



# Mechanism of Trauma and Trauma Care

## Objectives:

- Importance of Trauma Care
- Principles of primary and secondary assessments
- Establish management priorities within the Primary Survey

## Resources:

- Davidson's.
- 435 Slides.
- Raslan notes
- Surgical recall.
- Essentials of clinical surgery -
- 434 & 433 Teams

**Done by:** Sarah AlMutawa & Shahad Alenezi

**Sub-leader:** Omar Alotaibi

**Leaders:** Abdulrahman Alsayyari & Monerah Alsalouli

**Reviewed by:** Luluh Alzghayer

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Once you stop learning  
you start dying.

# Introduction:

(4:11) video taken from "the good doctor" about management of pneumothorax. (تأملوا بالمصطلحات الطبية المترجمة بالمقطع)

## Mechanisms and Patterns of Injury:

BLUNT	PENETRATING
<ol style="list-style-type: none"><li>1. High energy transfer e.g. Car Accident</li><li>2. Low energy transfer e.g. Fall from a bicycle</li></ol>	<ol style="list-style-type: none"><li>1. Stab wound</li><li>2. Gunshot wound</li><li>3. Shotgun</li></ol>
Associated with <b>multiple widely</b> distributed injuries because the energy is transferred over a <b>wider area</b> during blunt trauma.	Damage is <b>localized</b> to the path of the bullet or knife.

Why do I bother you with this lecture this year? and I'll come back again in your last year! We want you to know the **Principles of trauma care**, the **primary** and **secondary surveys**, how to take care of a trauma patient  
In the past, most of the people usually died from cardiac diseases or cancers but as we get better with treating these diseases, deaths due these diseases get less but the deaths due to trauma injuries become more and more.

## The Need:

- The **leading cause** of death in the **first four decades of life**.
- More than 5 million trauma-related deaths each year worldwide.
- Motor vehicle crashes cause over 1 million deaths per year. (we don't call it accidents b/c it's preventable)
- Injury accounts for 12% of the world's burden of disease.

## In Saudi Arabia:

- Motor vehicle crashes become more and more all over the world, and especially here in our region.
- It's a major problem worldwide, If you choose the Productive people in the community who aged below than 50, most likely they won't die from diseases, They could die from trauma injuries. So if the majority of saudi population are below 50, the number 1 killing in Saudi Arabia will be Trauma (RTA)
- We give you this lecture because we are trying to let you guys know that it is really a HUGE problem!  
How many cardiac centers we have in Saudi Arabia? A lot!  
How many cancer centers we have in Saudi Arabia? A lot!  
But how many trauma centers we have in Saudi Arabia? Not even one!  
Although we have one in NGHA, but it's not a credited and verified trauma center !
- If someone gets injured in a car crash he will be at the mercy of where he had the car crash, outside or inside Riyadh? If inside then which region North, South, East or West? This actually directly impact what will happen to him. who's the first responder?  
إذا جوه الهلال الأحمر وودوه مستشفى فيه مركز تروما زي الي بالحرس... زين الحمد لله.. إذا جوه ناس من المجتمعين حوله يحاولون يساعده ويريكونه سيارتهم... الله يعينه عاد إذا محد جاه وتركوه على الطريق... الله يعينه زيادة
- Trauma care is time sensitive, it depends on what happened in the 1st hour, while in others like cardiac or cancer care the patient will take his time choosing the best center In the past did the west go through what we are going through now? Yes!  
This was a problem in the west Before 50 years in 1960-1970 and they fixed it

## Trauma Organization:

How it started:

In 1976 Dr. Styner, an orthopedic surgeon, crashed his plane in rural Nebraska. Dr. Styner and his three children were seriously injured, and his wife was killed. He walked to a local road and then took his children to a rural hospital, where they received inadequate care, Then he went back to the physicians in Lincoln, Nebraska, and worked to develop the first prototype of the ATLS Presented in 1978 to the ACS and adopted by the College in 1979.

The course is now presented around the world, and This leads into the quote below:

"When I can provide better care in the field with limited resources than what my children and I received at the primary care facility there is something wrong with the system, and the system has to be changed." ~James Styner, MD, FACS 1977

## Pre Hospital Care:

The objective of pre hospital care is to **prevent further injury**, initiate resuscitation and transport the patient safely and rapidly to the most appropriate hospital.

- Airway control.
- Fluid resuscitation.
- Transportation.
  - Ground Ambulance.
  - Helicopter.

## Trimodal Death Distribution: Trauma patients die in 3 different time peaks:

### ● Immediate death (1st Peak):

Unsurvivable injuries: deaths occurring **immediately** after or within a few seconds of injury, contributes up to **50%** of the total.

**Impacted by:** Trauma prevention like:

- **Speed limit "Saher"**: actually in trauma we saw a reduction in the number of car crashes after Saher
- **Wearing seatbelt**: this reduces the risk of dying from a car crash by 50%! This percentage is even higher than what medication do. I hope that you really fasten your seatbelts!

### ● Early deaths (2nd Peak):

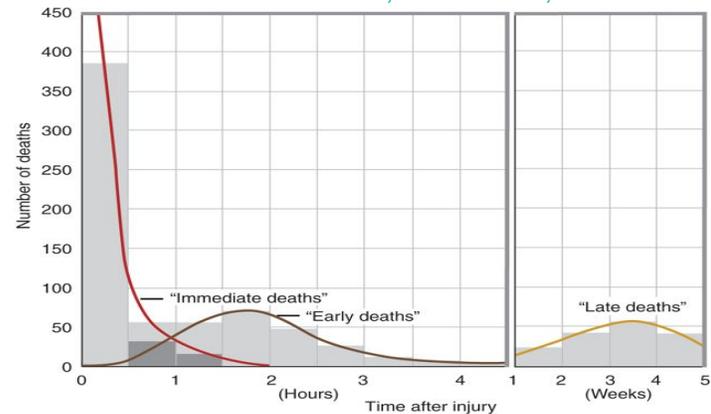
Golden hour: up to **4 hours** after injury, accounts for 30% of deaths Here are the ATLS, ambulance, hospitals, doctors ...

**Impacted by:** Early hospital care.

### ● Late deaths (3rd Peak):

Complications: accounts for **20%** of deaths (usually in an intensive care unit) **days to weeks** after the event. complications like sepsis and multiple organ dysfunction syndrome MODS

**Impacted by:** optimal early care and trauma center management.



## Advanced Trauma Life Support (ATLS):

### ABCDE approach to evaluation and treatment

The concept of having ATLS is to have a standard approach where Every single patient gets treated with the standard approach **REGARDLESS** however they get the trauma.

