



Trauma care

Objectives:

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

Resources:

- Davidson's.
- 436 doctors slides.
- Surgical recall.
- 435' team work

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COLOR INDEX:

NOTES, IMPORTANT, EXTRA, DAVIDSON'S

EDITING FILE

FEEDBACK



Introduction:

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

Mechanisms and Patterns of Injury:

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.
- Injury accounts for 12% of the world's burden of disease.

In Saudi Arabia:

There is ZERO true trauma centers here in KSA

Although we have one in NGH, but it's not accredited and verified trauma center

If someone have a cardiac disease or malignancy or infection in Saudi Arabia today, they'll get 21st century medicine as standard of care. But if someone got injured in a car crash the standard care won't be as satisfying as the rest

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

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.

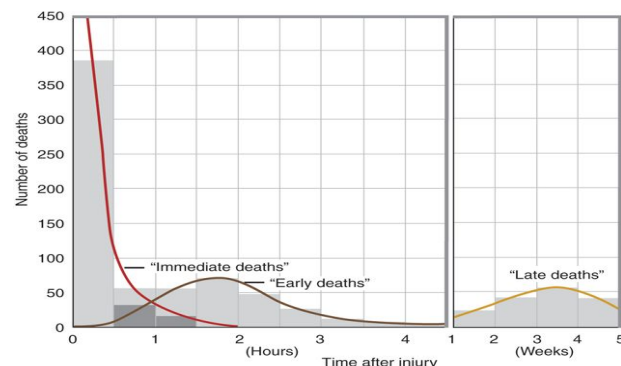
Trimodal Death Distribution: Trauma patients die in 3 different time peaks:

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"
- Wearing seatbelt





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. Although they survived the initial injury they didn't survive to leave the hospital complications like sepsis and multiple organ dysfunction syndrome MODS or spinal cord injury and they stay in the hospital for a long time and die from complications like bed sores or infections

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.
Treat greatest threat to life first
As we are identifying the threats to life we want to start treating right away. . we modify the trauma approach into primary survey and secondary survey (will be discussed)
Definitive diagnosis not immediately important
You just need to know the greatest to treat, 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, 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
If you don't know what you're doing don't interfere

ATLS Concept:

- **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

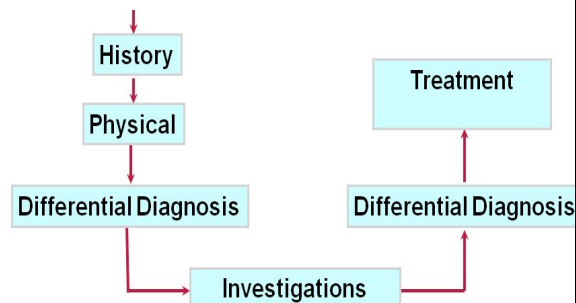
(Used for non-traumatic patients or as a Secondary Survey for Trauma Patients)

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 this way.

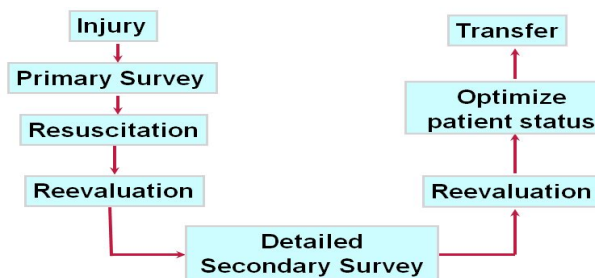
All of these are important but we call it in trauma care the secondary survey, we start with the primary survey to save the life



Initial Assessment / Management

((Only for Trauma Patients))

1. Injury
2. **Primary survey** ABCDE
3. Resuscitation
4. Reevaluation
5. **Detailed secondary survey**
6. Reevaluation *If the patient becomes stable*
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 to

For example where are you now? What is the date today? is it day 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:



- Trauma patients are usually high risk takers meaning that they tend to do risky behaviors so chances of them having hep B•C or HIV is high

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. same to all patients
- 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” (Airway with cervical spine protection, Breathing and Circulation).
- Although the concepts within the 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: as we mentioned that the beauty of ATLS is that it provides you the same priority for every patient !

but we need to tweak the approach little bit in some cases

- Trauma in elderly did he crash bc he had MI while driving? Is his brain bleeding due to stroke or bc of trauma?
- Pediatric trauma a heart rate of 120 in a 2 y.o is normal
- Trauma in pregnancy. You're taking care of 2 patients, priority is always to the mother bc if the mother dies the baby dies with her meaning if for example you need to do CT to a pregnant woman it's okay do it



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

How?

