

SIMULATION CASE TITLE: Transaxial thoraco-abdominal gunshot wound with tension pneumothorax

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

PATIENT NAME: Nick Bronchus

PATIENT AGE: 30 year-old Male

CHIEF COMPLAINT: Abdominal pain

PHYSICAL SETTING: 30 year-old male with gunshot wound (GSW) to the abdomen. Patient was in a bar fight. EMS reports that there was a bat lying on the ground near the patient. Patient is complaining of abdominal pain and shortness of breath.

Brief narrative description of case

30 year-old male with gunshot wound (GSW) to the left flank, found to have right pneumothorax with tension. Team should identify and treat tension pneumothorax and treat shock with blood transfusion and tranexamic acid (TXA). Upon completion of the primary survey, team should recognize transperitoneal, transaxial gunshot wound and proceed to the operating room.

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 tension pneumothorax
3. Recognize penetrating abdominal injury as source of shock
4. Treat shock with blood transfusion
5. Activate massive transfusion protocol (MTP)

Communication:

1. Become familiar with team roles and responsibilities
2. Employ closed loop communication
3. Practice using shared mental model

Critical Actions

- ☐ Team wears PPE
- ☐ Expose patient starting at the chest to allow for vitals and IV placement
- ☐ Place on monitor
- ☐ Place large bore IVs
- ☐ Perform primary survey
- ☐ Identify and treat pneumothorax

	☐ Obtain chest x-ray, pelvic x-ray, and EFAST ☐ Perform secondary survey ☐ Evaluate for other potential injuries in left abdomen with GSW ☐ Treat shock with blood; activate Massive Transfusion Protocol (MTP) ☐ Give Tranexamic Acid (TXA)
Learner Preparation or Prework	<i>None</i>
Simulation Moulage and Equipment	<u>Moulage:</u> Fully clothed young male Gunshot wound to left flank Gunshot wound to right scapula (posterior) No c-collar in place <u>Equipment:</u> Manikin that allows right side chest tube placement Non-rebreather and/or nasal cannula Chest tube Chest tube insertion tray Pleurovac Sutures- 0-silk Gauze and tape Simulated uncrossed pRBC product Simulated TXA

INITIAL PRESENTATION	
Overall Setting and Appearance	Scenario: In trauma bay Patient on stretcher, fully clothed
Trauma Activation level	Level 1
Activation level justification	GSW to the abdomen
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. Debrief-lead post sim debrief on team communication, resuscitation logistics and medical management		
EMS report	30 year-old male shot during a bar fight. He has an obvious GSW to his left flank. Patient has been complaining of abdominal pain.		
EMS vital signs	HR 100, BP 120/75, SpO2- we couldn't get a good read		
Past Medical/Surgical History	Medications/Allergies	Social History	Last meal
PMH: Multiple broken bones in the past (face, arm, ankle) PSH: None	Meds: Seroquel All: None	Social: + alcohol (6 beers this morning) + tobacco + meth	6 beers at the bar this morning

Primary Survey	
Initial ED vital signs	HR 100, BP 130/85, RR 20, SpO2 88% RA, T 97.2
General	Normal, just complains of abdominal pain Does not initially complain of SOB, but if asked, says yes.
Airway	Intact
Breathing	Decreased breath sounds on the right
Circulation	+ palpable distal pulses throughout
Disability	GCS 15, moving all extremities
Exposure	GSW wound to left flank at anterior axillary line and right scapula
EFAST	No lung sliding on right side (video # 6) +RUQ view (video # 1,2,3,4,5)

Secondary Survey	
General	Initially comfortable, started to get more labored during primary exam
HEENT	Normal cephalic, atraumatic, + tracheal deviation to the left
Neck	No cervical spine tenderness

Lungs	Decreased breath sounds on the right, now with deviated trachea to the left
Cardiovascular	Normal heart sounds, no muffled or distant sounds
Abdomen	+Diffuse tenderness with wound to L flank
Pelvis/MSK	Stable pelvis, moving all extremities
Neurological	GCS 15, neuro intact
Skin	GSW to L flank at anterior axillary line and right scapula
GU	Normal GU exam
Psychiatric	Clearly uncomfortable

