COMMON STRUCTURE FOR HIGH FIDELITY SIMULATION SCENARIO

SCENARIO TITLE

Haemorrhagic shock. Upper gastrointestinal bleeding. Bleeding oesophageal varices. Cardiac arrest.

SCENARIO OVERVIEW

HEALTHCARE SERVICE:

TARGET GROUP[1]: general medicine students

ESTIMATED SCENARIO DURATION: 45 minutes

SCENARIO SUMMARY[2]:

Man, 55, brought to emergency by his family. Patient known to have mixed hepatic cirrhosis (viral- HBV and toxic – chronical alcohol consumption), HTN. During the latest consultation, hepatitis was evaluated as Child B, with oesophageal varices during the latest follow-up exam. According to the family, one hour earlier episodes of hematemesis started with fresh blood, but also large quantities of clots. Gradually, he deteriorated from a neurological point of view and the haemorrhage has not stopped, reason for which they called 112. The patient is brought by an ambulance, unstable from a haemodynamic and respiratory point of view, comatose. Later, he develops cardiac arrest.

EDUCATIONAL OBJECTIVES

GENERAL OBJECTIVES:

- The participants should be able to work in team, to assign roles and to appoint a team leader.
- To identify the seriousness of the situation and establish the priority of actions to perform.
- To be able to perform several actions at the same time.
- To know and use the necessary material for actions required by this scenario.
- To recognise a patient in cardiac arrest.
- To know resuscitation protocol – Advanced Life Support

SCENARIO-SPECIFIC OBJECTIVES:

- To know the manifestations and complications of cirrhosis
- To know the sign and differential diagnosis of upper gastrointestinal bleeding

[1] Skill level and number of participants
[2] Scenario key words

- To know the main treatment modalities of upper gastrointestinal bleeding
- To know ALS resuscitation protocol
- To know and handle material necessary to perform specific emergency manoeuvres within the framework of this scenario
- To be able to perform necessary manoeuvres: monitoring, oxygen therapy, venous catheter, tracheal intubation, putting a Sengstaken–Blakemore tube
- To know broadly the treatment modalities for patient with bleeding oesophageal varices.

PARTICIPANTS' ROLE

STUDENT	Medicine students	3-4	
PROFESSIONAL			
TRAINERS[3]	Doctors	1-2	- Present the scenario - Present the different parts of the scenario - Control the dummy settings - Correct, gradually and during debriefing

EQUIPMENT LIST[4]

Medical supplies:

- Airway: non-rebreather mask, oropharyngeal airway of several dimensions, nasopharyngeal airway of several dimensions (Robertazzi), laryngoscope with several blades (Macintosh, Miller, MacCoy, airtraq), video laryngoscope, intubation tubes of several dimensions, mandrel for tracheal intubation tube, spark plug, sterile gel, Magill forceps, fixation for tracheal intubation tube, 20 ml syringe, sterile kits, hand sanitiser, sterile gloves, mobile aspirator with aspiration tubes: Yankauer and flexible, of several dimensions.
- Breathing: Ambu bag with oxygen reservoir, masks of different dimensions for the Ambu bag, antibacterial filter, mechanical fan with nozzle, oxygen bottle/vial.
- Circulation: peripheral venous catheters of various dimensions, catheter fixation, non-sterile compresses, tourniquet, disinfectant, non-sterile gloves, perfusion kit, drip solution vial. ECG screen with standard monitoring wires, pulse oximeter, blood pressure monitor, thermometer, capnography. AED with patches and paddles. Stethoscope. Central venous catheters, insertion kit, collateral circulation.
- Miscellaneous: Syringes of several dimensions, needles, urinary catheter, collecting bags, adhesive electrodes for dummy monitoring, band aids, compresses, disinfectant. Dummy, intubation, ECG device with 12 derivations, automated syringe.

Medicines and solutes:

- Drip solution vials: NaCl, Voluven, vials that imitate blood products
- Adrenalin, Atropine, Amiodarone
- Propofol, Etomidate, Ketamine, Fentanyl, Xylene, Suxamethonium
- Noradrenalin, terlipressin, pantoprazole, erythromycin, metoclopramide, ceftriaxone.

[3] Control of dummy setting / Debriefing/ Dummy voice/ Facilitator/ Disruptive element/ external stakeholder (phone speaker)
[4] Prefer Check-list for quick check-up

Documents: monitoring sheet, patient's medical documents

Accessories: work bench, stretcher

Environment: bed in emergency / intensive care, with all devices mentioned above.