Basic Airway Techniques:

Never do head tilt in trauma bc if he has c-spine injury and you did a head tilt he'll be quadriplegic for life

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 prevents the tongue from going back and blocking the airway. **Better than chin lift**

Advanced Airway Techniques:

Endotracheal intubation the definitive approach includes both nasotracheal and orotracheal intubation

1. Orototracheal intubation:

- a. It is the most common technique used to establish a definitive airway. + it prevents vomiting and secretions from going to lungs
- 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, provides you a way to ventilate the patient but it requires extra training not everybody can do this, if we couldn't go through the mouth we do it surgically 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:
 - Direct laryngoscopy.
 - Capnography: the monitoring of the concentration or partial pressure of carbon dioxide (CO 2) in the respiratory gases.
 - Audibility of bilateral breath sounds.
 - Chest X-Ray

2. 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 .
- c. Rarely used, most common is orotracheal

3. Surgical Routes:

- A. Cricothyroidotomy: done when attempts at intubation of the patient 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.

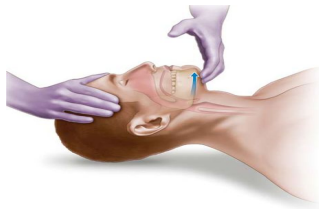


Decide: How to act & how to deal with your ER patient?!!

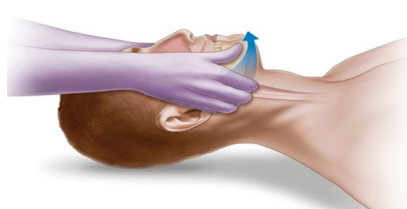
- Don't require early attention to the airway: Conscious patient who do not show tachypnea and have normal voice.
- Elective intubation: When you intubate the patient before his airways get compromised
 - Patients with penetrating neck injuries and an expanding hematoma, evidence of chemical or thermal 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):

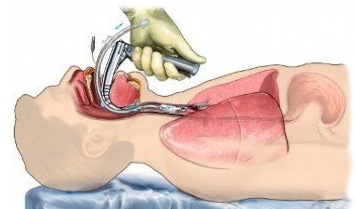
- Occult airway injury
- Progressive loss of airway
- Equipment failure
- Inability to intubate



Chin-lift Maneuver



Jaw-thrust Maneuver



Orotracheal intubation

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



B BREATHING

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. you basically do a physical examination of chest : inspect of chest movement, palpate ,percuss and auscultate
- Air entry.
- **Oxygen saturation.** The most important method in breathing assessment, if O2 sat is good move on, even if there is small pneumothorax its okay you can afford to pick it up in secondary survey. above 90% on room air is ok but 90% on 100%O2 is not good

Immediate life threatening injuries due to inadequate ventilation, it should be recognized during the primary survey: **IMPORTANT**

Laryngotracheal injury / Airway obstruction:


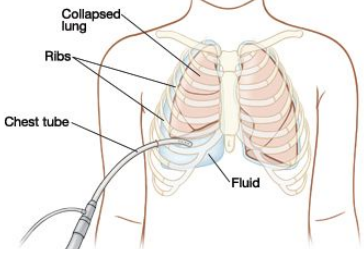
Pathophysiology:	For example: when patient has a tearing of the right or left main bronchus, intubation won't solve the problem as the air will leak to the facial plain forming subcutaneous emphysema, this will reduce the air used for gas exchange and make the patient hypoxic. most of these patient die at the scene before they come to the hospital, but if the patient comes 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:

