Health Education Thames Valley

ISOLATED HEAD INJURY

MODULE: Intensive Care Medicine / Trauma

TARGET: ALL ANAESTHETISTS, INTENSIVISTS & ED PHYSICIANS

BACKGROUND:

Head injuries are a major cause of morbidity and mortality in children and adults. Initial assessment and resuscitation should follow ATLS guidelines. The quality of the initial resuscitation has a direct impact on the long-term outcome from severe brain injury. Management of isolated brain injury in a non-neurosurgical centre has been associated with a 26% increase in mortality and 2.15-fold increase in the odds ratio of death compared with treatment in specialist neurosurgical centres. This is of particular concern, and reinforces the need for high quality training in early management of traumatic brain injury.

RELEVANT AREAS OF THE ANAESTHETIC CURRICULUM

IG_BS_07 AM_BS_04	Demonstrates effective pre-oxygenation, including correct use of the mask, head position and clear explanation to the patient.
IG_BS_10 AM_BS_05	In respect of airway management: • Demonstrates optimal patient position for airway management. • Manages airway with mask and oral/nasopharyngeal airways • Demonstrates hand ventilation with bag and mask • Able to insert and confirm placement of a Laryngeal Mask Airway • Demonstrates correct head positioning, direct laryngoscopy and successful nasal/oral intubation technique(s) and confirms correct tracheal placement. • Demonstrates appropriate use of bougies. • Demonstrates correct securing and protection of LMAs/tracheal tubes during movement, positioning and transfer.
CI_BK_12	Convulsions
CI_BS_01	Demonstrates good non-technical skills such as: [effective communication, team-working, leadership, decision-making
CI_BS_02	Demonstrates the ability to recognise a deteriorating situation early through careful monitoring
CI_BS_05	Demonstrates ability to recognise when a crisis is occurring
CI_BS_06	Demonstrates how to obtain the attention of others and obtain appropriate help when a crisis is occurring
3.6	Recognises and manages the patient with neurological impairment
MT_BS_01	Demonstrates how to perform the Primary Survey in a trauma patient
MT_BS_02	Demonstrates correct emergency airway management in a trauma patient including those with actual or potential cervical spine damage [S]
MT_BS_06	Demonstrates the initial resuscitation of patients with trauma and preparation for further interventions including emergency surgery
NA_IS_07	Demonstrates the ability to resuscitate, stablise and transfer patients with brain injury
CI_IS_01	Demonstrates leadership in the resuscitation room/simulation when practicing response protocols with other healthcare professionals
CI_IS_02	Demonstrates appropriate use of team resources when practicing response protocols with other healthcare professionals
TF_IS_02	Demonstrates the ability to optimally package a patient for inter-hospital transfer to minimise risks
TF_IS_03	Demonstrates the ability to establish appropriate ventilation and monitoring required of a critically ill patient for inter-hospital transfer
10.1	Undertakes transport of the mechanically ventilated critically ill patient outside of the ICU
MT_IS_05	Demonstrates correct preparation of patients for safe transfer including ensuring adequate resuscitation, appropriate accompanying personnel and the use of checklists
MT_IS_01	Demonstrates the ability to lead the multi-disciplinary trauma team to ensure that the primary survey, resuscitation and secondary surveys are conducted appropriately in non-complex trauma patients
MT_IS_02	Demonstrates advanced airway management in trauma patient [including those with suspected unstable cervical spine] including surgical airway techniques.
1.5	Assess and provides initial management of the trauma patient
TF_HS_01	Demonstrates leadership in the clinical management of any patient requiring transfer to another area/hospital for further management
TF_HS_04	Demonstrates the necessary organisational and communication skills required to effect the transfer of patients in a timely and efficient manner
TF_HS_06	Demonstrates leadership of the multi-disciplinary team undertaking the transfer

INFORMATION FOR FACULTY

LEARNING OBJECTIVES:

- Initial assessment and management of the brain-injured patient, including airway management
- Strategies to minimise surges in intra-cranial pressure
- Packaging of a patient for safe transfer to CT Scanning

SCENE INFORMATION:

- Location: Resuscitation Room

ED is extremely busy. They are short-staffed and have asked the ICU / Anaesthetic team to manage this patient who has presented with a low GCS following a head injury. Both the junior and senior anaesthetic trainees commence this scenario together

EQUIPMENT & CONSUMABLES

- Mannequin: On ED trolley, with full O2 cylinder
  Collar, blocks and tape on
  Head wound/bloody dressings on scalp
- Stocked airway trolley
- Portable monitor
- Portable ventilator
- Infusion pump(s)
- Syringes, IV fluid and giving sets

