ATLS – Recent Guidelines

Dr Daivik T Shetty
MBBS, MS Orthopedics
Consultant Orthopedic
Manipal Hospitals, Mangalore

ATLS , ACLS , BLS

JAMES K STYNER

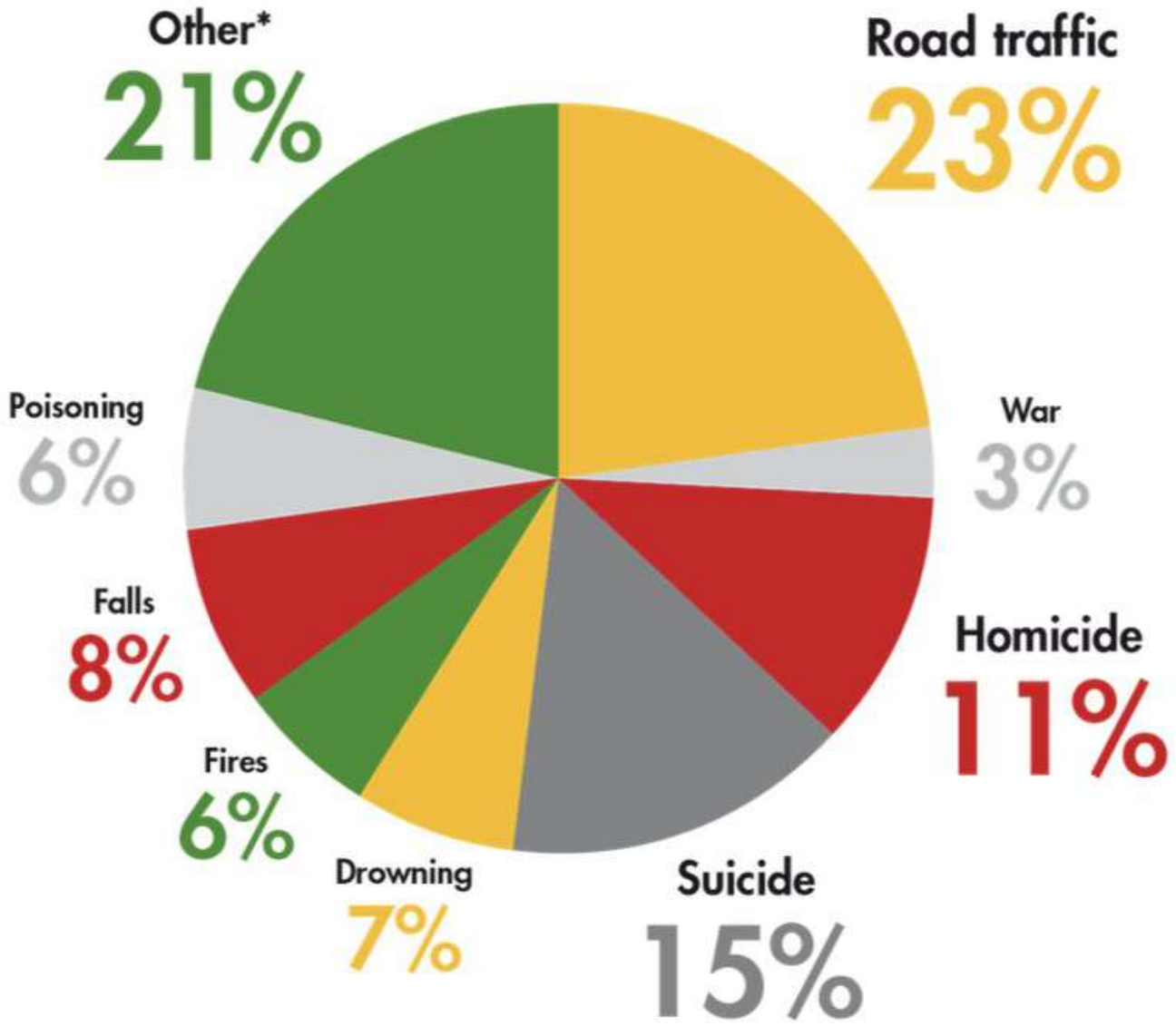
"WHEN I CAN PROVIDE BETTER CARE IN THE FIELD WITH LIMITED RESOURCES THAN MY CHILDREN AND I RECEIVED AT THE PRIMARY FACILITY...