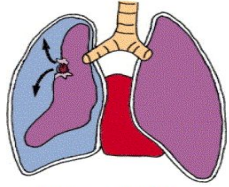
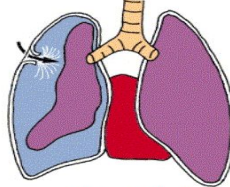
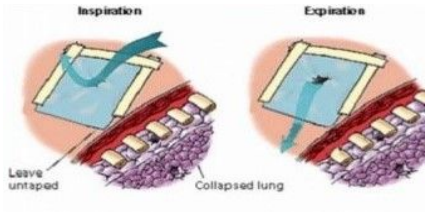
جا ستيشن بسنة من السنوات، اعطوهم اكس راي وطلبوا الندياقنوزز وسألوا عن الاكس راي فايندنتقز والمانجمنت.

Pathophysiology	<p>There's a parenchymal tear in the lung which acts as a one-way valve, with each inhalation allowing additional air to accumulate in the pleural space. The normally negative intrapleural pressure becomes positive:</p> <ul style="list-style-type: none"> ○ Depresses the ipsilateral hemidiaphragm. ○ Shift the mediastinal structures into the contralateral chest. ○ Subsequently the contralateral lung is compressed. ○ The heart rotates about the superior and inferior vena cava, this decreases venous return and ultimately cardiac output which results in cardiovascular collapse. <p>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 tension 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 hemodynamically compromised in tension pneumothorax due to the pneumothorax it self</p>
Diagnosis:	<p>Respiratory distress and hypotension in combination with any of the following physical signs in patients with chest trauma.</p> <ul style="list-style-type: none"> - General and Inspection: signs of tachycardia, hypotension, hypoxia, distended neck veins due to impedance of superior-vena cava, but the neck veins may be flat due to systemic hypovolemia.



	<ul style="list-style-type: none"> - Palpation: Tracheal deviation away from the affected side (contralateral side). (e.g. accumulation of air in the right lung will deviate the trachea to the left side), Subcutaneous emphysema on the affected side. - Percussion: hyperresonance (ipsilateral). - Auscultation: Lack or decreased breath sounds on the affected side. <p>You should NOT diagnose it from chest x ray! It's very clear clinically المريض قاعد يموت مافيه وقت، الحقوا عليه it is a clinical diagnosis and requires immediate treatment the patient will die if you wait for a CXR بكتبها مره ثانية Anyways CXR findings: Mediastinal deviation to the opposite side, tracheal deviation to the opposite side, hyperexpanded lower diaphragm, collapsed lung, hyperlucent lung field. further info</p>
<p>Treatment:</p>	<ul style="list-style-type: none"> ★ First: Immediate needle thoracostomy: <ul style="list-style-type: none"> ○ Decompression with a 14 gauge angiocatheter ○ In the second intercostal space in the midclavicular line [so you convert tension pneumothorax into simple pneumothorax, the blood pressure will go up and now you have more time to insert chest tube] ★ Then: Insert Tube thoracostomy: <ul style="list-style-type: none"> ○ In the fifth intercostal space in the midaxillary line immediately in the emergency department before the chest radiograph. <div style="display: flex; justify-content: space-around; align-items: center;">   </div>

Open pneumothorax (or sucking chest wound).

<p>Pathophysiology:</p>	<p>Is the opposite of Tension pneumothorax when you have an opening in the chest wall and the air is going into pleural space from outside through the open chest , unlike tension pneumothorax where the air is coming from inside due to lung injury</p> <ul style="list-style-type: none"> ● This occurs with full-thickness loss of the chest wall, permitting free communication between the pleural space and the atmosphere. ● This comprises ventilation due to equilibration of atmospheric and pleural pressures which prevents lung inflation and alveolar ventilation and result in hypoxia and hypercarbia <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> <div style="display: flex; justify-content: center; align-items: center;">  vs  </div>
<p>Treatment:</p>	<ul style="list-style-type: none"> ★ First: Close the chest wall defect create one-way valve(flutter valve dressing) 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"> ○ 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. <div style="display: flex; justify-content: center; align-items: center;">  </div>