PERSONS REQUIRED

Anaesthetic Junior Trainee
Anaesthetic Senior Trainee
ED Resus nurse
Paramedic for initial handover (Optional)
Foundation/ED Trainee (Optional)

PARTICIPANT BRIEFING: (TO BE READ ALOUD TO PARTICIPANT)

Handover from Paramedic or ED Nurse (ATMIST style):

This 34 year old man is a construction worker and was working on-site until the accident about 40 minutes ago. He sustained a head injury when a girder being transferred by a low crane swung and struck him in the back of the head. He was wearing a helmet, which was knocked off. He fell to the ground and witnessed reported that his arms and legs twitched for 30-40 seconds. The ambulance arrived within 7 mins. We witnessed a further brief tonic-clonic seizure that terminated spontaneously.

He has been maintaining his airway, and has had C-spine protection applied. High flow O2 was applied. There were no external chest injuries and his chest was clear with normal heart sounds. His observations have been: BP 150/85, HR 95, RR 12, SaO2 99% on O2, temp 36.6. His GCS was 5 initially: E2V2M1, but is now 4: E1V2M1.

'VOICE OF MANIKIN' BRIEFING:

Moans initially. Snoring noises develop unless oropharyngeal airway inserted, or intubation performed.

'VOICE OF TELEPHONE HELP BRIEFING':

There will be delay before help arrives. If team calls neurosurgeons, advise is to perform CT Head/Neck.

Health Education Thames Valley

ADDITIONAL INFORMATION

RADIOMETER ABL 9000 SERIES

ABL900 ED 00:00:00 08-01-2013
PATIENT REPORT Syringe S195uL Sample# 90.....

Patient ID
Patient First Name Unknown
Patient Last Name Male
Date of Birth 34 year old
Sample type Arterial
Fi O_2 1.0
Department ED
Operator

Blood Gas Values

pH	7.31		[7.340 - 7.450]
pCO2	6.8	kPa	[4.70 - 6.00]
pO2	18.2	kPa	[10.0 - 13.3]
pO2(A-a)e		kPa	

Oximetry Values

ctHb	14.5	g/dL	[12.0 - 16.0]
sO_2	96	%	[95.0 - 98.0]
fO_2Hb		%	[94.0 - 99.0]
fCOHb			[-]
fHHb		%	[-]
fmetHb		%	[0.02 - 0.06]
Hctc	0.38	%	

Electrolyte Values

cK+	4.5	mmol/L	[3.0 - 5.0]
cNa+	136	mmol/L	[136 - 146]
cCa^{2+}	1.18	mmeq/L	[1.15 - 1.29]
cCl-	100	mmol/L	[98 - 106]

Metabolite Values

cGlu	4.1	mmol/L	[3.5 - 10.0]
cLac	1.2	mmol/L	[0.5 - 1.6]

Acid Base Status

cBase(Ecf)c	-1	mmol/L
$cHCO^3$-(P,st)c	21	mmol/L

Notes
↑ Value (s) above reference range
↓ Value (s) below reference range
c Calculated Value (s)
e Estimated Value (s)

RADIOMETER ABL 9000 SERIES

ABL900 ED 00:00:00 08-01-2013
PATIENT REPORT Syringe S195uL Sample# 90.....

Patient ID
Patient First Name Unknown
Patient Last Name Male
Date of Birth 34 year old
Sample type Arterial
Fi O_2 1.0
Department ED
Operator

Blood Gas Values

pH	7.35		[7.340 - 7.450]
pCO2	5.2	kPa	[4.70 - 6.00]
pO2	27.7	kPa	[10.0 - 13.3]
pO2(A-a)e		kPa	

Oximetry Values

ctHb	14.3	g/dL	[12.0 - 16.0]
sO_2	98	%	[95.0 - 98.0]
fO_2Hb		%	[94.0 - 99.0]
fCOHb			[-]
fHHb		%	[-]
fmetHb		%	[0.02 - 0.06]
Hctc		%	

Electrolyte Values

cK+	4.4	mmol/L	[3.0 - 5.0]
cNa+	135	mmol/L	[136 - 146]
cCa^{2+}	1.17	mmeq/L	[1.15 - 1.29]
cCl-	101	mmol/L	[98 - 106]

Metabolite Values

cGlu	4.3	mmol/L	[3.5 - 10.0]
cLac	1.5	mmol/L	[0.5 - 1.6]

Acid Base Status

cBase(Ecf)c	-1.8	mmol/L
$cHCO^3$-(P,st)c	21	mmol/L

Notes
↑ Value (s) above reference range
↓ Value (s) below reference range
c Calculated Value (s)
e Estimated Value (s)

CONDUCT OF SCENARIO

INITIAL SETTINGS

A: Own. Snoring noises. Collar, blocks and tape applied.
B: SpO2 95% on O2. RR 12/min
C: HR 95 (Sinus), BP 165/85, IV Access.
D: Moans with painful stimulus, eyes closed, pupils equal initially.
E: Evidence of head wound. No other injuries.