طاح من سيارة، طاح من طائرة، طاح من الدور العاشر، كلهم نعاملهم نفس الشيء ونقدم لهم نفس الرعاية وكمان هذا يسهل الموضوع على الناس

### Treat greatest threat to life **first**

As we are identifying the threats to life we want to start treating right away and this is a completely different concept than what you used to do (to start with History, physical examination, investigation). so we modify the trauma approach into primary survey and secondary survey (will be discussed)

### Definitive diagnosis **not** immediately important

It doesn't matter now what is the cause of the airway obstruction! Is it foreign body, bleeding or fractured larynx, what matters is that the airway is compromised and I have to control it, It doesn't matter why the patient can't breathe! Is it pneumothorax, tension pneumothorax or hemothorax, what matters is that the oxygenation of the patient (pulse oximetry) is low and I have to interfere; Because it takes time to figure out what's going on

### Time is of the essence

How long does it take you to do all of what you used to do (History, physical examination, investigation)?  
A lot right! so if we apply this in a trauma pt he will die before you start the treatment

### Do no further harm

دائمًا أنسأل هالسؤال: يا دكتور أنا طالب طب ودائمًا أمر على حوادث أوقف ودي أساعد بس ما أعرف وش أسوي؟ أقول لهم إذا هو يتنفس خله لا تسوي شئى حتى لو هو جوا السيارة وأنت ما تعرف تطلعاه من السيارة بطريقة صحيحة، خله جوتها إلين ما يجي الإسعاف ويتصرف بطريقة صحيحة

## ABCDE approach:

- **A**irway with c-spine protection
- **B**reathing / ventilation / oxygenation
- **C**irculation: stop the bleeding!
- **D**isability / neurological status
- **E**xpose / **E**nvironment / body temperature

### Regular Medical Assessment

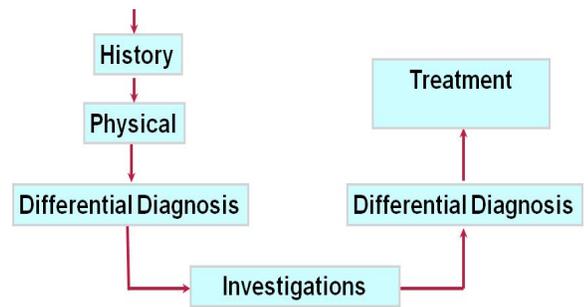
( Used for non-traumatic patients or as a Secondary Survey for Trauma Patients )

This is the Regular or the routine way to approach a patient

1. History taking
2. Physical Examination
3. Differential diagnosis
4. Investigation
5. Evaluate your differential diagnosis
6. Start treatment

A trauma patient would die before receiving treatment if we approach him in the same way.

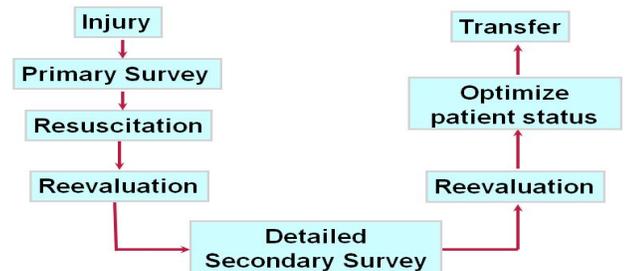
All of these are important but we call it in trauma care the secondary survey, we start with the primary survey to save the life



### Initial Assessment / Management

(( Only for Trauma Patients ))

1. Injury
2. **Primary survey**
3. Resuscitation
4. Reevaluation
5. **Detailed secondary survey**
6. Reevaluation
7. Optimize patient status
8. Consider early transfer



## Quick Assessment:

What is a quick, simple way to assess a patient in 10 seconds?

- **Identify yourself**
- **Ask the patient his or her name**  
(if you know his or her name, otherwise you can't judge the answer)
- **Ask the patient what happened**

ask the patient questions that you and the patient know the answer

For example where are you now? What is the date today? Or is it now morning or night?

By this very short interaction you know that his airways is intact otherwise you won't be able to hear his voice, you know that his breathing is ok because he is getting air in and out, you know that his oxygenation, blood pressure, brain all are fine so his ABCD is ok because he's providing his brain enough oxygen and enough blood pressure to think in order to give me a correct answer.

\* The patient who fails the simple quick assessment test needs immediate attention.

An appropriate response to the previous questions confirms the following:

- **A** Patent airway
- **B** Sufficient air reserve to permit speech
- **C** Sufficient perfusion to permit cerebration
- **D** Clear sensorium we need adequate cardiac output to ensure clear sensorium.

## Standard Precautions:



- The amount of effort that you put in yourself to be a doctor is very huge, it would be very unfortunate to get pricked by HIV or Hepatitis B, C or even to get Corona because you didn't follow the standard precautions!
- People underestimate this but trauma victims are more likely to be infected by communicable diseases. So you don't want in your attempt to help this patient to be at risk of being infected
- Believe me it's worth it, make it a Habit !

## Recall:

### What widely accepted protocol does trauma care in the United States follow?

Advanced Trauma Life Support (ATLS) precepts of the American College of Surgeons

### What are the 3 main elements of the ATLS Protocol?

1. Primary survey/resuscitation
2. Secondary survey
3. Definitive care

### How and when should the patient history be obtained?

It should be obtained while completing the primary survey; often the rescue squad, witnesses, and family members must be relied upon

## The Primary Survey: Check this [video](#) before going through the rest of the lecture ( only 3:00 mins )

- The goal of primary survey is to **identify** and **treat** conditions that constitute an immediate threat to life.
- ATLS provides a structured approach to the trauma patient with standard Algorithms of care.
- It emphasizes the "**golden hour**" concept that timely prioritized interventions are necessary to prevent death.
- The ATLS Course refers to the primary survey as assessment of the "**ABC**" (**A**irway with cervical spine protection, **B**reathing and **C**irculation).
- Although the concepts within primary survey are presented in a sequential fashion in reality they often proceed simultaneously.

**Keep in mind: Primary survey is VERY IMPORTANT for the OSCE exam, they can ask us about one of the "ABCDE"**

## Special considerations:

- Trauma in elderly
- Pediatric trauma
- Trauma in pregnancy

As we mentioned that the beauty of ATLS is that it provides you **the same priority** for every patient !

لأننا نحتاج نحرص على بعض المرضى أكثر مثل كبار السن والأطفال والحوامل

- For example, if a young patient had a car crash and he is hypotensive, most likely that is because he is bleeding, but if we apply the same scenario in an elderly patient maybe he first had MI while he was driving then he had the car crash so you

will treat him as MI patient

- Or if there is a young patient with 120 heart rate (High) is not the same as a Pediatric patient with the same heart rate (Normal) because the vital signs of pediatrics are different so we need to take this into consideration

- Or in a pregnant lady because you are dealing with 2 patient the mother and her baby.



## AIRWAY Management with cervical spine protection:

We start with the airway first because it's what kills the patient first!

### What to do?

- ★ **Establish patent airway and protect c-spine.** (if you think that the airway is not patent (not open) you have to maintain it), We Assume everybody has a c spine injury until proven otherwise, so we put the collar to protect the neck and spine regardless the hx, we just assume it.

### How?

#### Basic Airway Techniques:

1. **Chin-lift Maneuver:** it opens the airway and this is the 1st approach but in trauma we don't like it because it moves the c spine and as we said we assume that every trauma pt has c spine injury
2. **Jaw-thrust Maneuver:** we like it in trauma The tongue is attached to the mandibular (the jaw), so if you move the mandible (the jaw) anteriorly you will move the tongue also anteriorly and this will prevent the tongue from going back and blocking the airway.