- this done when you're not in the hospital , in hospital we do dressing and chest tube-

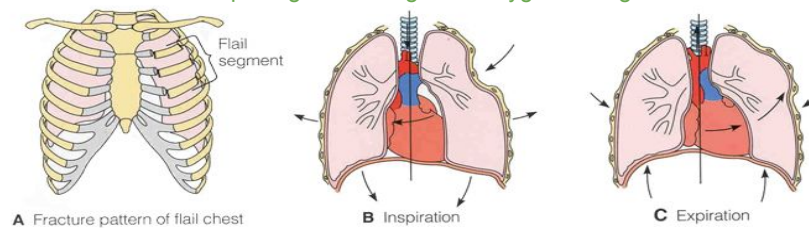
★ **Then:** tube thoracostomy in the 5th intercostal space midaxillary line.

Flail chest with underlying pulmonary contusion

Pathophysiology:

- It occurs when **three or more** contiguous ribs are fractured in at least two locations
- **Paradoxical movement** of this free-floating segment of chest wall may be evident in patient with spontaneous ventilation due to the negative intrapleural pressure of inspiration.
- Rarely, the additional work of breathing and chest wall pain caused by the flail segment is sufficient to **compromise ventilation**.

Note: We used to think that the paradoxical movement causes the hypoxia but now we know that the force that broke the segment made it go back and hit the lung that causes contusion → pulmonary edema and fluid accumulation → impaired gas exchange across the alveolar membrane → O₂ sat goes down .SO HYPOXIA IS CAUSED MAINLY BY UNDERLYING LUNG CONTUSION . + we give trauma patients a lot of fluids → third spacing in the lung → oxygenation gets worse



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 :)

Treatment:

- ⇒ So Oxygen & analgesia.
- ⇒ Resultant hypoventilation and hypoxemia may require intubation and mechanical ventilation.

Massive hemothorax

- (> 1.5 L) Massive bleeding in the chest
- Kind of similar to tension pneumothorax but instead of having air pushing on the lung you have 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
- In medical cardiac tamponade the management is Pericardiocentesis to relieve the pressure , in trauma we are more concerned with the heart injury that led to tamponade so treatment IS NOT Pericardiocentesis. You need to take the pt to OR to fix the heart
- If 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)

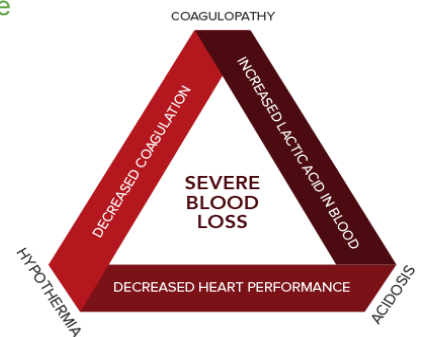


CIRCULATION:

Blood pressure is a very bad way to assess circulation, bc 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 (Tachycardic?)
 - all of these are sensitive but not very specific , you don't know if low levels of consciousness is due to bleeding or head trauma , is he cold bc its cold or bc he is bleeding , is he tachycardic bc he is bleeding or bc he crossed a red light and killed 4 people.
 - 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.
- Lethal triad (triad of death) : When you leave the pt bleeding for a long time the pt will end up with having this triad which is :
 - Hypothermia
 - Coagulopathy
 - Acidosis

once the patient goes into this triad it's very difficult to stop the bleeding even though you restore the blood volume 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:

- **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

Extra about circulatory management :

1. Blood pressure and pulse should be measured manually at least every 5 minutes in patient with significant blood loss until normal vital signs values are restored
2. Blood should be drawn simultaneously 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
3. If peripheral angiocatheter access is difficult, saphenous vein cutdown at the ankle provide excellent access

You can never give enough blood through the vein to compensate for active bleeding , try to restore volume but most importantly you need to control the hemorrhage, to control hemorrhage you need to know where

Trauma patients bleed in very specific areas :

