Appendix F: MedEdPORTAL Simulation Case

SIMULATION CASE TITLE: Fall with epidural hematoma

LEARNER AUDIENCE: Emergency medicine (EM) residents, EM attendings, Trauma residents, Physician Assistants, Trauma attendings, EM nursing

PATIENT NAME: Noah Kayuse

PATIENT AGE: 68 year-old Male

CHIEF COMPLAINT: Fall, + loss of consciousness (LOC), altered mental status

PHYSICAL SETTING: 68 year-old male brought in by ambulance after he tripped down some steps in a pub and fell. EMS reports fall down 4 steps: +LOC and confusion.

Brief narrative description of case	68 year-old male with history of atrial fibrillation on Coumadin falls down 4 steps striking his head. Team should identify and treat head injury with worsening GCS, intubate, and reverse anticoagulation.
Primary Learning Objectives	*Learning:* 1. Perform ATLS - Complete primary survey, secondary survey, adjunct studies, and stabilizing interventions in an organized and timely fashion 2. Recognize and manage head injury while on anticoagulation 3. Intubation considerations for trauma patient with head injury *Communication:* 1. Become familiar with team roles and responsibilities 2. Employ closed loop communication 3. Practice using shared mental model
Critical Actions	❒ Team members wear PPE ❒ Expose patient starting at the chest to allow for vitals and IV placement ❒ Place on monitor ❒ Place large bore IVs ❒ Perform primary survey ❒ Obtain chest x-ray, pelvic x-ray, and EFAST ❒ Perform secondary survey ❒ Identify high likelihood for increased intracranial pressure (ICP) and treatment options ❒ Reverse anticoagulation

Learner Preparation or Prework	*None*
Simulation Moulage and Equipement	**<u>Moulage:</u>** Fully clothed elderly male C-collar in place Hematoma to left temporal area Random ecchymosis on arms and legs Medication bottle with "Warfarin" written on it, in pocket **<u>Equipment:</u>** Manikin Simulated fresh frozen plasma +/-prothrombin complex concentrate (4PCC) Simulated Mannitol versus hypertonic saline (whichever is used mostly in institution trauma bay) Nasal cannula Endotracheal tube (7.5) with stylet, +/- rigid stylet for glidescope Bag-valve-mask (BVM) End-tidal Co2 monitoring or easy-cap Simulated rapid sequence intubation medications

Initial Presentation	
Overall Setting and Appearance	Scenario: In trauma bay Patient on stretcher, fully clothed
Trauma Activation level	Level 2
Activation level justification	Fall with head injury on anticoagulation with LOC and GCS 10
Assigned sim team roles	1. EMS-gives team field information and vital signs 2. The Patient- all cases utilize a manikin, but someone needs to be the voice of the patient 3. Observer-ensure that team achieves critical actions, takes notes on team dynamics 4. Debriefer-leads post sim debrief on team communication, resuscitation logistics and medical management
EMS Report	Per a bystander and EMS, patient tripped and fell down 5 steps while leaving the bar this morning. + LOC.

	Patient remembers drinking a few beers, but does not recall what exactly happened. He thinks that he fell, but he is not sure. Then he starts rambling random words. Per EMS, the patient takes some sort of anticoagulant for his afib.		
EMS vital signs	HR 101, BP 110/75, SpO2 98% RA, RR 20, T 98.2		
Past Medical/Surgical History	**Medications/Allergies**	**Social History**	**Last meal**
PMH: Atrial fibrillation **PSH**: None	**Meds**: Coumadin-compliant **All**: None	**Social**: +alcohol No tobacco	6 beers at the bar this morning

Primary Survey	
Initial ED vital signs	HR 101, BP 110/75, SpO2 98% RA, RR 20, T 98.2
General	Confused, does not remember events, rambling random words.
Airway	Intact
Breathing	Equal bilateral breath sounds
Circulation	2 + distal pulses
Disability	GCS 10 (E2- opens to pain, V3- random words, not conversational exchange, M5-localizes pain)
Exposure	Hematoma to left temporal area
EFAST	Negative (video #1,2,3,4,5)

Secondary Survey	
General	Confused, does not remember events
HEENT	Hematoma to left temporal area, not expanding, PERRLA, EOMI
Neck	No cervical spine tenderness
Lungs	Equal bilateral breath sounds
Cardiovascular	Irregular heart rate, no murmurs/rubs/gallops appreciated
Abdomen	Soft, non-tender, non-distended

Pelvis/MSK	Stable pelvis, moving all extremities, complains of diffuse pain with range of motion and palpation, but no focal tenderness
Neurological	GCS 10 on initial exam (E2V3M5)
Skin	ecchymosis to face
GU	Normal GU exam
Psychiatric	Confused

Imaging (see image bank)	
Chest X-ray	Negative initially (image #1) Repeat chest x-ray with ETT tube in place (image # 12)
Pelvis X-ray	Normal, no open book fracture (image #2)
EFAST	Negative (video #1,2,3,4,5)

Instructor Notes - Changes and Case Branch Points
This section should be a list with detailed description of each step than may happen during the case. If medications are given, what is the response? Do changes occur at certain time points? Should the nurse or other participant prompt the learners at given points? Should new actors or participants enter, and when? Are there specific things the patient will say or do at given times? There are a few examples given, but it is expected that most cases will have many more changes and potential branch points.