#### Advanced Airway Techniques:

Endotracheal intubation includes both **nasotracheal** and **orotracheal** intubation

##### 1. **Nasotracheal intubation:**

- a. It can be accomplished only in patients who are breathing spontaneously.
- b. The primary application for this technique in Emergency Department (ED) is in those patients requiring emergent airway support in whom chemical paralysis cannot be used.
- c. Rarely used, most common is orotracheal

##### 2. **Orotacheal intubation:**

- a. It is the **most common** technique used to establish a definitive airway.
- b. Because all patients are presumed to have cervical spine injuries, manual in-line **cervical immobilization** is essential by using cervical collar. is the most secure way, you put a tube through the mouth by passing the tube in the upper trachea and inflate a balloon and this isolate the trachea and provides you a way to ventilate the patient but it requires extra training not everybody can do this, sometimes if we couldn't go through the mouth we do it surgically from outside it might help but most of the time you don't want to go through these things it's better to do jaw thrust bc it's easier for both the patient and the doctor.
- c. **Correct endotracheal placement is verified with:**
  - i. Direct laryngoscopy.
  - ii. Capnography: the monitoring of the concentration or partial pressure of carbon dioxide (CO<sub>2</sub>) in the respiratory gases.
  - iii. Audibility of bilateral breath sounds.
  - iv. Chest X-Ray

##### 3. **Surgical Routes:** ركزوا بالسؤال بنوع الانجزي، بيكون سؤال مجاني

- A. **Cricothyroidotomy:** Patients in whom attempts at intubation have failed or who are precluded from intubation due to **extensive facial injuries**.
- B. **Emergent Tracheostomy:** Is indicated in a patient with **extensive laryngeal injury**. It is the most common technique used to establish a definitive airway.

### Desseide: How to act & how to deal with your ER patient?!!

- **Don't require early attention to the airway:** Conscious patient who do not show tachypnea and **have normal voice**.
- **Elective intubation:** When you intubate the patient **before** his airways get compromised
  - Patients with **penetrating neck injuries** and **an expanding hematoma**, evidence of chemical or **thermal injuries** to the mouth, nares or hypopharynx, extensive subcutaneous air in the neck, **complex maxillofacial trauma** or airway bleeding, in these cases elective intubation should be performed.
  - These patients may initially have a satisfactory airway but they may become obstructed if soft tissue swelling, hematoma formation, or edema progress.
- **Establishment of a definitive airway (i.e. endotracheal intubation): Unconscious patient with trauma**
  - Indicated in patients with apnea, inability to protect the airway due to **altered mental status**, impending airway compromise due to inhalation injury, hematoma, facial bleeding, soft tissue swelling or aspiration, and inability to maintain oxygenation.
  - **Altered mental status is the most common indication for intubation!!!!!!**

**Pitfalls** (Unexpected difficulties):

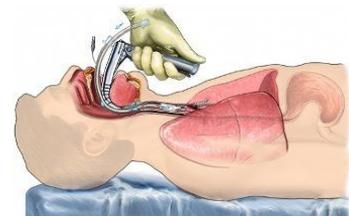
- Occult airway injury
- Progressive loss of airway
- Equipment failure
- Inability to intubate



Chin-lift Maneuver



Jaw-thrust Maneuver



Orotracheal intubation

Video: [Airway Manoeuvres \(1:19\)](#)

**B** BREATHING and Ventilation:

Once a secure airway is obtained, adequate oxygenation and ventilation must be assured. All injured patients should receive supplemental oxygen and be monitored by pulse oximetry.

**Assess and ensure adequate oxygenation and ventilation:**

- Respiratory rate.
- Chest movement.
- Air entry.
- **Oxygen saturation.** above 90% is normal if less then there is a problem and you have to fix it

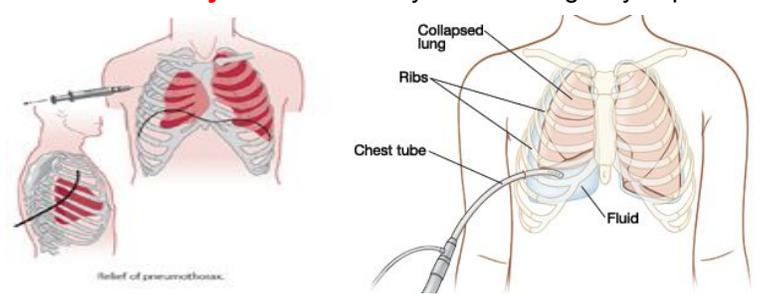
**Immediate life threatening injuries** due to inadequate ventilation and should be recognized during the primary survey: **IMPORTANT - Will be in your exam!**

◀ **Laryngotracheal injury / Airway obstruction:**

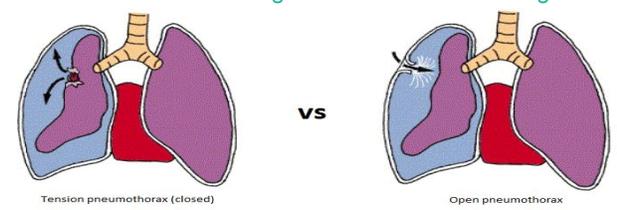
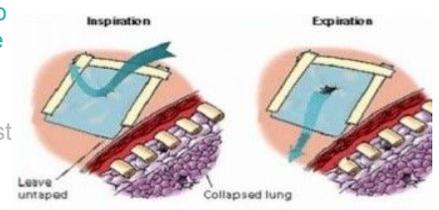
Pathophysiology:	For example: when patient has a tearing of the right or left main bronchus, intubation won't solve the problem as the air will leak to the facial plain forming subcutaneous emphysema, this will reduce the air used for gas exchange and make the patient hypoxic. most of these patient die at the scene before they come to the hospital, but if the patient come to the hospital it'll be very clear to diagnose because if you intubate the patient he will not ventilate well and there will be subcutaneous emphysema because of the air leaking and you will see it as bobbles in the skin.
Treatment:	⇒ Rush the patient to the OR

◀ **Tension pneumothorax:** جاستيشن بسنة من السنوات، اعطوهم اكس راي وطلبوا الديقنوز وسالوا عن الاكس راي فايندقز ومانجمنت