SCENARIO PREPARATION

SIMULATOR PREPARATION:
- Setting: corresponding to initial state (cf. table)
- Positioning: prepare material and dummy, 10-15 minutes
- Accessories:

ENVIRONMENT PREPARATION:
- prepare the dummy
- prepare monitoring devices
- prepare devices for respiratory tracts: oxygen, suction, Ruben valve, mechanical fan, intubation material
- prepare material for peripheral and central venous catheter
- prepare medication and blood products
- prepare Sengstaken–Blakemore tube

PREPARATION OF ADDITIONAL EXAMINATIONS:
- patient's medical history
- arterial astrup

PREPARATION OF STUDENTS/LEARNERS: professional outfit
- Introduce the room in which the scenario takes place
- Safety principles during simulation: defibrillator, needles
- Present simulation possibilities
- Present the available material
- Briefly describe the scenario evolution (the fact there are several possibilities of patient evolution, depending on therapeutic decisions)

BRIEFING

TIME:

SITUATION: Man, 55, brought to emergency by his family. Patient known to have mixed hepatic cirrhosis (viral- HBV and toxic – chronical alcohol consumption), HTN. During the latest consultation, hepatitis was evaluated as Child B, with oesophageal varices during the latest follow-up exam. According to the family, one hour earlier episodes of hematemesis started with fresh blood, but also large quantities of clots. Gradually, he deteriorated from a neurological point of view and the haemorrhage has not stopped, reason for which they called 112. The patient is brought by an ambulance, unstable from a haemodynamic and respiratory point of view, comatose

DOCUMENTS: latest medical examinations: patient suffering from viral and toxic mixed Child B hepatic cirrhosis. Bleeding oesophageal varices in distal oesophagus.

PATIENT DATA[5]

Surname: Ion
Name: Cătălin
Date of birth: 2-07-1962
Allergies: no known allergies
Age: 55
Weight: 65
Height: 1.7
Gender: M
History: viral and toxic mixed hepatic cirrhosis. Average bleeding oesophageal varices
Medical history: Propranolol, Silymarin, Ramipril, Indapamide
Surgeries: no surgery, endoscope evaluation in his recent history
Personal treatment: Propranolol, Silymarin, Ramipril, Indapamide

FRAMES OF REFERENCE / EXPERTS RECOMMENDATIONS[6]

- ERC European resuscitation council guidelines for resuscitation 2015. Section 3. Adult advanced life support.
- ERC - European resuscitation council guidelines for resuscitation 2015. Section 4. Cardiac arrest in special circumstances
- SFAR - Société Française d'Anesthésie et de Réanimation
- Portal Hypertensive Bleeding in Cirrhosis : Risk Stratification, Diagnosis and Management : 2016 Practice Guidance by the American Association for the Study of Liver Diseases
- World Gastroenterology Organisation Global Guidelines – Esophagealvarices - January 2014
- Textbook of Critical Care - J.L.Vincent et all., 2017, Elsevier

DEBRIEFING IDEAS

- Recognise the seriousness of haemorraghic manifestations
- Establish priority of actions
- Establish priority of medication
- Know ways to administer adrenalin, doses and undesirable manifestations
- Good communication within the team
- Importance to address the respiratory tract as soon as possible
- Understand the fact that if the respiratory tract cannot be addressed, cardiac arrest can happen fast, due to severe hypoxemia
- Know the ALS 2015 resuscitation protocol
- Haemorrhagic shock treatment – basic principles
- Upper gastrointestinal bleeding treatment – basic principles

SCENARIO PROGRESS

Monitor setting	Patient dummy	Students' interventions (what we would like to see...)	Messages
Beginning time of scenario:			

[5] Care record layout or if not necessary to the scenario, voice memo for the trainer
[6] Quoted sources, bibliography

Initial state:
 	
