SAFETY

simulation for medical practice

SIMULATION APPROACH FOR EDUCATION AND TRAINING IN EMERGENCY

Polytrauma

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Co-funded by the Erasmus+ Programme of the European Union

DOCUMENT VERSION 00

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Summary

Scenario Description

Learning Target

Evaluation of a polytraumatized patient (ABCDE approach):

A. Airway patency + cervical spine immobilization
B. Breathing + ventilation Supplemental Oxygen
C. Circulation + Haemorrhage control IV line x2
D. Disability: pupils, GCS. Re-evaluate ABC
E. Exposure: undress, explore the back, prevent hypothermia

ADJUNCTS TO PRIMARY SURVEY: X-ray (thorax & pelvis), basic monitoring, E-FAST, complementary tests (haemoglobin, lactate)

SECONDARY SURVEY: Medical history (SAMPLER approach), head-to-toe evaluation, reassessment

Differential diagnosis of shock in polytrauma patient:

RULED OUT: obstructive (tension pneumothorax, cardiac tamponade, embolism), cardiogenic and distributive shock (spinal cord injury)

HAEMORRHAGIC SHOCK: Biomechanics of trauma, abdominal pain, Hb drop, abdominal E-FAST+

Treatment

1. Adequate oxygenation
2. Fluids, transfusion, hemodynamic support

Description

Where:
- Emergency department

Frame conditions:
- Resuscitation room / trauma bay
- Laboratory tests, X-ray and echography available
- OR, CT-scan or MRI are available and have to be organized

Participants

- Medical students 5th or 6th year or Residents 1st year

- Nurse students 4th year

- Nurse assistant as confederate

- Surgeon

3. Stop bleeding: surgery/embolization **Non-technical skills** - Situation awareness (be aware of the initial situation and re-asses) - Share the mental mode - Anticipate and plan next step		

Notes: This scenario can be performed either by the whole team in different roles (Medical and nurse role) or one participant (medical or nurse role).

Scenario Briefing

Briefing (everyone)

You are working in the Emergency department.

A 21-year-old male is brought after **falling while driving an electrical scooter at high speed**.

Past medical history:

- No known allergies
- No significant medical history

Current medication: No

Additional Briefing (individual positions)

Medical student or resident:
It is expected that you to assess the patient, try to find a diagnosis, and make a therapy decision.
You will work with a colleague nurse.

Nurse student:
A patient that has had a high-speed accident while driving an electrical scooter just arrived. You are asked to take care of him. You will enter the room with the medical student. In the room there is a nurse assistant.

Case Briefing (roleplayers)

Nurse assistant:
You are a nurse assistant in the emergency department. You will be in the room when the participant(s) arrive, and will help them find the requested material and medication.

You can guide with questions (hidden hints).
If the hints are ignored, help with more direct comments: "Last time I saw that, the team did…" (only correct hints!).
And finally, after a faked phone call: "The consultant is coming. He told us to do…"

Surgeon: Ask what has happened, what they suspect, what treatment they have applied, what they think is the next step (if they do not argue correctly, they will say the opposite to force a discussion).

Notes: This scenario briefing is for 2 students (medical and nurse). A second medical student can be added, either from the beginning of the case or as help to the first student.
-If the only participant is a nurse student, the senior emergency doctor will remain in the scenario from the beginning. A second nurse student can be added, either from the beginning of the case or as help to the first student.

Script Sim Nurse/Co-Instructor

List of Material

- Standard ER-room with monitoring, defibrillator, equipment, stretcher
- Vasoactive drugs
- Packed red blood cells
- Laboratory/POC-results (important: haemoglobin and lactate)
- A prepared 12-lead-ecg
- A device to reproduce pre-recorded images
- An abnormal chest X-ray (rib fractures in the left side)
- A normal pelvis X-ray
- An ultrasound (US) probe
- Pre-recorded E-FAST images:
  - Normal pulmonary US
  - Normal cardiac US
  - Abnormal abdominal US (intraperitoneal free fluid)

Set-Up Room

- Standard ER-room with monitoring, equipment, stretcher

- The mannequin/patient is lying on a stretcher

- Ultrasound machine available

- Outside the room (ready only on request):
  - 12-lead ecg
  - lab-results
  - x-rays
  - echo-images