Imaging (see image bank)	
Chest X-ray	Right pneumothorax with tension (if taken before chest tube placement) (image #5) Chest x-ray with right side chest tube (if taken after tube placement) (image #6)
Pelvis X-ray	Normal, no open book fracture (image #2)
EFAST	No lung sliding on right side (video #6) Rest of EFAST negative (video #1,2,3,4,5)

INSTRUCTOR NOTES - CHANGES AND CASE BRANCH POINTS		
<i>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.</i>		
Intervention / Time point	Change in Case	Additional Information
During primary survey, BP and HR worsen	Nurse can prompt for FAST/Chest x-ray HR 125, BP 99/43, RR 25, SpO2 86%	
If right pneumothorax was immediately recognized and chest tube placed	Vitals improve	Team can do finger thoracostomy or chest tube, as long as it is done immediately

	HR 95, BP 115/66, RR 20, SpO2 98%	
Repeat Chest x-ray after chest tube placement	Pneumothorax resolved with tube in place	
Team should look for other injuries and have a high level of suspicion for intra-abdominal injury given the trajectory	Bullets travel- team should thoroughly evaluate for wounds	

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. Supplemental oxygen is provided and 2 large bore IVs are placed. Team initiates the primary survey and notices decreased breath sounds on the right. As they are about to roll the patient for exposure, the nurse notes a change in the vital signs, including low BP, increased HR, and decreased SpO2 associated with increased tachypnea and mildly labored breathing. Team should perform EFAST and identify right side pneumothorax with concern for tension given the change in vitals. There should be a high level of suspicion for pericardial and peritoneal fluid, which will be negative. Team may also do chest x-ray, but this will delay chest tube placement, and patient will become more tachycardic, hypotensive, and tachypneic.

Pain medication is given prior to chest tube insertion, local infiltration +/- systemic medication. Skin is cleansed with betadine or chlorprep before the chest tube is inserted. Team member inserting the chest tube dons sterile gown and gloves. Once the chest tube is placed, vital signs will improve. Team should complete the secondary survey and notice the 2 gunshot wounds. They should be thorough and look in the axilla and perineum for any other GSWs, and no other wounds will be identified. Once the patient is stabilized, team should consider CT scan of chest and abdomen to evaluate for trajectory versus operating room. The case will conclude after this discussion.

Anticipated Management Mistakes

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

1. Failure to recognize tension pneumothorax as a source of hypotension and tachycardia
2. Delay to complete primary survey and place chest tube
3. Failure to roll the patient and identify the posterior injury
4. Failure to investigate other possible injuries

Debrief Points		Additional Information
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Communication	Closed loop communication	Don't ask the room for things, ask people, especially for critical actions.
	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.
	Shared mental model	Talk out loud so that everyone is on the same page. Discuss plan for pneumothorax management out loud.
Logistics	Know where chest tube tray and pleurovac supplies are kept.	
Medical		
Discuss possible pitfalls of the thoraco-abdominal GSW	Chest and abdomen must be considered for possible injuries.	
ABCDEs of Trauma	Complete primary survey before you move to secondary. Repeat primary survey when clinical status changes or after an intervention.	
Chest tube placement versus needle thoracostomy for tension pneumothorax		http://rebelem.com/what-is-the-best-anatomic-location-for-needle-thoracostomy/
Make note not to describe gunshot wounds as entrance or exit	Describing/documenting gunshot wounds as entrance or exit has legal implications.	

	Unless you were there or are a forensic scientist, all gunshot wounds are just wounds.	
Pain control	Ensure that pain medications are given before inserting a chest tube, systemic and or local. Not giving medications makes insertion unnecessarily harder (patients guard and this closes off the rib spaces).	
Sterile chest tube insertion	There is always time to prep the chest and at least put on sterile gloves while the team helps to set up for the chest tube. This decreases the incidence of empyema.	
Blunt vs penetrating trauma	Trauma is often categorized as blunt or penetrating. In this instance, the patient was both hit with fists/bat and had GSWs.	