AP: 100/60
HR: 100
RR: 30
SpO_2: 92%
 	
ECG curve: sinus tachycardia
 	
Clinical signs:
- eyes: open spontaneously
- pupils: symmetrical, intermediary, reactive
- pulmonary auscultation : difficult phonation due to bleeding. Bilateral VM, no added wheezing
	Symptoms, voice
	- agitated patient
	- GCS: 4, 6, 3
	- hematemesis with fresh blood and clots
	- pale, moist teguments, piloerection
	- superficial, rapid breathing, using accessory muscles
	- Extended capillary refill time
		- Patient ABCDE evaluation
		- Haemorrhagic shock diagnosis
		- Call for help (IC, ER doctors)
		- Manoeuvres to perform simultaneously:
		  - Basic monitoring: SpO2, AP, ECG
		  - Venous catheter – at least 2 large PVC 14-18G
		  - Oxygen therapy – mask with reservoir – FiO2 as close as possible to 100%
		  - Start volume resuscitation
		- Establish priority of manoeuvres, simultaneous manoeuvres.
		- Take into account the advanced approach to respiratory tracts.
		- Possible preparation of material to approach respiratory tract
		- Blood test: arterial astrup, coagulation, biochemistry, hemoleucogram, blood group and Rh.
		- Discussion about transfusion
		- Discussion about contact with interventional digestive endoscopy service
		- Prepare and administer medication according to upper gastrointestinal bleeding: PPI (bolus + continuous), volume resuscitation, discuss terlipressine administration
		- Possible discussion about emergency methods to perform medicinal and mechanical haemostasis during upper gastrointestinal bleeding: medication such as tranexamic acid, Adrenostazin, Vitamin K, Etamsylate and Sengstaken-Blakemore tube (or other types of tube).
			- Recognise haemorrhagic shock, discuss AP limits according to patients' pathology.
			- Differential diagnosis of upper gastrointestinal bleeding
			- Discuss in brief physiopathological mechanisms involved in apparition of bleeding during cirrhosis
			- Keep good cooperation in the team
			- Share tasks
			- Constant patient monitoring
			- Frequent reevaluation
			- Know material for intubation, catheter, volume resuscitation, central catheter
			- Astrup results: metabolic acidosis partially compensated by breathing, severe anaemia (Hb: 5), hypochloremia, hypokalemia
			- Emphasise the importance of early follow-up of Hb, blood typing and beginning of transfusion asap.

State 2:
 	
AP: 80/40
HR: 110
RR: 35
SpO_2: 88%
 	
ECG curve: sinus tachycardia
 	
Clinical signs:
- eyes
- pupils
- pulmonary auscultation
	- The patient gradually calms down
	- GCS: 2, 4, 2
	- Muscle stone begins to decrease
	
	- The patient displays great respiratory effort with bradypnea
	
	- Increase perspiration paleness
		- ABCDE reevalution
		- Close monitoring of vital signs: AP, ECG, SpO_2
		- Administer second liquid bolus 20 ml/kg
		- Start transfusion: CPAP :MT : 1 :1 :1
		- Start vasoactive support with 1st choice Noradrenaline, starting dose 0.01 µg/kg/min
		- Start Terlipressine transfusion: 2 mg every 4 h. (2 mg/ 40 ml à 10 ml/h)
		- Start Tranexamic acid transfusion: 1 g for 10 min., 1 g for 8h
		- Improved haemodynamic parameters after transfusion and Noradrenaline infusion
		  - **If participants decide to approach respiratory tract:**
		  - First prepare all necessary material, including for difficult tracheal intubation and surgical approach of respiratory tract
		  - rapid sequence tracheal intubation: medication: ketamine – first choice 2mg/kg, Lysthenon 1.5mg/kg. +/- Xylene.
		  - Sellick manoeuvre
		  - Prepare emergency medication: atropine, ephedrine, adrenaline.
		  - If first attempt at tracheal intubation fails, ventilate mask and bag
		  - If participants choose spark plug, they succeed in intubating with a 6.5mm tube.
		- Not to stop administering adrenaline, continue volume filling while monitoring hemodynamic response.
		- **If students decides to put a Blakemore-Sengstaken tube**
		- Continuous sedation on Ketofol
		- Take contact with interventional endoscopy service
		- The patient is prepared for transport: sedation + curarisation + mechanical ventilation
			- Emphasise that the patient displays respiratory manifestations due to massive hematemesis.
			- Emphasise the importance of starting transfusion, vasoactive support before tracheal intubation, prepare suction before TI, haemostatic medication
			- Emphasise the importance of performing haemostasis asap
			
			- If they decide not to perform rapid induction TI or to put a Sengstaken-Blakemore tube, the scenario moves to **State 5**; if they put Blakemore tube after TI, **State 3**.
			
			- Emphasise the importance of multidisciplinary care and of cooperation with interventional endoscopy, radiology and surgery services.
			
			- Take into account putting central venous catheter.
			- Discussion about putting Sengstaken-Blakemore tube – upsides, downsides, risks.