Pathophysiology:	<ul style="list-style-type: none"> <li>● There's a parenchymal tear in the lung which acts as a <b>one-way valve</b>, with each <u>inhalation</u> allowing <u>additional air</u> to accumulate in the <u>pleural space</u>.</li> <li>● The normally negative intrapleural pressure becomes <b>positive</b>: <ul style="list-style-type: none"> <li>○ <b>Depresses</b> the ipsilateral <u>hemi-diaphragm</u>.</li> <li>○ <b>Shift</b> the mediastinal structures into the <u>contralateral chest</u>.</li> <li>○ Subsequently the <u>contralateral lung</u> is <b>compressed</b>.</li> <li>○ The heart <b>rotates</b> about the superior and inferior vena cava, this <b>decreases</b> venous return and ultimately <u>cardiac output</u> which results in <b>cardiovascular collapse</b>.</li> </ul> </li> </ul> <p>In <b>simple</b> pneumothorax: When there is lung injury the air escape from the lung into pleural cavity then doesn't go back again from pleural cavity into the lung → the air will start to accumulate with every breath in a closed space so the pressure will go up and Subsequently it can lead to <b>tension</b> pneumothorax when the contralateral lung is compressed and the heart rotates about the superior and inferior vena cava → this decreases venous return and ultimately cardiac output which results in → cardiovascular collapse and finally the patient will become hypotensive.</p> <p>#So the patient will be <b>hemodynamically compromised</b> in tension pneumothorax due to the pneumothorax it self</p>
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<p><b>Diagnosis:</b></p>	<p><b>Respiratory distress</b> and <b>hypotension</b> in combination with any of the following physical signs in patients with chest trauma.</p> <ul style="list-style-type: none"> <li>- <b>Inspection:</b> tachycardia, hypotension, hypoxia, <b>distended neck veins</b> due to impendence of superior-vena cava, but the neck veins <u>may be flat</u> due to <b>systemic hypovolemia</b>.</li> <li>- <b>Palpation:</b> <b>Tracheal deviation</b> <u>away</u> from the affected side (<b>contralateral side</b>). (e.g. accumulation of air in the right lung will deviate the trachea to the left side), Subcutaneous <b>emphysema</b> <u>on the affected side</u>.</li> <li>- <b>Percussion:</b> hyperresonance (<b>ipsilateral</b>).</li> <li>- <b>Auscultation:</b> <b>Lack or decreased breath sounds</b> <u>on the affected side</u>.</li> </ul> <p><b>Dr. Thamer:</b> You should <b>NOT</b> diagnose it from chest x ray! It's very clear clinically <b>عليه</b> الحقا وقت، المريض قاعد يموت مافيه وقت، <b>بكتها مره ثانية:</b> it is a clinical diagnosis and requires immediate treatment the patient will die if you wait for a CXR. Anyways CXR findings: Mediastinal deviation to the opposite side, tracheal deviation to the opposite side, hyperexpanded lower diaphragm, collapsed lung, hyperlucent lung field. <a href="#">further info</a></p>
<p><b>Treatment:</b></p>	<ul style="list-style-type: none"> <li>★ <b>First: Immediate needle thoracostomy:</b> <ul style="list-style-type: none"> <li>○ Decompression with a <b>14 gauge</b> angiocatheter</li> <li>○ In the <b>second intercostal space</b> in the <b>midclavicular line</b> [so you convert tension pneumothorax into simple pneumothorax, the blood pressure will go up and now you have more time to insert chest tube ]</li> </ul> </li> <li>★ <b>Then: Insert Tube thoracostomy:</b> <ul style="list-style-type: none"> <li>○ In the <b>fifth intercostal space</b> in the <b>midaxillary line</b> immediately in the emergency department before the chest radiograph.</li> </ul> </li> </ul> 

### ◀ Open pneumothorax (or sucking chest wound).

<p><b>Pathophysiology:</b></p>	<p>Is the opposite of Tension pneumothorax when you have an <u>opening in the chest wall</u> and the air is going through the chest wall instead of the trachea!</p> <ul style="list-style-type: none"> <li>● This occurs with full-thickness loss of the chest wall, permitting free communication between the pleural space and the atmosphere.</li> <li>● This comprises ventilation due to equilibration of atmospheric and pleural pressures which prevents lung inflation and alveolar ventilation and result in <b>hypoxia</b> and <b>hypercarbia</b></li> </ul> <p>[in other words: Normally In inspiration the chest expands so you create negative pressure and the air goes into the nose → trachea → bronchi → lung, but if you have an opening in the chest wall the resistance in this opening will be less than the resistance in the trachea so the air will go in and out faster through this opening so it's ineffective breathing]</p> 
<p><b>Treatment:</b></p>	<ul style="list-style-type: none"> <li>★ <b>First:</b> Close the chest wall defect create one-way valve that allows the air to go out through the opening in the expiration because the dress is pushed by the +ve pressure, but not to go inside through the inspiration because the dress will be sucked by the -ve pressure So the patient can now breathe normally through the nose. <ul style="list-style-type: none"> <li>○ Placement of dressing secured on 3 sides to create (flutter-valve) because securing on 4 sides will cause tension pneumothorax, a chest tube distant from injury must then be placed.</li> <li>○ flutter valve dressing غالبًا ينعمل بالحالات الطارئة خارج المستشفى مثل الحروب بينما بالمستشفى فعليا هم يسكرون الفتحة بالكامل وينفس الوقت يحطون الـ Chest tube</li> </ul> </li> <li>★ <b>Then:</b> tube thoracostomy in the 5th intercostal space midaxillary line.</li> </ul> 

## ◀ Flail chest with underlying pulmonary contusion

<p><b>Pathophysiology:</b></p>	<ul style="list-style-type: none"> <li>• It occurs when <b>three or more</b> contiguous ribs are fractured in at least <u>two locations</u></li> <li>• <b>Paradoxical movement</b> of this free-floating segment of chest wall may be evident in patient with spontaneous ventilation due to the negative intrapleural pressure of inspiration.</li> <li>• Rarely, the <u>additional work of breathing</u> and <u>chest wall pain</u> caused by the flail segment is sufficient to <b>compromise ventilation</b>.</li> </ul> <p><b>Note:</b> We used to think that the paradoxical movement causes the hypoxia but now we know that the force that broke the segment make it go back and hit the lung that causes edema and hemorrhage so the oxygen exchange in this part of the lung gets affected and this causes hypoxia. <b>SO HYPOXIA IS CAUSED BY RESTRICTED CHEST WALL MOVEMENT &amp; UNDERLYING LUNG CONTUSION</b></p> <div data-bbox="503 577 1315 808" data-label="Image"> </div> <p>Think: A patient with blunt trauma to the chest immediately presented to the ER with hypoxia and a normal CXR. what is the likely cause of hypoxia? Pulmonary contusion :)</p>
<p><b>Treatment:</b></p>	<ul style="list-style-type: none"> <li>⇒ So <b>Oxygen &amp; analgesia</b>.</li> <li>⇒ Resultant hypoventilation and hypoxemia may require intubation and mechanical ventilation.</li> </ul>

## ◀ Massive hemothorax:

- (> 1.5 L) Massive bleeding in the chest that causes tension, so it's Like tension pneumothorax but instead of air here is **blood**.
- Treat it by inserting chest tube in the 5th intercostal space midaxillary line, Use a big size tube (32) because you don't want it to be blocked by blood.

## ◀ Cardiac tamponade:

- Blood collected in the pericardium because of heart injury so with every single beat of the heart, the heart will bleed into the pericardium space, pressure will accumulate and compress the heart causing tamponade
- Traumatic cardiac tamponade (where there is blood accumulating around the heart) needs cardiac surgeon to take the pt to the OR to stop the bleeding
- Unless you don't have a cardiac surgeon you treat it as a medical cardiac tamponade (where there is fluid accumulating around the heart not blood) with Pericardiocentesis
- The triad of signs in cardiac tamponade (Beck's triad): Hypotension, Distended neck veins, and muffled heart sounds. Other signs include tachypnea, tachycardia, pulsus paradoxus, and a reduced level of consciousness.

**THREE critical tools used to differentiate these in multisystem trauma patient are:**

- a) Chest radiograph
- b) Pelvis radiograph
- c) Focused Abdominal Sonography for Trauma (FAST)



# CIRCULATION:

Most of you will say that we assess the circulation by blood pressure, but it will not drop unless the patient loses at least 40-50% of his blood volume = 2.5 L ! So we have to rely on other things like:

- **Level of consciousness**
- **Skin color and temperature** Pale? Cold?
- **Pulse rate and character** Tachycardia?

but all of these are not very specific so we always assess the trauma patient for bleeding even though he doesn't look that he is bleeding, we don't wait for him to show us that he is bleeding!