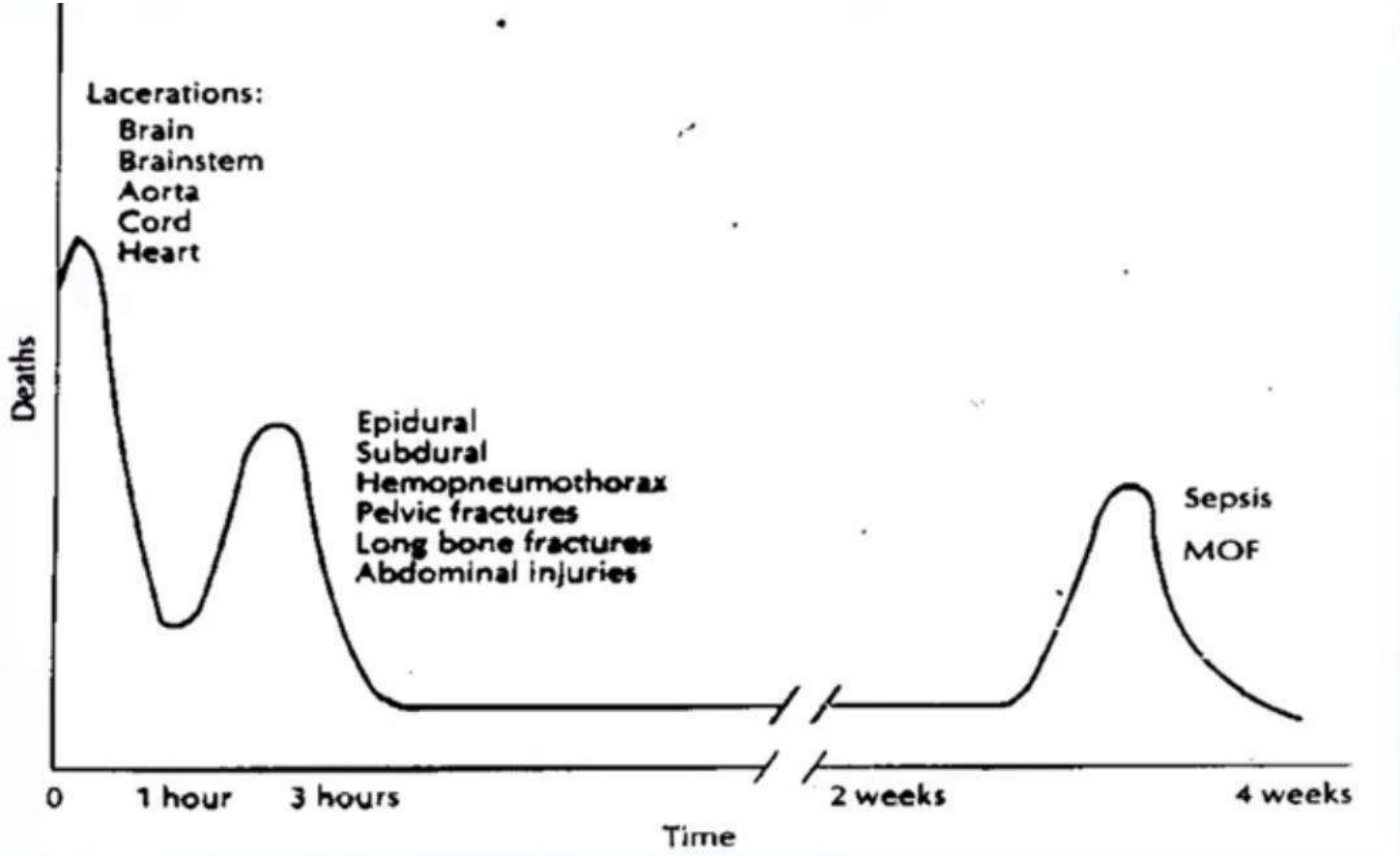
THERE IS SOMETHING WRONG WITH THE SYSTEM AND THE SYSTEM HAS TO BE CHANGED"