State 3: AP: 120/70 HR: 85 RR: 15 SpO_2 : 95% ECG curve: sinus rhythm Clinical signs: - eyes: closed - pupils: symmetrical, intermediary, reactive - pulmonary auscultation: Bilateral VM, no added wheezing	Sedated patient Perspirations stopped No piloerection	- ABCDE reevaluation - Continue transfusion at a 1: 1:1 rate, continue vasoactive support and therapy already initiated - Closely monitor vital signs: AP, ECG, SpO_2 - The patient is prepared for transport to endoscopy service - Suddenly, the patient cannot be ventilated, SpO_2 decreases fast down to zero, AP can no longer be measured, HR decreases to 60 bpm - Move to **State 4**	- Preparation for transport, discussion about what to monitor during patient transport - The patient suddenly shows AEP - Move of Blakemore tube with compression of respiratory tracts under balloon.
State 4: AP:--- HR: 60 RR: --- SpO_2 : sinus rhythm ECG curve: Clinical signs: - eyes - pupils - pulmonary auscultation	- No neurological response - GCS 3 pts - Pale teguments with cyanotic shade, cold - No central or peripheral pulse	- The fan starts to make high pressure and low volume alarm sounds - Recognise cardiac arrest by AEP rhythm, bring the defibrillator. - Quick monitoring with defibrillation patches - Start resuscitation manoeuvres - 100/120 min. thoracic compressions, 10 / minutes FiO2 100% ventilations - Administering adrenaline, 1 mg / 3-5 min., first dose administered after cardiac arrest diagnosis - Cause of cardiac arrest: respiratory tract obstruction after move of Sengstaken-Blakemore tube balloon with secondary compression of respiratory tracts and severe hypoxia - To rectify it: cut the tube with scissors. - Once it is cut, spontaneous circulation soon resumes, teguments regain colours, oxygen parameters increase - Emergency transport to endoscopy service - End of scenario	- Discussion about complications caused by the Sengstaken-Blakemore tube - Possibility to remedy those complications - Discussion about the potentially reversible causes of cardiac arrest: 4 H and 4 T - Discussion about continuing the therapy for haemorrhagic shock and about steps to follow to achieve haemostasis by endoscopy

State 5: AP: 0 HR: 50 RR: 0 SpO_2: not recorded ECG curve: sinus rhythm Clinical signs: - eyes - pupils - pulmonary auscultation	- Cardiac arrest by pulseless electric activity - No central pulse - Respiratory silence	- Start resuscitation manoeuvres in accordance with ALS – 2015 protocol - Monitoring through defibrillator, with the help of patches - Thorax compressions and ventilations 30 :2 - Administer 1 mg Adrenaline IV every 3-5 min. - Ventilation with mask and balloon impossible; participants have to perform tracheal intubation. Afterwards, 100-120/min thorax compressions, 10/min ventilations - Reevaluation of HR every 2 min - Bleeding remains important - Participants are guided to put S-H tube - Minutes after, and after administering blood, vasoactive support and haemostatic medication, spontaneous circulation resumes: FC: 90-100 bpm, AP: 100/60, no spontaneous breathing, GCS 3 pts - The patient is prepared for transport to endoscopy service End of scenario	- If the respiratory tract had been approached earlier, the patient would probably have not been in cardiac arrest - Importance to obtain haemostasis asap - Importance to correct hypovolemia with blood transfusion asap - Vasoactiv medication, haemostatic
End time of scenario:			

SCENARIO EVALUATION

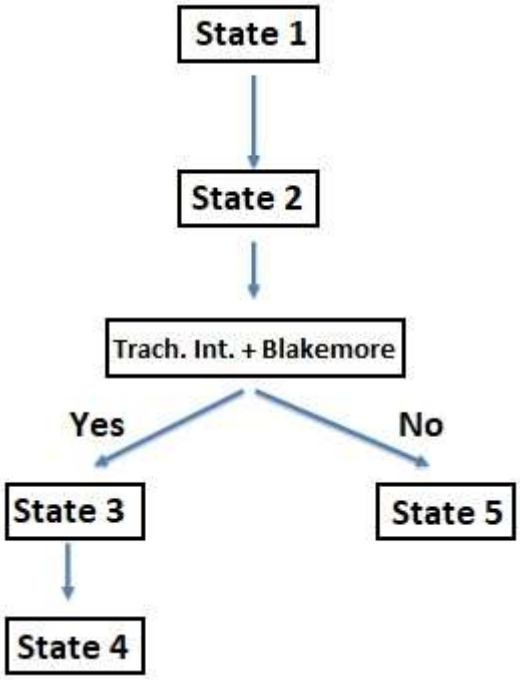
POSITIVE ASPECTS:

TO IMPROVE:

REALISM:

USED PROTOCOLS:

PROTOCOLS TO IMPLEMENT:


State 1
State 2
Trach. Int. + Blakemore
Yes
No
State 3
State 5
State 4