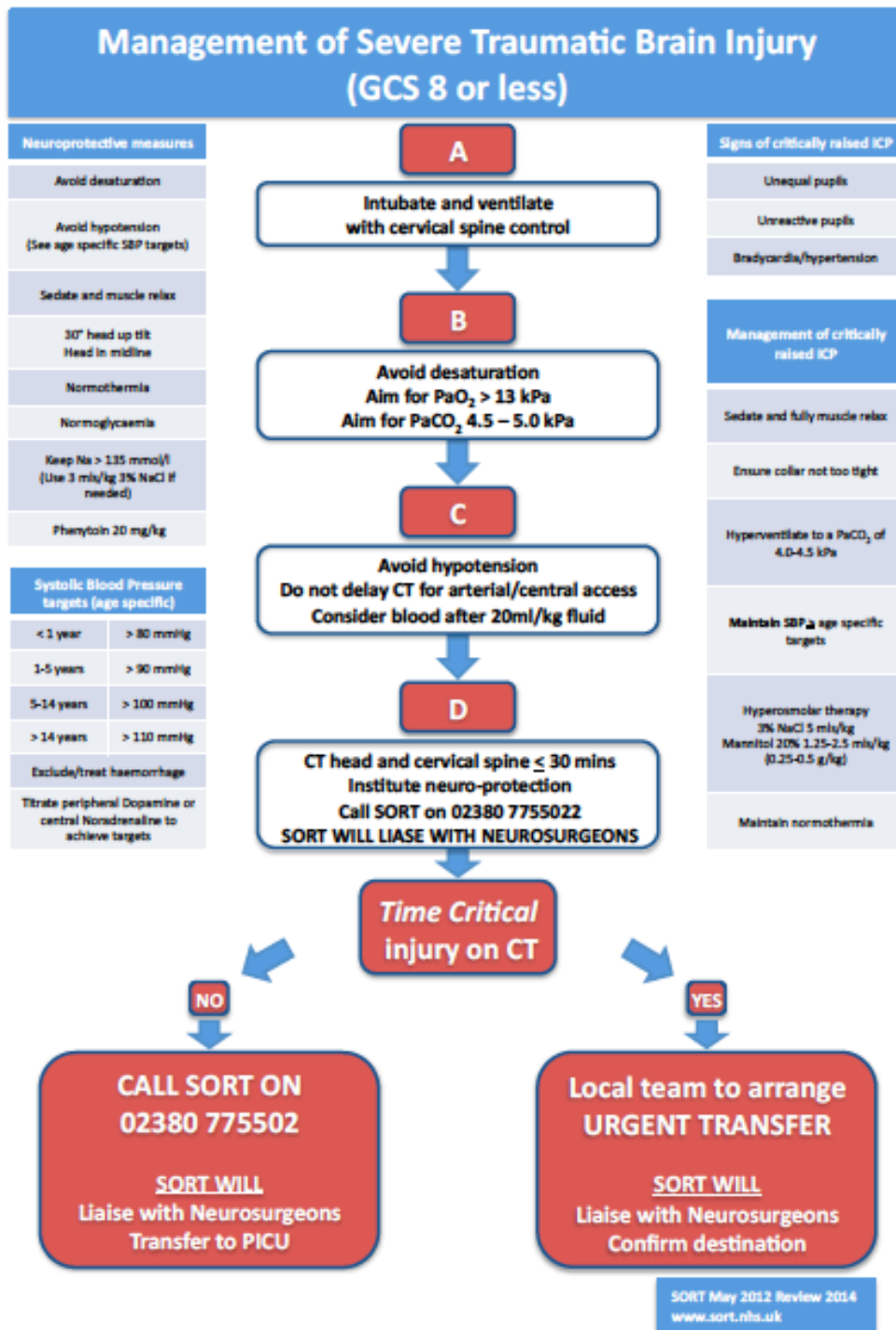
1. Hyperosmolar therapy – mannitol or hypertonic saline
2. Support ventilation, aiming PaCO₂ of 4.0-4.5 kPa
3. Avoid desaturation
4. Aim normoglycaemia and normothermia
5. 30% head-up tilt, keeping head in midline

Do not perform LP in child with reduced level of consciousness unless a scan has excluded a brain lesion and discussed with consultant.