Chest: it's a very big cavity you can lose up to 2-3L of blood

Abdomen : it's a very big cavity you can lose up to 2-3L of blood

Long bones: each femur fracture can loose 2L so if someone broke the 2 femurs → 4L

Pelvis

Retroperitoneum

Street : Open wound at the site of crash, pt can come to you vasoconstricted but he stopped bleeding so

always ask the paramedic if there was a lot of blood at the site if yes start transfusing right away

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
Immediate Treatment: - Tube thoracostomy to facilitate lung reexpansion , - Massive hemothorax (>1500 ml. blood) is an indication for operative intervention!!!!!!	Immediate Treatment: - Pericardial drain under ultrasound guidance. - Followed by ⇒ operative intervention	Immediate Treatment: - Fluid resuscitation. - Immediate surgical intervention	Immediate Treatment: - Pelvis fracture needs ⇒ Immediate external fixation

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.

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 not? is there a head injury? 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:

- **Glasgow Coma Scale score (GCS):**

I will ask you to calculate the GCS score in one of your exams: written, MCQs, OSCE, 3rd or 5th year

The GCS scoring part in surgical recall down is helpful to memorise it

- **Pupillary response:** look at the pupils. Are they reactive to light, are they equal?
- Observe for neurological deterioration.

Table 7.1 Glasgow Coma Scale	
Eyes open	
• Spontaneously	4
• To verbal command	3
• To pain	2
• No response	1
Best motor response	
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
Best verbal response	
• 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** from head to toe to be able to examine everything bc if you miss an injury the risk of death is very high
- Prevent hypothermia cover them back to prevent hyperthermia remember the lethal triad
- Check for missed injuries

Resuscitation:

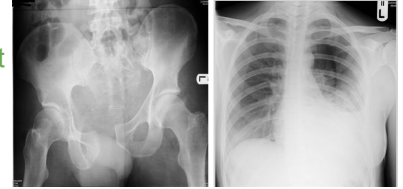
- Protect and secure airway
- Ventilate and oxygenate
- Stop the bleeding!
- Vigorous shock therapy
- Protect from hypothermia

Although the primary survey and resuscitation are mentioned separate, they are actually done at the same time, you resuscitate as you go when you are checking the patient airway if its not intact you resuscitate by intubation while you are checking breathing if there is pneumothorax you resuscitate by

chest tube and so on... so it's not 2 separate steps! It's done together

Adjuncts to primary survey:

- **Primary survey should take 10 – 20 minutes:**
 - ECG / Vital signs / ABGs "Arterial Blood Gases" / Pulse Oximeter and CO₂ / Urinary - gastric catheter unless contraindicated / Urinary output
- **X-rays:** (To any trauma patient)
 - 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 unless if you don't have access to CT ,so if the pt is stable do CT
 - Chest x-ray
 - Pelvic x-ray
- **Diagnostic Tools:**
 - FAST¹
 - DPL² → (Picture)



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

1. Bleeding in the **chest** (detected by x-ray) fluid in the chest is hemothorax NOT pleural effusion
2. Bleeding in the **pelvis** (detected by x-ray)
3. Bleeding in the **long bone** (detected by x-ray)
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 larger 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 it's not ascites! It's HEMOPERITONEUM)
5. Bleeding in the **street**

- **Consider early transfer:**
 - Use time before transfer for resuscitation
 - Do not delay transfer for diagnostic tests

in a perfect world all of the ABCDE should be done wherever the pt was taken then after they've stabilized the pt he should be transferred but unfortunately that's not the case here
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.

¹ Focused Assessment with Sonography for Trauma.

² Diagnostic Peritoneal Lavage



Recall (EXTRA):

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

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:**
- **Complete neurologic exam**
- **Special diagnostic tests:**
- **Reevaluation**

Summary

Trimodal death distribution:

Immediate death (1st Peak):	Early deaths (2nd Peak):	Late deaths(3rd Peak):
deaths occurring immediately after or within a few seconds of injury, contributes up to 50% of the total.	up to 4 hours after injury, accounts for 30% of deaths	accounts for 20% of deaths (usually in an intensive care unit) days to weeks after the event.