Intervention / Time point	**Change in Case**	**Additional Information**
A team member finds a bottle of coumadin in the patient's pocket	Recognize head injury on anticoagulation	If no one finds the bottle, EMS can return to the room and say,"oh yeah,I found a bottle of Warfarin in the patient's pocket when we picked him up"
Change in vitals during primary survey	HR 107, BP 120/78, Sp02 99% on RA, RR 20	
During the primary survey, GCS will change to 7, becomes unresponsive. (E1V2M4)-no eye opening, no verbal response, withdrawal from pain	Team to intubate	Team should discuss whether it is necessary to pre-medicate with Lidocaine
Upgrade the trauma activation level	Call the operative to upgrade to level 1 activation	Change in mental status should prompt team to recognize change in activation criteria to mobilize more resources

Given the change in mentation and head injury, team should discuss the management options for elevated ICP	Hypertonic saline versus mannitol to be given	
Team should discuss reversing Coumadin	PCC vs. FFP and Vitamin K	Team should discuss options for the reversal agents

Ideal Scenario Flow
Learners enter the room to find a patient fully clothed. As the team walks into the room, roles should be assigned. Team leader and primary nurse should identify themselves clearly. All team members must wear PPE. As a team approaches the patient, nurse should be putting the patient on the monitor and getting vital signs as examining residents begin the primary survey. Two large bore IVs are placed. Team initiates the primary survey and calculates GCS to be 10. As they undress the patient, they discover the bottle of Coumadin. As the team continues through the primary survey, repeat vitals stabilize, but soon after the patient decompensates to a GCS of 7. Team discusses whether or not to pretreat (there is little evidence to support this practice). Team gives the Rapid Sequence Intubation (RSI) medications and successfully intubates the patient with cervical spine precautions. Either mannitol or hypertonic saline is given for the elevated ICP in setting of head injury. Team should also discuss the reversal agents, such as PCC and FFP. Chest x-ray shows successful intubation. Pelvis x-ray and EFAST are negative. Neurosurgery is consulted. The case will conclude with disposition to CT scan.

Anticipated Management Mistakes
Possible management errors or difficulties that are commonly encountered when using this simulation case.

1. Failure to recognize the initial GCS
2. Failure to reverse anticoagulation
3. Lack of knowledge on how to reverse Warfarin
4. Failure to address and give medications for elevated ICP

Debrief Points		**Additional Information**
Communication	Closed loop communication	Don't ask the room for things, ask people, especially for critical actions.
	Shared mental model	Discuss airway plan out loud so that the team can help achieve successful intubation.
	Role clarity	-Designate roles out loud, so everyone knows who is doing what.

		-Be sure to ask who the team leader is and who the primary nurse is. -When you arrive, introduce yourself. -Speak up if you do not feel you can complete the task asked of you.
Logistics	What meds are immediately available? How long does it take to get PCC to the bedside? Is 4PCC kept in the trauma bay? What is stocked in the trauma bay, mannitol versus hypertonic saline?	
Medical		
Patients at high risk of morbidity and mortality from traumatic brain injury	● Elderly ● Infants (large head size, compressible skull, risk of non-accidental injury) ● Anticoagulated patients ● Chronic alcoholics (at risk for falls/assaults, cerebral atrophy, coagulopathy due to chronic liver disease)	https://www.ncbi.nlm.nih.gov/pubmed/8459458
Intubation of elderly	● Maintain cervical spine precautions (especially in elderly, possible central cords, etc). ● Pre-oxygenate ● Avoid permissive hypotension in trauma patients with significant head injuries- maintain systolic BP greater than 90 ● No need to pre-medicate	
Management of elevated ICP	Mannitol versus hypertonic saline	https://www.ncbi.nlm.nih.gov/pubmed/21242790

Reversal agents for commonly used anticoagulants	● Coumadin- PCC (50 U/kg) and Vitamin K (10 mg IV over 10 min) ● Dabigitran (Pradaxa)- Idarucizumab (Praxbind) 5 mg IV over 15 minutes ● Factor Xa anticoagulants (Eliquis/ Xarelto)- No good evidence to use Andexanet alpha; use PCC	https://www.ncbi.nlm.nih.gov/pubmed/24970013