Set-Up Simulator

- Standardized patient.
If an actor is not available, a computerized mannequin (voice required) can be used

- Patient with daily clothes on a stretcher emphasizing the age of the patient (21 yo male). A simulated bruise in the left hypochondrium

- When the scenario starts, the patient is not monitored, has neither an i.v. line nor oxygen

Notes:
- x-ray machine available? (if unavailable, send participants out of the room)
- real time ultrasound / echography? (if not available, use any item as receiving transducer, US made by confederate and show video on a tablet computer)

Scenario Saver

How to react if the medical problem is not identified	How to react if the medical problem is identified too quickly	Other comments, material needed for savers (e.g. white coat)
If the participants are not able to reach a diagnosis or they don´t treat the patient according to the diagnosis, the confederate can give hints and guide the participant through all the steps for the resolution of the case. **The patient will not die**. The confederate can guide with questions (hidden hints): **"What does …. mean?"** **"Is it also possible to do …?"** If the hints are ignored, help is also possible with more direct comments: **"Last time I saw that, the team did…"** (only correct hints!) And finally, the confederate can **fake a phone call to the consultant** and say afterwards: **"The consultant is coming.** **He told us to do…"** If the haemorrhagic shock is not treated properly, the surgeon can ask: **what do you suspect, what treatment have you applied, what do you think is the next step…?**	The response of the patient/simulator to the therapy may vary. If the team really is too fast, more drugs / alternative drugs are needed to succeed. But a good performance should not be slowed down unnecessarily!	If the participants are starting a treatment or doing an action that might be harmful for the patient, the confederate will give hints. In worst case a team member in the role of the consultant surgeon will enter the scenario to reconduct the situation. A radio connection between the team and the confederate should exist to direct the learners via the confederate in the favoured direction.

Scenario End Criteria

Scenario ends when …	Timing	
All of the following statements are true: - **Recognition of shock** and **differential diagnosis of shock in polytrauma** patient (ABCDE approach) - **Start initial resuscitation** (fluids, vasopressor drugs, transfusion according to local guidelines) - **Discuss definitive treatment** - **Share mental model** These can be achieved by the participants on their own or with help of the scenario saver. Then the surgeon (confederate) will enter the scenario and ask the participants for a handover.	The scenario is planned to last 15 minutes. At the end of the scenario the surgeon will enter the room and requests a hand-over, following the SBAR-scheme (including ABCDE and SAMPLERS). He/she will **discuss the definitive treatment** (embolization/surgery) Instructors could help if the previous points have not been achieved within the stipulated time via the confederates.	

Notes: Don't let the patient die!
General note – end the scenario saying:
"The patient is now going to be taken care of, thank you for solving the case"

Simulator Set-Up, Steering

	Phase 1 **Stability**	**Phase 2**
Vitals	Eyes open Airway clear Resp. Rate: 12/min SpO2: 98%, pain HR: 80/min ECG: Sinus rhythm BP: 110/70 mmHg (CO2: 34 cm H2O) Temp: 35,5°C Glycaemia: 110mg/dl	Eyes open Airway clear Resp. Rate: **21**/min SpO2: 97% HR: **106**/min ECG: Sinus tachycardia BP: **100/60** (CO2: 28 cm H2O)
Text for patient	Patient is complaining of pain everywhere and specially in his left thorax (low rib fractures). If patient is asked, he is capable of recalling the accident, he was driving his electrical scooter at high speed when a pedestrian appeared out of nowhere. Trying to avoid him, he fell on his left side and he hit the kerb of the boardwalk.	Patient expresses that he is **a little dizzy** The patient mentions also **abdominal pain** in left upper abdomen (left hypochondrium) **Mild agitation** due to abdominal pain
Other info	He was wearing a helmet, no head traumatism.	
Expected management during scenario	<u>Blood gas analysis</u> arterial, 37,0°C pO_2 **105 (92 basal)** (70-100) pCO_2 **36.5** mmHg (35-45) HCO_3 **21.1** mmol/L (22-28) pH **7.36** (7.35-7.45) BE **-2.5** mmol/L (-3-3) Lactate **1.4** mmol/L (1.0-1.5) Hb **12.5** g/dl (12-17) * HCO_3^- = Bicarbonate BE = Base Excess	- X-ray: 2-3 low left ribs are fractured, pelvis is normal - Auscultation: normal respiratory sounds, tachypnea, tachycardia (CT-Scan/MRI is available on another floor – pretty long transport)