EXPECTED ACTIONS

- Primary Survey
- Monitoring
- OP Airway. High Flow O2.
- Bloods, X-match,
- Glucose, Blood Gas.

ONSET OF SEIZURE

A: Own. Snoring noises worsen unless airway managed.
B: SpO2 92% on O2. RR 8/min
C: HR 80 (Sinus), BP 180/85, IV Access.
D: Convulsions. Silent. GCS 3.
- Seizure stops as anaesthetic drugs given.
E: Evidence of head wound. No other injuries.

EXPECTED ACTIONS

- Prepare for RSI
- Maintain C-Spine Control
- Appropriate induction with limitations of intracranial pressure surges
- Maintenance of sedation

POST-INTUBATION

A: Intubated.
B: SpO2 98% on ventilator. etCO2 6.5 initially.
C: BP surges to 205/115 unless specifically addressed during intubation (e.g. Opioids), otherwise stable or falls post-induction, HR 60.
D: RHS pupil dlated compared to the LHS.

EXPECTED ACTIONS

- Institute neuroprotective measures: avoid hypoxia, EtCO2 4.45, temperature and glycaemic control, consider elevating head.
- CT Head
- Consider Mannitol (appropriate dose required) and a catheter.
- Package patient for safe transfer: minimum monitoring on bed, continuous sedation and follow

LOW DIFFICULTY

- Neuroprotective measures alone improve pupillary dilatation, provided etCO2 reduced to below 4.5

NORMAL DIFFICULTY

- No improvement in pupillary dilatation with neuroprotective measure.
- Improves if mannitol given appropriately
- Help arrives if required.

HIGH DIFFICULTY

- **Both pupils dilate – patient is coning**
- **HR 35/min, BP 200/105 then 190/60**
- Neurogenic Pulmonary oedema ensues
- Bilateral creps, **SpO2 80%** despite vent.
- **ST Depression on ECG**
- **Unrecoverable PEA/Asystolic arrest**
- Participant expected to commence CPR and cease efforts appropriately.
- **NEEDS APPROPRIATE DEBRIEF**

RESOLUTION

Scenario ends when patient is safely packaged for transfer or at faculty discretion

DEBRIEFING

POINTS FOR FURTHER DISCUSSION:

Technical:

- Initial Assessment of the trauma patient
- Airway management in the brain-injured patient
- Physiology of intracranial pressure
- Limiting surges in ICP

Non-technical:

- Based on established non-technical frameworks e.g. ANTS, NOTECHS etc

DEBRIEFING RESOURCES

1. Traumatic Brain Injury Resources available from AnaesthesiaUK Home>>Intensive Care>>Neurosciences
   http://www.anaesthesiauk.com/SectionContents.aspx?sectionid=226

2. NICE Clinical Guidance CG56 Head Injury: Triage, assessment, investigation and early management of head injury in infants, children and adults (Sept 2007)
   http://www.nice.org.uk/nicemedia/live/11836/36257/36257.pdf (Quick Reference Guide)

3. SIGN Guideline 110: Early management of patients with a head injury (May 2009)
   http://www.sign.ac.uk/guidelines/fulltext/110/index.html

4. The Brain Trauma Foundation www.braintrauma.org

5. AAGBI Guideline: Recommendations for the Safe Transfer of Patients with Brain Injury (2006)
   http://www.aagbi.org/sites/default/files/braininjury.pdf

6. Gordon JK, McKinlay J. Physiological changes after brain stem death and management of the heart- beating donor. June 2012. CEACCP 12 (3)
   http://ceaccp.oxfordjournals.org/content/early/2012/05/23/bjaceaccp.mks026.full.pdf+html

INFORMATION FOR PARTICIPANTS

KEY POINTS:

- Initial assessment and management of the brain-injured patient, including airway management
- Strategies to minimise surges in intra-cranial pressure
- Packaging of a patient for safe transfer to CT Scanning