Advanced Trauma Life Support (ATLS):

ABCDE approach to evaluation and treatment

- **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

Treat greatest threat to life **first**

Definitive diagnosis **not** immediately important

Time is of the essence

Do no further harm

● Lethal triad:

- **Hypothermia , Coagulopathy, Acidosis.**

Glasgow coma scale(GCS):

Table 7.1 Glasgow Coma Scale

Eyes open	
● Spontaneously	4
● To verbal command	3
● To pain	2
● No response	1
Best motor response	
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
Best verbal response	
● 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)	

Immediate life threatening injuries

- **Laryngotracheal injury / Airway obstruction - Massive hemothorax - Cardiac tamponade**

- **Tension pneumothorax:**

(Depresses ipsilateral hemidiaphragm, Shift the mediastinal structures to contralateral chest, Subsequently the contralateral lung is compressed, The heart rotates about the superior and inferior vena cava, this decreases venous return and ultimately cardiac output which results in cardiovascular collapse.)

Diagnosis: Respiratory distress, hypotension , distended neck veins, Tracheal deviation, Subcutaneous emphysema , Lack or decreased breath sounds. \ **Treatment:** First: Immediate needle thoracostomy (In second intercostal space midclavicular line), Then: Insert Tube thoracostomy (In fifth intercostal space midaxillary line)

- **Open pneumothorax (or sucking chest wound).**

This occurs with full-thickness loss of the chest wall, permitting free communication between the pleural space and the atmosphere. \ **Treatment:** First: Close the chest wall defect Then: tube thoracostomy.



- **Flail chest with underlying pulmonary contusion**

occurs when three or more contiguous ribs are fractured in at least **two locations**, Paradoxical movement of this free-floating segment of chest wall. \ **Treatment:** intubation and mechanical ventilation

Questions

- 1. 22 y/o patient presented to ER due to RTA (road traffic accident), the Emergency doctor wanted to start the primary survey (ABCDE). How would be the initial step in the assessment and protection of patient's AIRWAY?**
 - A. Do intubation
 - B. Do cricothyroidotomy
 - C. Do chin lift or jaw thrust
 - D. Check if the patient able to speak in normal tone of voice
- 2. In the previous scenario, during resuscitation and the patient was opening his eyes to painful stimulation and his was answering the doctor's questions with an inappropriate words. Also the patient's posture was stiff with bent arms toward the body and the wrists and fingers are bent and held on the chest and legs held out straight. What is the GCS (Glasgow coma scale) score of this patient?**
 - A. 9
 - B. 10
 - C. 3
 - D. 8
- 3. Which of the following type of pneumothorax is not one of the 6 immediate life threatening injuries?**
 - A. Tension pneumothorax
 - B. Open pneumothorax
 - C. Traumatic closed pneumothorax
 - D. Flail chest and pulmonary contusion
- 4. Which of the following is a way to indicate the blood pressure status of a traumatic patient?**
 - A. Urine output
 - B. Level of Lactic acid in the blood
 - C. By checking the blood pressure
 - D. Level of consciousness
- 5. 40 Y/O male patient presented to ER complaining of chest tightness, he did an ECG, he had acute MI, he had PCI and managed successfully and discharged, after 1 day the patient came with rapid breathing, palpitation and dec. level of consciousness. What is the most likely diagnosis of this patient?**
 - A. Tension pneumothorax
 - B. Cardiac tamponade
 - C. Pericarditis



D. Cardiogenic shock

6. In the previous scenario what would be the best next step after doing resuscitations to the patient?

- A. Pericardiocentesis, then treat the patient medically
- B. Pericardiocentesis, then treat the patient surgically
- C. Pericardiocentesis, then admit the patient for IV antibiotics
- D. Pericardiocentesis, then send the patient home

7. Which of the following is not part of Trauma Lethal Triad?

- A. Decrease blood PH
- B. Low body temperature
- C. Coagulopathy
- D. Hyperthermia

Answers:

1:D

2:D

3:C

4:D

5:B

6:B

7:D