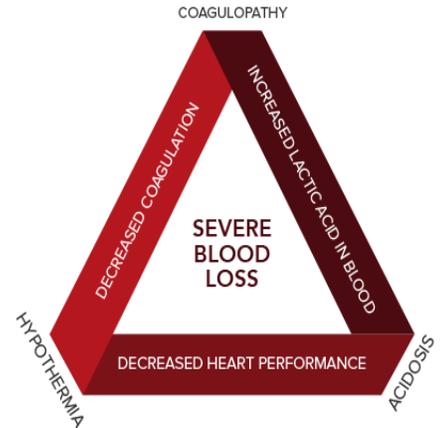
What we try to utilize now is to check lactic acid and base deficit in the blood gases, because they will be high in anaerobic metabolism in case of shock.

- When you leave the pt bleeding for a long time the pt will end up with having

**Lethal triad** (triad of death):

- **Hypothermia**
- **Coagulopathy**
- **Acidosis**

once the patient goes into this triad even though you restore the blood volume and stop the bleeding the patient will continue to bleed because of medical problems and it's very difficult to bring the patient back again, mortality 99%



## Circulatory Management:

1	Blood pressure and pulse should be measured manually <u>at least every 5 minutes</u> in patient with significant blood loss until normal vital signs values are restored.
2	Two peripheral catheters, <b>16 gauge</b> or larger (14 gauge) in adults.
3	<b>Fluid resuscitation</b> (Normal saline or ringer lactate, ringer lactate is better because it's more physiological)
4	Blood should be <u>drawn simultaneously</u> and send for measurement of hematocrit level, as well as for typing and cross-matching for possible blood transfusion in patient with evidence of hypovolemia.
5	If peripheral angiocatheter access is difficult, <b>saphenous vein</b> cutdown <u>at the ankle</u> provide excellent access.
6	Additional venous access through <b>femoral</b> or <b>subclavian vein</b> (can be used for CVP measurement).
7	<b>Intraosseous needle*</b> can be placed in the <u>proximal tibia</u> (preferred) or <u>distal femur</u> of an unfractured extremity for fluid resuscitation in patient under <b>6 years of age (in children)</b> . *risk of osteomyelitis or injury to artery / vein
8	External control of hemorrhage should be achieved promptly while circulating volume is restored. Manual compression of open wounds with ongoing bleeding should be done with a <b>single 4 x 4 gauze</b> and a gloved hand. Blind clamping of bleeding vessels should be avoided.

### To sum up the circulatory management:

- **Control hemorrhage:** THE MOST IMPORTANT THING IS TO STOP THE BLEEDING!  
it doesn't help to give the patient fluid or blood while it's getting out due to the bleeding
- Restore volume start with 2L of crystalloid (the updated version of ATLS says 1L is enough), then move to blood as soon as possible, bc crystalloid doesn't carry oxygen, it just buys you more time to do cross matching. So Ideally if the pt is losing blood to give blood. We have in our ER O- blood so we can give right away to minimize the amount of crystalloid.
- Reassess patient

During the circulation section of the primary survey **FOUR** life-threatening injuries that must be identified:

Massive hemothorax	Cardiac tamponade	Massive Hemoperitoneum	Mechanically unstable pelvic fracture
<b>Immediate Treatment:</b> - Tube thoracostomy to facilitate lung re-expansion , - <i>Massive hemothorax (&gt;1500 ml. blood) is an indication for operative intervention!!!!!!</i>	<b>Immediate Treatment:</b> - Pericardial drain under ultrasound guidance. - Followed by ⇒ <b>operative intervention</b>	<b>Immediate Treatment:</b> - Fluid resuscitation. - Immediate surgical intervention	<b>Immediate Treatment:</b> - Pelvis fracture needs ⇒ <b>Immediate external fixation</b>

If the patient is hypotensive and you couldn't find the bleeding source after looking in the abdomen and chest. Then think of cardiac tamponade, as it is very commonly missed.

### Shock Classification and Initial Fluid Resuscitation:

- **Classic signs and symptoms of shock:** are tachycardia, hypotension, tachypnea, mental status changes, diaphoresis and pallor. The quantity of acute blood loss correlates with physiologic abnormalities.
  - ★ Tachycardia is often the **earliest sign** of ongoing bleeding. "but can be masked in pt. taking beta blockers"
  - ★ Hypotension is not reliable early sign of Hypovolemia, because blood volume must decrease by **>30%** before hypotension occurs.

### Signs and Symptoms of Advancing Stages of Hemorrhagic Shock (IMPORTANT!!!)

	Class I	Class II	Class III	Class IV
Blood loss (ml)	Up to 750	750-1500	1500-2000	↑ 2000
Blood loss (% BV)	Up to 15%	15-30%	30-40%	↑ 40%
Pulse Rate	↓ 100	↑ 100	↑ 120	↑ <b>140</b>
Blood Pressure(mmHg)			Decreased	Decreased
Pulse Pressure	Normal or Increased	Decreased	Decreased	Decreased
Respiratory Rate	14-20	20-30	30-40	↑ 35
Urine Output(ml/hr)	↑ 30	30 – 20	15 – 5	<b>Negligible</b>
CN/Mental Status	Slightly anxious	Mildly anxious	Anxious and confused	Confused and Lethargic due to hypoxia

- **Fluid resuscitation:**
  - Fluid resuscitation begins with a 2 L (Adult) or 20 ml/kg (child) IV bolus of isotonic **CRYSTALLOID, TYPICALLY RINGER'S LACTATE.**
  - For persistent hypotension, this is repeated **once** in an adult and **twice** in a child before red blood cells (RBCs) are administered.
  - Urine output is a quantitative reliable indicator of organ perfusion. Adequate urine output is 0.5 ml/kg per hour in an adult, and 1 ml/kg per hour in child.
  - Based on the initial response to fluid resuscitation, hypovolemic injured patients can be separated into three broad categories:
    1. Responders: BP will get stabilized.
    2. Transient responders: BP will improve, then fall again which means there's an active bleeding.
    3. Non-responders: e.g. **cardiac tamponade** this means that there's a major bleeding that cannot be controlled by resuscitation.

## D DISABILITY

Disability doesn't mean that the patient can't move, it means that the trauma affects the brain so is he alert or no? is there a head injury or no? what is the patient glasgow coma score? We would like to save him from being quadriplegic, but what is more important is that the patient is alive.