RELEVANT AREAS OF THE ANAESTHETIC CURRICULUM

IG_BS_07 AM_BS_04	Demonstrates effective pre-oxygenation, including correct use of the mask, head position and clear explanation to the patient.
IG_BS_10 AM_BS_05	In respect of airway management: • Demonstrates optimal patient position for airway management. • Manages airway with mask and oral/nasopharyngeal airways • Demonstrates hand ventilation with bag and mask • Able to insert and confirm placement of a Laryngeal Mask Airway • Demonstrates correct head positioning, direct laryngoscopy and successful nasal/oral intubation technique(s) and confirms correct tracheal placement. • Demonstrates appropriate use of bougies. • Demonstrates correct securing and protection of LMAs/tracheal tubes during movement, positioning and transfer.
CI_BK_12	Convulsions
CI_BS_01	Demonstrates good non-technical skills such as: [effective communication, team-working, leadership, decision-making
CI_BS_02	Demonstrates the ability to recognise a deteriorating situation early through careful monitoring
CI_BS_05	Demonstrates ability to recognise when a crisis is occurring
CI_BS_06	Demonstrates how to obtain the attention of others and obtain appropriate help when a crisis is occurring
3.6	Recognises and manages the patient with neurological impairment
MT_BS_01	Demonstrates how to perform the Primary Survey in a trauma patient
MT_BS_02	Demonstrates correct emergency airway management in a trauma patient including those with actual or potential cervical spine damage [S]
MT_BS_06	Demonstrates the initial resuscitation of patients with trauma and preparation for further interventions including emergency surgery
NA_IS_07	Demonstrates the ability to resuscitate, stablise and transfer patients with brain injury
CI_IS_01	Demonstrates leadership in the resuscitation room/simulation when practicing response protocols with other healthcare professionals
CI_IS_02	Demonstrates appropriate use of team resources when practicing response protocols with other healthcare professionals
TF_IS_02	Demonstrates the ability to optimally package a patient for inter-hospital transfer to minimise risks
TF_IS_03	Demonstrates the ability to establish appropriate ventilation and monitoring required of a critically ill patient for inter-hospital transfer
10.1	Undertakes transport of the mechanically ventilated critically ill patient outside of the ICU
MT_IS_05	Demonstrates correct preparation of patients for safe transfer including ensuring adequate resuscitation, appropriate accompanying personnel and the use of checklists
MT_IS_01	Demonstrates the ability to lead the multi-disciplinary trauma team to ensure that the primary survey, resuscitation and secondary surveys are conducted appropriately in non-complex trauma patients
MT_IS_02	Demonstrates advanced airway management in trauma patient [including those with suspected unstable cervical spine] including surgical airway techniques.
1.5	Assess and provides initial management of the trauma patient
TF_HS_01	Demonstrates leadership in the clinical management of any patient requiring transfer to another area/hospital for further management

TF_HS_04	Demonstrates the necessary organisational and communication skills required to effect the transfer of patients in a timely and efficient manner
TF_HS_06	Demonstrates leadership of the multi-disciplinary team undertaking the transfer

DEBRIEFING RESOURCES

7. Traumatic Brain Injury Resources available from AnaesthesiaUK Home>>Intensive Care>>Neurosciences
http://www.anaesthesiauk.com/SectionContents.aspx?sectionid=226

8. NICE Clinical Guidance CG56 Head Injury: Triage, assessment, investigation and early management of head injury in infants, children and adults (Sept 2007)
http://www.nice.org.uk/nicemedia/live/11836/36257/36257.pdf (Quick Reference Guide)

9. SIGN Guideline 110: Early management of patients with a head injury (May 2009)
http://www.sign.ac.uk/guidelines/fulltext/110/index.html

10. The Brain Trauma Foundation www.braintrauma.org

11. AAGBI Guideline: Recommendations for the Safe Transfer of Patients with Brain Injury (2006)
http://www.aagbi.org/sites/default/files/braininjury.pdf

12. Gordon JK, McKinlay J. Physiological changes after brain stem death and management of the heart-beating donor. June 2012. CEACCP 12 (3)
http://ceaccp.oxfordjournals.org/content/early/2012/05/23/bjaceaccp.mks026.full.pdf+html

PARTICIPANT REFLECTION:

What have you learnt from this experience? (Please try to 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	
Secondary Participant (e.g. 'Call for Help' responder)	
Other health care professional (e.g. nurse/ODP)	
Other role (please specify):	
Observer	

	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?