COMMON STRUCTURE FOR HIGH FIDELITY SIMULATION SCENARIO

SCENARIO TITLE

Anaphylactic shock with oedema of glottis

SCENARIO OVERVIEW

HEALTHCARE SERVICE:

TARGET GROUP[1]: students in general medicine

ESTIMATED SCENARIO DURATION: 30 – 45 minutes

SCENARIO SUMMARY[2]:

Man, 35, brought by his family to the emergency service. According to them, one hour earlier he was administered an intramuscular penicillin injection for a cutaneous infectious pathology. A few minutes later, the patient started developing rashes, oedemas on the lips and eyelids, dyspnoea with wheezing and dizziness.

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.

SCENARIO-SPECIFIC OBJECTIVES:

- To know the manifestations of anaphylaxis and be able to tell the difference between a light reaction and an anaphylactic shock.
- To know the administering ways and required doses to administer adrenalin during anaphylactic shock.
- To know and handle the necessary material during specific emergency actions required by this scenario.
- To be able to perform necessary actions: monitoring, oxygen therapy, venous catheter, tracheal intubation, tracheal intubation in challenging conditions, cricothyrotomy through Seldinger technique.

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

- To recognise complications that could arise during anaphylactic shock.

PARTICIPANTS' ROLE

STUDENTS	Medicine students	3-4	
PROFESSIONALS			
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, 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.
- Miscellaneous: Syringes of several dimensions, needles, urinary catheter, collecting bags, adhesive electrodes for dummy monitoring, dummy for difficult intubation, ECG device with 12 derivations, automated syringe.

Medicines and solutes:

- Drip solution vials: NaCl, Ringer 1, Voluven
- Adrenalin, HHC, Methylprednisolone, Chlorphenamine, Ranitidine, Noradrenaline
- Propofol, Etomidate, Ketamine, Fentanyl, Xylene, Suxamethonium chloride
- Miofilin, Salbutamol, magnesium sulfate, Ephedrine, Atropine

[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

SIMULATION TYPE:

DUMMY TYPE:

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, Ambu bag, mechanical fan, intubation material, difficult intubation material, material for surgical approach of respiratory tracts

PREPARATION OF ADDITIONAL EXAMINATIONS:
- patient's medical history
- arterial blood gas test

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, 35, brought by his family to the emergency service. According to them, one hour earlier he was administered an intramuscular penicillin injection for a cutaneous infectious pathology. A few minutes later, the patient started developing rashes, oedemas on the lips and eyelids, dyspnoea and dizziness.

DOCUMENTS: no known pathology

PATIENT DATA[5]

Surname: Constantin
Name: Alexandru
Date of birth: 2-7-1982
Allergies: no known allergies
History: no known pathologies
Medical history: no known pathologies
Surgeries: no known pathologies
Personal treatment: no home treatment

Age: 35
Weight: 80
Height: 1.7
Gender: M

FRAMES OF REFERENCE / EXPERTS RECOMMENDATIONS

DAS - Difficult Airway Society - DAS Difficult intubation guidelines 2015
ERC - European resuscitation council guidelines for resuscitation 2015. Section 4. Cardiac arrest in special circumstances
SFAR - Société Française d'Anesthésie et de Réanimation
BENUMOF AND HAGBERG'S AIRWAY MANAGEMENT, 2013, Saunders, Elsevier Inc.
Clinical Anesthesia, 8th ed., Barash P et al., Wolters Kluwer, 2017.
ERC European resuscitation council guidelines for resuscitation 2015.Section 3.Adultadvanced life support.

DEBRIEFING IDEAS

- Recognise the seriousness of anaphylactic 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
- Recognise and treat bronchospasm
- Collect blood markers to inform the allergic reaction

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

Initial state:
 	
AP: 90/60
HR: 120
RR: 30
SpO_2: 92%
 	
ECG curve: sinus tachycardia
 	
Clinical signs:
- eyes: open spontaneously
- pupils: symmetrical, intermediary, reactive
- Respiratory tracts: dysphonia
- pulmonary auscultation: sibilant rhonchi
	Symptoms, voice
	- nervous patient, with oedemas on eyelids and lips.
	- brief rashes appeared on upper limbs, start to appear on the rst of the body
	- abdominal cramps
	- manifestations appeared about 5 minutes after intramuscular penicillin injection
		- Patient evaluation following ABCDE method
		- Anaphylactic shock diagnosis
		- Call rescue services (intensive care doctors, emergency)
		- Simultaneous actions:
		  - Basic monitoring
		  - Venous catheter-at least 2 large PVC 14-18 G
		  - Oxygen therapy – adrenalin nebulisation for stridor/mask with reservoir – FiO2 as near as possible to 100%
		  - Administer 0.5mg adrenaline im (in the thigh)
		  - volume resuscitation (liquid bolus 20ml/kg – Ringer Lactate)
		- Prepare adrenaline dilution for IV administration (1 vial with 9ml NaCl 0.9% - 1:10.000 – 100µg/ml)
		- Take into account the advanced approach to respiratory tract
		- Possibly prepare material to approach respiratory tract
			- Recognise anaphylactic shock
			- briefly discuss physiopathological mechanisms
			- Good cooperation within the team
			- Share tasks
			- Constant patient monitoring
			- Regular patient reevaluation
			- Know intubation and difficult intubation material
			- Discussion about adrenaline doses, effects, administering ways