Do not take child to CT scan until stabilised

DEBRIEFING RESOURCES

1. Guideline for management of child with decreased conscious level (from Nottingham; used as RCPCH guidance for National Audit 2011
<http://www.nottingham.ac.uk/paediatric-guideline/Guideline%20algorithm.pdf>
2. SORT guideline for management of traumatic brain injury. Many of the general principles apply to the child with raised intracranial pressure, whatever the cause.
<http://www.sort.nhs.uk/Media/Guidelines/ManagementofseveretraumaticbraininjuryGCS8orless.pdf>



DECREASED CONSCIOUSNESS - HANDOUT

INFORMATION FOR PARTICIPANTS

KEY POINTS

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

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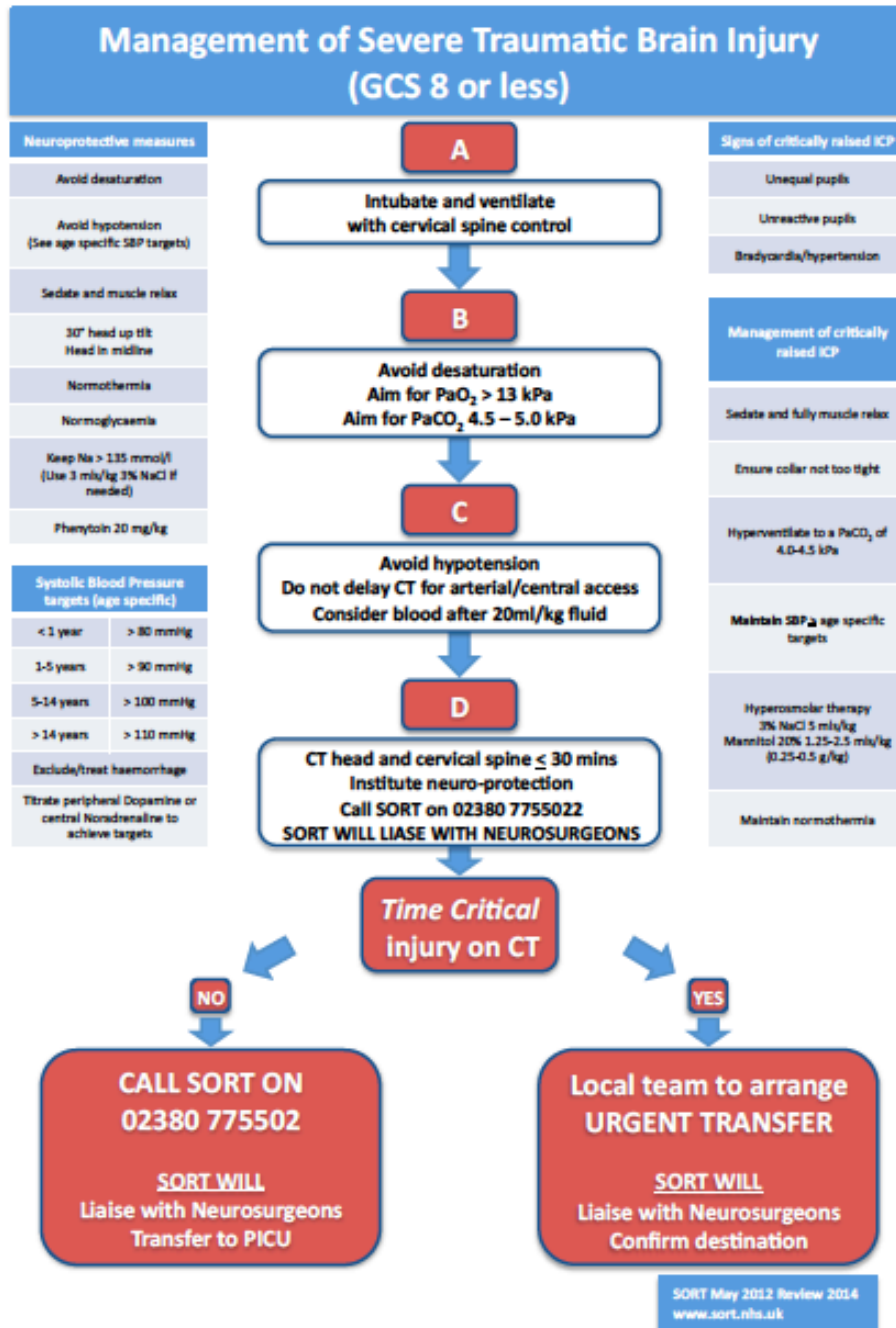
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Management of raised ICP:

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RELEVANT AREAS OF THE CURRICULUM