	Phase 3 **Shock:** Abdominal bleeding	**Phase 4** **Post-treatment**
Vitals	Eyes blinking slowly, **sleepiness without unconsciousness** Airway clear **Resp. Rate: 24**/min SpO2: 97% (with high-flow O2) **HR: 130/min** ECG: Sinus tachycardia **BP: 80/50 mmHg** CO2: 33 cm H2O Temp: 36,1 °C Glycaemia: 180mg/dl	**Eyes open**, **sleepiness without unconsciousness** Airway clear Resp. Rate: 20/min SpO2: 99% with high-flow O2 HR: 115/min ECG: Sinus tachycardia BP: 90/60 mmHg CO2: 34 cm H2O
Text for patient	Patient deteriorates: (the **speech becomes slow**, it takes time to find the words) Patient mentions that **he doesn´t feel well, he feels tired and weak**. The patient complains of **increasing abdominal pain** in left upper abdomen (left hypochondrium)	He feels a little better but he doesn't feel well.
Other info	Abdominal guarding and tenderness in left upper abdomen • abdominal echography, pre-recorded video will show abdominal free fluid • **fluid therapy** with **partial improvement**	The participants need to recognize - the critical state of the patient and the need for final control of the bleeding -> **surgery/embolization**
Expected management during scenario	<u>Blood gas analysis</u> arterial, 37,0°C pO_2 **122** mmHg (70-100) pCO_2 **31.4** mmHg (35-45) HCO_3 **15,3** mmol/L (22-28) pH **7.28** (7.35-7.45) BE **-8.8** mmol/L (-3-3) Lactate **5,9** mmol/L (1.0-1.5) Hb **10.5** g/dl (12-17) * HCO_3^- = Bicarbonate BE = Base Excess	<u>Blood gas analysis</u> arterial, 37,0°C pO_2 **154** mmHg (70-100) pCO_2 **36,5** mmHg (35-45) HCO_3 **6,6** mmol/L (22-28) pH **7.13** (7.35-7.45) BE **-10,3** mmol/L (-3-3) Lactate **8.8** mmol/L (1.0-1.5) Hb **9,9** g/dl (12-17) * HCO_3^- = Bicarbonate BE = Base Excess

Notes:
If the participant asks for other specialists (thoracic surgeon, orthopaedist, general surgeon) they are busy and will arrive at the end of the scenario.
Not learning target are: placements of iv-lines, taking blood samples, intubation, FAST-echo (but the participant should be able to interpret the images).

Abstract

Learning Target:	Diagnostic and initial treatment of a haemorrhagic shock in a polytrauma patient
Description:	- Signs and symptoms recognition - Basic monitoring - ABCDE evaluation - Hypovolemic shock secondary to splenic or hepatic lesion, diagnostic and supportive treatment - Assess definitive treatment
Participants:	Medical student 5th or 6th year or resident 1st year and/or Nurse student 4th year
Case Briefing:	A 21-year-old male is brought after he had fallen while driving an electrical scooter at high speed. Past medical history: - No known allergies - No relevant past medical history Current medication: No
List of Material:	- Basic monitoring - Oxygen treatment and intubation material - Venous lines - Medication: local anaesthetic, vasopressors, morphine - Syringes and infusion pumps - X-ray, echo images - Blood products
Set-Up Room	- Emergency room - Standardized patient/mannequin
Set-Up Simulator:	- Vital signs remote control (Tablet and APP, ex: SimMon®)
Scenario Saver:	Nurse assistant as confederate and surgeon (team member)
Scenario End Criteria:	After discussing differential diagnosis of shock in polytrauma patient (ABCDE approach), starting initial resuscitation and proposing the definitive treatment
Management during Scenario:	From control room and with confederates. Possibility of communication with confederate (walkie talkie)
Other:	Limitations: Intravenous cannulation & real time performing echography, x-ray