\*it means that disability is about brain injury not spinal or distal neurological injury

- **Baseline neurologic evaluation** We examine the brain by 2 things:
  - Pupillary response: look at the pupils. Are they reactive to light or no, is there a discrepancy in the size or no.
  - **Glasgow Coma Scale score:**  
I will ask you to calculate the GCS score in one of your exams: written, MCQs, OSCE, 3rd or 5th year احفظوه وقد أعذر من أنذر →  
\*The GCS scoring part in surgical recall down is helpful to memorise it
- **Observe for neurological deterioration.**

Table 7.1 Glasgow Coma Scale

<b>Eyes open</b>	
• Spontaneously	4
• To verbal command	3
• To pain	2
• No response	1
<b>Best motor response</b>	
To verbal command	
• Obeys verbal command	6
To painful stimulus	
• Localizes pain	5
• Flexion withdrawal	4
• Abnormal flexion (decorticate rigidity)	3
• Extension (decerebrate rigidity)	2
• No responses	1
<b>Best verbal response</b>	
• Orientated and converses	5
• Disorientated and converses	4
• Inappropriate words	3
• Incomprehensible sounds	2
• No response	1
Total number of points (minimum 3, maximum 15)	

## E EXPOSURE & ENVIRONMENT

- **Completely undress the patient**
- Prevent hypothermia
- Check for missed injuries

## Resuscitation:

Although the primary survey and resuscitation are mentioned separate, they are actually done in the same time, when you are checking the patient airway you are resuscitating while you are checking breathing you are resuscitating ... so it's not 2 separate steps! It's done together

- Protect and secure airway
- Ventilate and oxygenate
- Stop the bleeding!
- Vigorous shock therapy
- Protect from hypothermia

## Adjuncts to primary survey:

- **Primary survey should take 10 – 20 minutes:**
  - ECG / Vital signs / ABGs "Arterial Blood Gases" / Pulse Oximeter and CO<sub>2</sub> / Urinary - gastric catheter unless contraindicated / Urinary output
- **X-rays:** (To any trauma patient)
  - C-spine x-ray now a lot of studies are coming up saying that the accuracy of c spine X Ray to detect c spine fracture is 50% so we don't do it anymore if we have access to CT
  - **Chest x-ray**
  - **Pelvic x-ray**
- **Diagnostic Tools:**
  - FAST<sup>1</sup>
  - DPL<sup>2</sup> → (picture)



<sup>1</sup> Focused Assessment with Sonography for Trauma.

<sup>2</sup> Diagnostic Peritoneal Lavage

Give me 5 differential diagnosis for **Hypotensive** trauma patient?

1. Bleeding in the **chest** (detected by x-ray)
2. Bleeding in the **pelvis** (detected by x-ray)
3. Bleeding in the **long bone** (detected by x-ray) "Femur fracture can bleed 1-2 Liters"
4. Bleeding in the **abdomen** (very difficult to detect because the abdomen is a huge cavity that can accommodate large amount of blood before it become distended "especially if the patient is obese and by that time the patient will lose large amount of blood so we use a diagnostic tool called **DPL** we open a small opening and we aspirate, if there is a blood we rush the patient to the OR **but** now we use **FAST** which is a fancy way of saying abdominal ultrasound looking for 1 question: is there fluid or no? if yes of course it's not ascites! It's bleeding)
5. Bleeding in the **street** (open wound causing bleeding)

\* **Don't** say that the patient is hypotensive because there is bleeding in the **brain!** the skull doesn't accommodate enough blood to drop the blood pressure!

● **Consider early transfer:**

There's no point to delay the patient to do more investigation if you don't have access to the services that he needs, for example if the pt has a brain injury and you don't have a neurosurgeon in your hospital then don't delay the pt to do head CT, send him to a hospital that has a neurosurgeon and they will do the CT for him.

- Use time before transfer for resuscitation
- Do not delay transfer for diagnostic tests

**Recall:**

**What are the 5 steps of the primary survey?**

Think: "ABCDEs":

- Airway (and C-spine stabilization)
- Breathing
- Circulation
- Disability
- Exposure and Environment

**What principles are followed in completing the primary Survey?**

Life-threatening problems discovered during the primary survey are always addressed before proceeding to the next step

**What are the goals during assessment of the airway?**

Securing the airway and protecting the spinal cord

**In addition to the airway, what MUST be considered during the airway step?**

Spinal immobilization by full backboard and rigid cervical collar

**In an alert patient, what is the quickest test for Airway?**

Ask a question: If the patient can speak, the airway is intact

**What is the first maneuver used to establish an airway?**

Chin lift, jaw thrust, or both; if successful, often an oral or nasal airway can be used to temporarily maintain the airway

**If these methods are unsuccessful, what is the next maneuver used to establish an airway?**

Endotracheal intubation

**If all other methods are unsuccessful what is the definitive airway?**

Cricothyroidotomy, a.k.a. "Surgical airway": Incise the cricothyroid membrane between the cricoid cartilage inferiorly and the thyroid cartilage superiorly and place an endotracheal or tracheostomy tube into the trachea

**What must always be kept in mind during difficult attempts to establish an airway?**

Spinal immobilization and adequate oxygenation; if at all possible, patients must be adequately ventilated with 100% oxygen using a bag and mask before any attempt to establish an airway

**What are the goals in assessing breathing?**

Securing oxygenation and ventilation Treating life-threatening thoracic injuries

**What comprises adequate assessment of breathing?**

- **Inspection:** for air movement, respiratory rate, cyanosis, tracheal shift, jugular venous distention, asymmetric chest expansion, use of accessory muscles of respiration, open chest wounds
- **Auscultation:** for breath sounds
- **Percussion:** for hyperresonance or dullness over either lung field
- **Palpation:** for presence of subcutaneous emphysema, flail segments

**What are the life-threatening conditions that MUST be diagnosed and treated during the breathing step?**

- Tension pneumothorax
- Open pneumothorax
- Massive hemothorax

**What are the goals in assessing circulation?**

Securing adequate tissue perfusion; treatment of external bleeding

**What is the initial test for adequate circulation?**

Palpation of pulses: As a rough guide, if a radial pulse is palpable, than systolic pressure is at least 80 mm Hg; if a femoral or carotid pulse is palpable, than systolic pressure is at least 60 mm Hg

**What comprises adequate assessment of circulation?**

Heart rate, blood pressure, peripheral perfusion, urinary output, mental status, capillary refill (normal < 2 seconds), exam of skin: cold, clammy = hypovolemia

**Who can be hypovolemic with normal blood pressure?**

Young patients; autonomic tone can maintain blood pressure until cardiovascular collapse is imminent

**Which patients may not mount a tachycardic response to hypovolemic shock?**

Those with concomitant spinal cord injuries, Those on B-blockers, Well-conditioned athletes

**How are sites of external bleeding treated?**

By direct pressure; ± tourniquets

**What is the trauma resuscitation fluid of choice?**

Lactated Ringer’s (LR) solution (isotonic, and the lactate helps buffer the hypovolemia-induced metabolic acidosis)

**What are the contraindications to placement of a Foley?**

**Signs of urethral injury:** Severe pelvic fracture in men / Blood at the urethral meatus (penile opening) / “High-riding” “ballotable” prostate (loss of urethral tethering) / Scrotal/perineal injury/ecchymosis

**What test should be obtained prior to placing a Foley catheter if urethral injury is Suspected?**

Retrograde UrethroGram (RUG): dye in penis retrograde to the bladder and x-ray looking for extravasation of dye

**What are the goals in assessing Disability?**

Determination of neurologic injury ( Think: neurologic disability)

**What comprises adequate assessment of disability?**

Mental status—Glasgow Coma Scale (GCS)

Pupils—a blown pupil suggests ipsilateral brain mass (blood) as herniation of the brain compresses CN III

Motor/sensory—screening exam for lateralizing extremity movement, sensory deficits

**Describe the GCS scoring system:**

**Eye opening (E)**

(Think: Eyes = “four eyes”)

- 4—Opens spontaneously
- 3—Opens to voice (command)
- 2—Opens to painful stimulus
- 1—Does not open eyes

**Motor response (M)**

(Think: Motor = “6-cylinder motor”)

- 6—Obeys commands
- 5—Localizes painful stimulus
- 4—Withdraws from pain
- 3—Decorticate posture
- 2—Decerebrate posture
- 1—No movement