Level One

L1_GEN_STA_02	Effective responses to challenge, complexity and stress in paediatrics
L1_GEN_STA_03	Advanced neonatal and paediatric life support skills
L1_GEN_STA_05	Effective skills in paediatric assessment
L1_GEN_STA_06	Skills in formulating an appropriate differential diagnosis in paediatrics
L1_GEN_STA_07	Effective initial management of ill-health and clinical conditions in paediatrics seeking additional advice and opinion as appropriate
L1_GEN_STA_09	Safe practical skills in paediatrics
L1_GEN_STA_15	Knowledge of common and serious paediatric conditions and their management
L1_GEN_STA_29	Effective communication and interpersonal skills with colleagues
L1_GEN_STA_30	Professional respect for the contribution of colleagues in a range of roles in paediatric practice
L1_GEN_STA_32	Effective handover, referral and discharge procedures in paediatrics
L1_GEN_STA_34	Ethical personal and professional practice in providing safe clinical care
L1_GEN_STA_35	Reliability and responsibility in ensuring their accessibility to colleagues and patients and their families
PAED_L1_NEURO_GEN_12	Understand the principles and use of neuro-radiological imaging
PAED_L1_NEURO_GCS_01	Know the likely causes or pathogens of meningism and altered consciousness
PAED_L1_NEURO_GCS_02	Understand the principles of treatment (of decreased consciousness)
PAED_L1_NEURO_GCS_04	Know when it is safe to perform a lumbar puncture
PAED_L1_NEURO_GCS_07	Recognise early signs of meningitis and encephalitis
PAED_L1_NEURO_GCS_08	Use a validated coma score
PAED_L1_NEURO_GCS_09	Recognise signs and implications of raised intra-cranial pressure
PAED_L1_NEURO_GCS_10	Initiate therapy (for raised intracranial pressure) appropriately
PAED_L1_NEURO_GCS_11	Call for help promptly

Level Two (as above plus):

L2_GEN_STA_02	Increasing credibility and independence in response to challenge and stress in paediatrics
L2_GEN_STA_03	Leadership skills in advanced neonatal and paediatric life support

L2_GEN_STA_04	Responsibility for conducting effective paediatric assessments and interpreting findings appropriately
L2_GEN_STA_06	Improving skills in formulating an appropriate differential diagnosis in paediatrics
L2_GEN_STA_09	Effective skills in performing and supervising practical procedures in paediatrics ensuring patient safety
L2_GEN_STA_15	Extended knowledge of common and serious paediatric conditions and their management
L2_GEN_STA_29	Skill in ensuring effective relationships between colleagues
L2_GEN_STA_32	Effective skills in ensuring handover, referral and discharge procedures in paediatrics
L2_GEN_STA_34	Sound ethical, personal and professional practice in providing safe clinical care
L2_GEN_STA_35	Continued responsibility and accessibility to colleagues, patients and their families
PAED_L2_NEURO_GCS_01	Assess and manage early presentations of meningitis and encephalitis
PAED_L2_NEURO_GCS_03	Assess and initiate management of raised intra-cranial pressure
PAED_L2_NEURO_NTD_02	Be able to recognise the signs and symptoms of blocked shunts

Level Three (as above plus):

L3_GEN_STA_02	Responsibility for an effective response to complex challenges and stress in paediatrics
L2_GEN_STA_03	Leadership skills in advanced neonatal and paediatric life support
L3_GEN_STA_06	Effective skills in making safe decisions about the most likely diagnoses in paediatrics
L3_GEN_STA_07	Leadership skills in the management of common and complex conditions in general paediatrics and paediatric subspecialties seeking additional advice and opinion as appropriate
L3_GEN_STA_09	Expertise in a range of practical procedures in paediatrics specific to general and sub-specialist training
L3_GEN_STA_15	Detailed knowledge of common and serious paediatric conditions and their management in General Paediatrics or in a paediatric sub-specialty
L3_GEN_STA_29	Positive and constructive relationships form a wide range of professional contexts
L3_GEN_STA_32	Effective leadership skills in the organisation of paediatric team-working and effective handover
L3_GEN_STA_34	Exemplary professional conduct so as to act as a role model to others in providing safe clinical care
L3_GEN_STA_35	Responsibility for ensuring their own reliability and accessibility and that of others in their team
PAED_L3_NEURO_GEN_04	Recognise features of life-threatening neurological disorders including raised intercranial pressure, CNS tumours and initiate the appropriate clinical response with apposite urgency
PAED_L3_NEURO_NTD_02	Be able to recognise the signs and symptoms of acute and chronic blocked shunts

PARTICIPANT REFLECTION

What have you learned from this experience? (Please try and list 3 things)

How will your practice now change?

What other actions will you now take to meet any identified learning needs?

PARTICIPANT FEEDBACK

Date of training session:.....
 ...

Profession and grade:.....

What role(s) did you play in the scenario? (Please tick)

Primary/Initial Participant	<input type="checkbox"/>
Secondary Participant (e.g. 'Call for Help' responder)	<input type="checkbox"/>
Other health care professional (e.g. nurse/ODP)	<input type="checkbox"/>
Other role (please specify):	<input type="checkbox"/>
Observer	<input type="checkbox"/>

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
I found this scenario useful					
I understand more about the scenario subject					
I have more confidence to deal with this scenario					
The material covered was relevant to me					

Please write down one thing you have learned today, and that you will use in your clinical practice.

How could this scenario be improved for future participants? This is especially important if you have ticked anything in the disagree/strongly disagree box.

FACULTY DEBRIEF – TO BE COMPLETED BY FACULTY TEAM

What went particularly well during this scenario?

What did not go well, or as well as planned?

Why didn't it go well?

How could the scenario be improved for future participants?