State 2:
 	
AP: 80/40
HR: 130
RR: 35
SpO_2:
 	
ECG curve: sinus tachycardia
 	
Clinical signs:
- eyes[6]
- pupils[7]
- pulmonary auscultation
	- the patient gradually calms down
	- Muscle tonus starts to decrease
	
	- increased dysphonia, stridor and wheezing appear
	
	- increased oedema on cephalic extremities
	
	- sibilant rhonchi still present
		- ABCDE reevaluation
		- Decide to administer IV adrenalin – dilution 1:10.000, administer doses of 50g each, repeat after a few minutes depending on the effect and patient's tolerance.
		- Closely search vital signs: AP, ECG, SpO2.
		- Administer 2nd liquid bolus of 20ml/kg
		- **If participants decide to approach respiratory tract (state 2)**
		  - 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.
		- Take into account line 2.3 medication: anti-H1, anti-H2, corticoid: HHC 200mg/IV / Methylprednisolone 125 mg/IV
		- Continuous Ketofol sedation.
			- Emphasise that the patient shows increasingly severe respiratory manifestations, despite adrenaline IV
			
			- Create difficult intubation scenario due to glottis oedema
			
			- Learners can only intubate if they use spark plug.
			- Show and make demonstration on how to use spark plug correctly.
			
			- If tracheal intubation is not induced by spark plug or if does not use spark plug, the scenario moves to **State 3**; if they use spark plug and manage to intubate, the scenario moves to **State 4**.
			- Discuss with participants about line 2 and 3 medication during an anaphylactic shock and about adrenaline doses in continuous administering. Possibility to administer also noradrenaline.
			- Take into account the use of central venous catheter.

[6] Open, half-closed, closed
[7] Miosis, mydriasis, anisocoria, normal-reactive

State 3:
 	
AP: 90/50
HR: 125
RR: 10-15
SpO_2: 85%
 	
ECG curve:
 	
Clinical signs:
- eyes
- pupils
- pulmonary auscultation
	- Patient in mental fog
	- Important respiratory effort
	- Cannot make noises
	- Beginning of perioral cyanosis
	- Extended sibilant rhonchi
	- Increasingly strong perspiration of teguments, piloerection.
		- ABCDE reevaluation
		- Decision to administer a new dose of adrenaline
		- Monitor vital signs: AP, ECG, SpO_2
		- **If participants decide to approach the respiratory tract:**
		  - Prepare beforehand all necessary material, including for difficult tracheal intubation and for the surgical approach of the respiratory tract
		  -
			- Emphasise that the patient's consciousness is deteriorating
			- Obvious respiratory effort, with use of accessory muscles and Diaphragmatic paradox
			- If participants do not first mention the surgical approach to the respiratory tract, go to **State 5**
			- If participants succeed the approach to respiratory tract, go to **State 4**
			- **State 2** continues with the part about **State 3** respiratory tract (if participants do not succeed at State 2)
			- Show the manoeuvres of the surgical approach.
			- Discuss with participants about lines 2 and 3 medication during anaphylactic shock and about adrenaline doses in continuous administering. Possibility to administer also noradrenaline.
			- Take into account the use of central venous catheter.

State 4:
 	
AP: 110/60
HR: 80
RR: 13
SpO_2: 91%
 	
ECG curve: sinus rhythm
 	
Clinical signs:
- eyes
- pupils
- pulmonary auscultation
	- Patient sedated
	- Respiratory tract with prosthesis
	- Teguments start to regain colours
	
	- Sibilant rhonchi increasingly strong and present in the whole thorax.
		After tracheal intubation and when the fan is connected, the latter makes alarm of increased pressure and minute volume.
		
		- Recognise bronchospasm
		- Administer bronchodilator:
		  - Salbutamol by nebulisation
		  - Magnesium sulfate IV 2g
		  - Miofilin
		  - Ipratropium bromide
		  - Ketamin
		- Improved respiratory condition after bronchodilatator and increased SpO_2
		- End of scenario for those who followed 1, 2, 3, 4, 5.
		
		- Collect arterial astrup
		- Collect blood sample for tryptase dose
			- recognise bronchospasm as a manifestation of anaphylaxis
			
			- Method to treat bronchospasm
			
			- Discuss medication administered during bronchospasm
			
			- Three doses of tryptase: asap, 1-2hours, 24 hours or during convalescence
			
			- Arterial astrup indicates combined respiratory and lactic acidosis. Hypokalaemia.