**Verbal response (V)**

(Think: Verbal = “Jackson 5”)

- 5—Appropriate and oriented
- 4—Confused
- 3—Inappropriate words
- 2—Incomprehensible sounds
- 1—No sounds

**What is a normal human GCS? 15**

**What is the GCS score for a dead man? 3**

**What is the GCS score for a patient in a “coma”? ≤ 8**

**GCS indication for intubation? ≤ 8**

**How does scoring differ if the patient is intubated?**

Verbal evaluation is omitted and replaced with a “T”; thus, the highest score for an intubated patient is 11 T

**What are the goals in obtaining adequate exposure?**

Complete disrobing to allow a thorough visual inspection and digital palpation of the patient during the secondary survey

**What is the “environment” of the E in ABCDEs?**

Keep a warm Environment (i.e., keep the patient warm; a hypothermic patient can become coagulopathic)

**How do you rule out a C-spine bony fracture?**

With a CT scan of the C-spine

**What studies are available to evaluate for intra-abdominal injury?**

FAST, CT scan and DPL

**What is a FAST exam?**

Ultrasound: Focused Assessment with Sonography for Trauma = FAST

**What does FAST exam look for?**

Blood in the peritoneal cavity looking at Morison’s pouch, bladder, spleen, pericardial sac

**What does DPL stand for?**

Diagnostic Peritoneal Lavage

**What diagnostic test is the test of choice for evaluation of the unstable patient with blunt abdominal trauma?**

FAST

**What is the indication for abdominal CT in blunt trauma?**

Normal vital signs with abdominal pain/ tenderness /mechanism

**What is the indication for DPL or FAST in blunt trauma?**

Unstable vital signs (hypotension)

**How is a DPL performed?**

Place a catheter below the umbilicus (in patients without a pelvic fracture) into the peritoneal cavity, Aspirate for blood and if < 10cc are aspirated, infuse 1 L of saline or LR, Drain the fluid (by gravity) and analyze

**What injuries does CT scan miss?**

Small bowel injuries and diaphragm injuries

### What injuries does DPL miss?

Retroperitoneal injuries

### What is **Pneumothorax**?

Injury to the lung, resulting in release of air into the pleural space between the normally opposed parietal and visceral pleura

### How is it diagnosed?

Tension pneumothorax is a clinical diagnosis: dyspnea, jugular venous distention, tachypnea, anxiety, pleuritic chest pain, unilateral decreased or absent breath sounds, tracheal shift away from the affected side, hyperresonance on the affected side

### What is the treatment of a tension pneumothorax?

Rapid thoracostomy incision or immediate decompression by needle thoracostomy in the second intercostal space midclavicular line, followed by tube thoracostomy placed in the anterior/ midaxillary line in the fourth intercostal space (level of the nipple in men)

### What is the medical term for a “sucking chest wound”?

Open pneumothorax

### What is a tube thoracostomy?

“Chest tube”

### How is an open pneumothorax diagnosed and treated?

- **Diagnosis:** usually obvious, with air movement through a chest wall defect and pneumothorax on CXR
- **Treatment in the ER:** tube thoracostomy (chest tube), occlusive dressing over chest wall defect

### What does a pneumothorax look like on chest X-ray?

Loss of lung markings (Figure shows a right-sided pneumothorax; arrows point out edge of lung-air interface)

### What is **Flail Chest**?

Two separate fractures in three or more consecutive ribs

### How is it diagnosed?

Flail segment of chest wall that moves paradoxically (sucks in with inspiration and pushes out with expiration opposite the rest of the chest wall)

### What is the major cause of respiratory compromise with flail chest?

Underlying pulmonary contusion!

### What is the treatment?

Intubation with positive pressure ventilation and PEEP PRN (let ribs heal on their own)

### What is it **Cardiac Tamponade**?

Bleeding into the pericardial sac, resulting in constriction of heart, decreasing inflow and resulting in decreased cardiac output (the pericardium does not stretch!)

### What are the signs and Symptoms?

Tachycardia/shock with Beck's triad, pulsus paradoxus, Kussmaul's sign

### Define the following:

- **Beck's triad:**
  1. Hypotension
  2. Muffled heart sounds
  3. JVD,
- **Kussmaul's sign:** JVD with inspiration

### How is cardiac tamponade Diagnosed?

Ultrasound (echocardiogram)

### The treatment?

Pericardial window: if blood returns then median sternotomy to r/o & treat cardiac injury, Massive Hemothorax

### How is **Massive Hemothorax** diagnosed?

Unilaterally decreased or absent breath sounds; dullness to percussion; CXR, CT, chest tube output

### What is the treatment?

Volume replacement Tube thoracostomy (chest tube) Removal of the blood (which will allow apposition of the parietal and visceral pleura, sealing the defect and slowing the bleeding)

### What are indications for emergent thoracotomy for Hemothorax?

Massive hemothorax =

1. >1500 cc of blood on initial placement of chest tube
2. Persistent > 200 cc of bleeding via chest tube per hour X 4 hours

### What findings on chest film are suggestive of thoracic aortic injury?

Widened mediastinum (most common finding), apical pleural capping, loss of aortic contour/KNOB/AP window, depression of left main stem bronchus, nasogastric tube/tracheal deviation, pleural fluid, elevation of right mainstem bronchus, clinical suspicion, high-speed mechanism

### What study is used to rule out thoracic aortic injury?

Spiral CT scan of mediastinum looking for mediastinal hematoma with CTA thoracic arch aortogram (gold standard)

### What is the most common site of thoracic aortic traumatic tear?

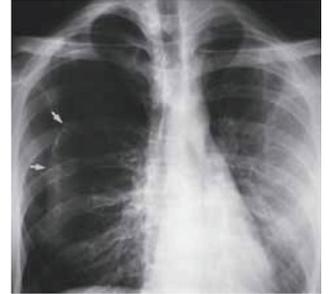
Just distal to the take-off of the left subclavian artery

### What is the treatment of a gunshot wound to the belly?

Exploratory laparotomy

### What is the evaluation of a stab wound to the belly?

If there are peritoneal signs, heavy bleeding, shock, perform exploratory laparotomy; otherwise, many surgeons either observe the asymptomatic stab wound patient closely, use local wound exploration to rule out fascial penetration, or use DPL



# The Secondary Survey

Like what we normally do to any other patient (after all life threatening injuries have been identified and patient stabilized) "History, Physical examination, Investigation..." In Trauma we call it a fancy name (The Secondary Survey).

## What is the secondary survey?

- The **complete** history and Physical examination

## When do I start the secondary survey?

- Primary survey is completed
- ABCDEs are reassessed
- Vital functions are returning to normal

## What are the components of the secondary survey?

- **History:** Allergies, Medications, Past illnesses, Last meal, Events / Environment / Mechanism
- **Physical exam:**
  - Head to toe.
  - With the patient "log-rolled", Examine the back and spine for localized tenderness, swelling, bruising or a "step".
  - The **perineum** is examined and a **rectal** examination is performed to evaluate for sphincter tone, presence of blood, rectal perforation, or high riding prostate, this is particularly critical in patients with suspected spinal cord injury, pelvic fracture, or transpelvic gunshot wounds.
  - **Vaginal** examination with **speculum** should be performed in women with pelvic fractures to exclude an open fracture.
  - Complete **neurologic** exam
- **In addition to physical examination the following should be done:**
  1. **Vital Signs Monitoring**
  2. **CVP Monitoring**
  3. **ECG Monitoring**
  4. **Nasogastric Tube Placement**
    - a. Contraindicated in complex maxillofacial injury and should be passed orally
    - b. It evaluate the stomach content for blood which may suggest gastro- duodenal injury.
    - c. If it passed to the chest it may suggest diaphragmatic injury.
  5. **Foley Catheter Placement.**
    - a. To monitor the urine output-Foley Catheter placement should be deferred after urological evaluation in patients with signs of urethral injury ( **Blood at the meatus, perineal or scrotal hematoma, or a high riding prostate**).
  6. **Repeat FAST as needed**
  7. **Laboratory Measurements.**
  8. **Radiographs.**
- **Special diagnostic tests:**
  - Selective radiography and laboratory tests are done early after the primary survey.
  - **For patients with severe blunt trauma the following radiograph should be done:** -
    - Lateral Cervical Spine X-R
    - Chest X-R
    - Pelvis X-R
  - **For patients with truncal gunshots wound:**
    - Anteriorposterior and lateral radiographs of the chest and abdomen should be done with marking the entrance and exit sites with metallic clips or stables.
  - **In critically injured patient blood sample for :**
    - Type and Cross- Matching.
    - Complete Blood Count
    - Blood Chemistry
    - Coagulation Studies
    - Lactate Level
    - Arterial Blood Gas Analysis

## Recall:

### **What principle is followed in completing the secondary Survey?**

Complete physical exam, including all orifices: ears, nose, mouth, vagina, rectum

### **Why look in the ears?**

Hemotympanum is a sign of basilar skull fracture; otorrhea is a sign of basilar skull Fracture

### **Examination of what part of the trauma patient's body is often forgotten?**

Patient's back (logroll the patient and examine!)

### **What signs of thoracic trauma are often found on the neck Exam?**

Crepitus or subcutaneous emphysema from tracheobronchial disruption/ PTX; tracheal deviation from tension pneumothorax; jugular venous distention from cardiac tamponade; carotid bruit heard with seatbelt neck injury resulting in carotid artery injury

### **What is the best physical exam for broken ribs or sternum?**

Lateral and anterior-posterior compression of the thorax to elicit pain/instability

### **What is the best way to diagnose or rule out aortic injury?**

CT angiogram

### **What must be considered in every penetrating injury of the thorax at or below the level of the nipple?**

Concomitant injury to the abdomen: Remember, the diaphragm extends to the level of the nipples in the male on full expiration

### **What is the significance of subcutaneous air?**

Indicates pneumothorax, until proven otherwise

### **What conditions must exist to pronounce an abdominal physical exam negative?**

Alert patient without any evidence of head/spinal cord injury or drug/EtOH intoxication (even then, the abdominal exam is not 100% accurate)

### **What physical signs may indicate intra-abdominal Injury?**

Tenderness; guarding; peritoneal signs; progressive distention (always use a gastric tube for decompression of air); seatbelt sign

### **What is the seatbelt sign?**

Ecchymosis on lower abdomen from wearing a seatbelt ( ≈ 10% of patients with this sign have a small bowel perforation!)

### **What is the best physical exam technique to test for pelvic fractures?**

Lateral compression of the iliac crests and greater trochanters and anterior posterior compression of the symphysis pubis to elicit pain/ instability

### **What physical signs indicate possible urethral injury, thus contraindicating placement of a Foley catheter?**

High-riding ballotable prostate on rectal exam; presence of blood at the meatus; scrotal or perineal ecchymosis

### **What must be documented from the extremity exam?**

Any fractures or joint injuries; any open wounds; motor and sensory exam, particularly distal to any fractures; distal pulses; peripheral perfusion

### **What complication after prolonged lower extremity ischemia must be treated immediately?**

Compartment syndrome

### **What is the treatment for this condition?**

Fasciotomy (four compartments below the knee)

### **What injuries must be suspected in a trauma patient with a progressive decline in mental status?**

Epidural hematoma, subdural hematoma, brain swelling with rising intracranial pressure , But hypoxia/hypotension must be ruled out!

# MCQS

1) 40 years old man who was stabbed after being involved in a fight. Examination revealed 1 cm wound above the clavicle. What is the most appropriate next step?

- A. Take him immediately to the OR
- B. CTA
- C. Observation
- D. Chest X-ray

2) A trauma patient presented with a blood pressure of 80/60 mmHg. The trauma team has done a DPL and it was positive. What is the next step?

- A. FAST
- B. Laparotomy
- C. Plain x-ray
- D. Observation

3) Patient admitted to the emergency unit with evidence of tracheal deviation to the left, hyperresonance in the right lung. He is conscious and hypotensive. What is the next step in management?

- A. X-ray
- B. CT scan
- C. Chest tube

4) A 45-year-old male patient brought to emergency department after involvement in road traffic accident. On arrival he was dyspneic with massive laryngeal injury. Pulse 120 beats/min, BP 90/50 mmHg, Temperature 37°C. Which of the following is the most appropriate initial step in management of this patient?

- A. Cricothyroidotomy
- B. IV fluid resuscitation
- C. Surgical repair of laryngeal injury
- D. Emergency tracheostomy

5) A trauma adult opens their eyes when you say their name, and speaks to you in words that make no sense. When you apply pressure on their nail bed, they move their arm away. Calculate their GCS:

- A. 15
- B. 10
- C. 8
- D. 3

6) In abdominal injuries, the most informative initial investigation is:

- A. CT
- B. US
- C. Abdominal xray
- D. DPL

7) Which of the following should be ruled out on primary survey?

- A. Blunt aortic valve injury leading to aortic regurgitation
- B. Traumatic aortic disruption
- C. Tension pneumothorax
- D. Esophageal injury

8) A 35 year-old male patient, brought to ER after RTA with blunt chest trauma. On examination he was dyspneic, with distended neck veins. Chest examination revealed normal bilateral equal air entry with muffled heart tones. Pulse 120 beats/min, BP 80/40 mmHg, Temp 37°C, Which of the following is the most likely diagnosis ?

- A. Tension pneumothorax
- B. Massive hemothorax
- C. Cardiac tamponade
- D. Open pneumothorax

9) In Glasgow coma scale, verbal score 2 represent which one of the following ?

- A. Incomprehensible response
- B. Inappropriate response
- C. No response
- D. Confused response

10) A 45 front seat passenger involved in a car crash. He was brought to ER in cervical collar. He has a boggy swelling to his forehead and significant bilateral periorbital bruising, The trauma team is busy with a traumatic cardiac arrest of the driver; the nurse has asked you to assess his airway, as she concerned he is snoring and that his breathing is now "snoring" in nature. What is the best approach to this patient?

- A. Endotracheal intubation .
- B. Nasopharyngeal intubation .
- C. Chin-lift Maneuver.
- D. Jaw-thrust Maneuver.

11) A 25 years old patient had motor vehicle accident. His BP 70/40 .. And he has abdominal distention with diffuse tenderness. The paramedics brought him to the ED. What's the intervention that takes the priority during the transportation to the ED?

- A. Control the central bleeding
- B. Prevent further harm
- C. Insert central line for resuscitation
- D. Give oxygen ventilation

Answers: 1-B 2-B 3-C 4-A 5-B 6-D 7- C 8- C 9- A 10- A 11- B