State 5: AP: 0 HR: 50 RR: 0 SpO_2: not apparent ECG curve: sinus rhythm Clinical signs: - eyes - pupils - pulmonary auscultation	- Cardiac arrest with pulseless electric activity - Absence of central pulse - Respiratory silence	- Start resuscitation manoeuvres, following ALS 2015 protocol - CPR 30:2 - If participants mentions the surgical approach of respiratory tract, they can make it - Administer 1mg IV adrenaline every 3-5 minutes - Reevaluate heart rate every 2 min. - If surgical approach done, patient leaves AEP in sinus rhythm, AP: 160/80 mmHg, AV: 100 bpm. - After ending cardiac arrest, start **State 4**. - If surgical approach not mentioned, next rhythm recorded at 2 min of resuscitation (if impossible to perform insufflation with mask and bag, or the approach to respiratory tract) will be asystole, followed by death (asystole for 20 min). End of scenario.	If the participants have not first mentioned the surgical approach of the respiratory tract, after several unsuccessful attempts to intubate, the patient enters in cardiac arrest by AEP due to hypoxia.
End time of scenario:			

SCENARIO EVALUATION

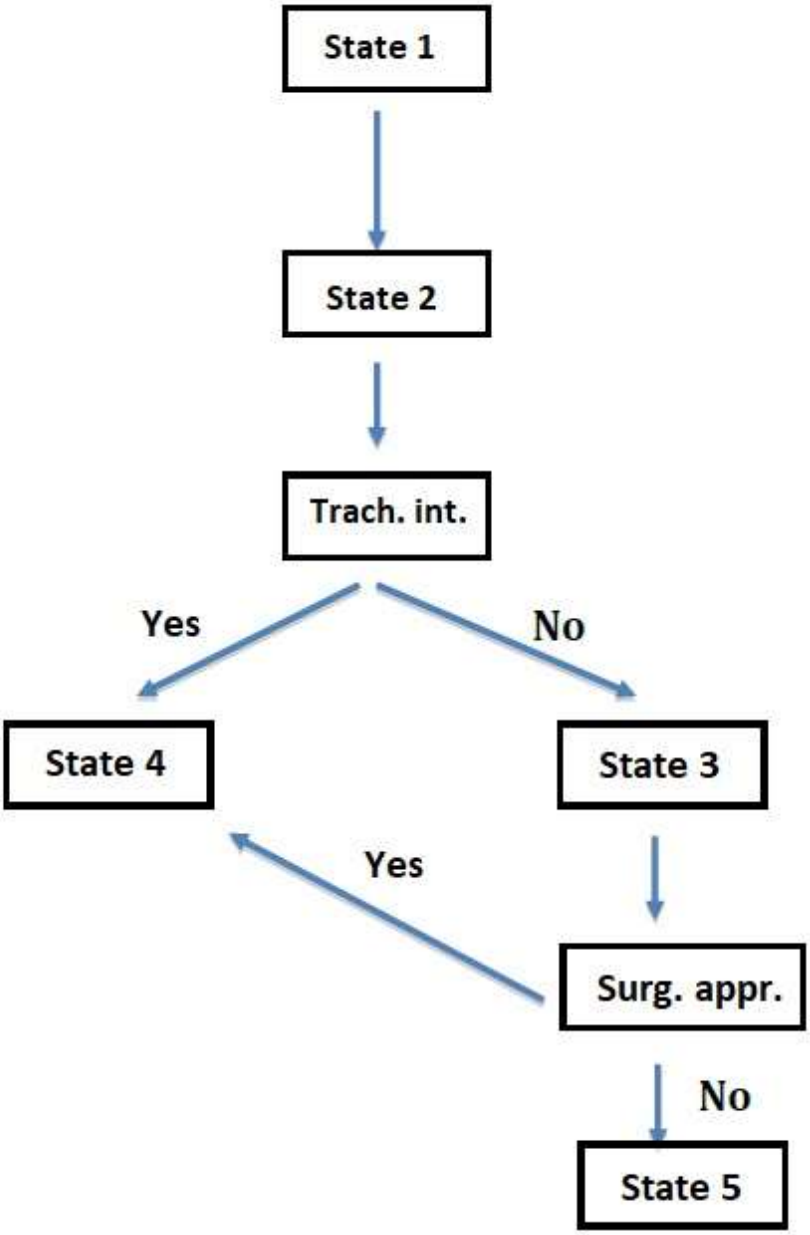
POSITIVE ASPECTS:

TO IMPROVE:

REALISM:

USED PROTOCOLS:

PROTOCOLS TO IMPLEMENT:


State 1
State 2
Trach. int.
Yes
No
State 4
State 3
Yes
Surg. appr.
No
State 5