ATLS

ADVANCED TRAUMA LIFE SUPPORT

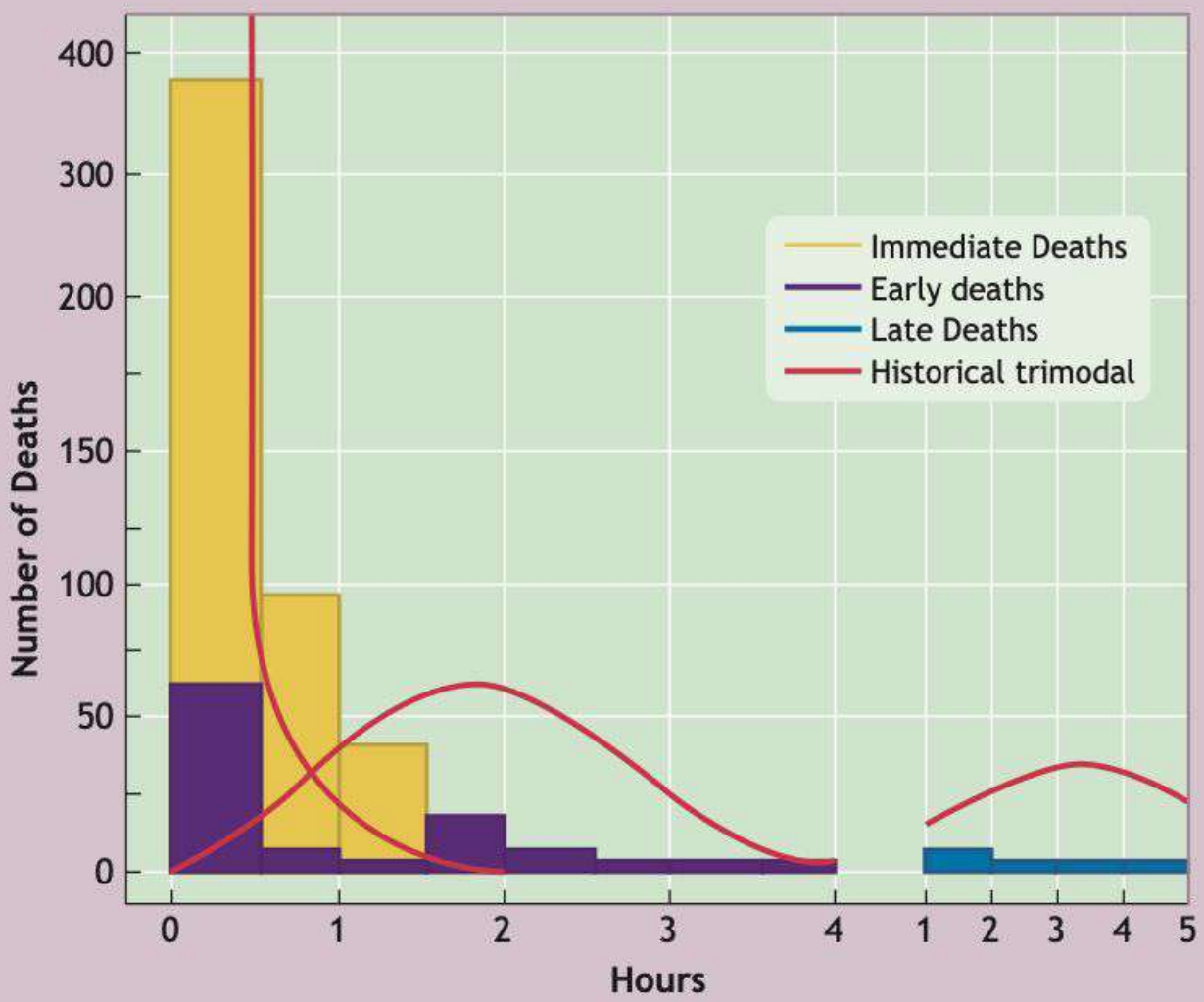
REPRESENTS AN ORGANIZED APPROACH FOR EVALUATION AND MANAGEMENT OF TRAUMA PATIENTS





Dying from trauma – ”Golden Hour” of resuscitation

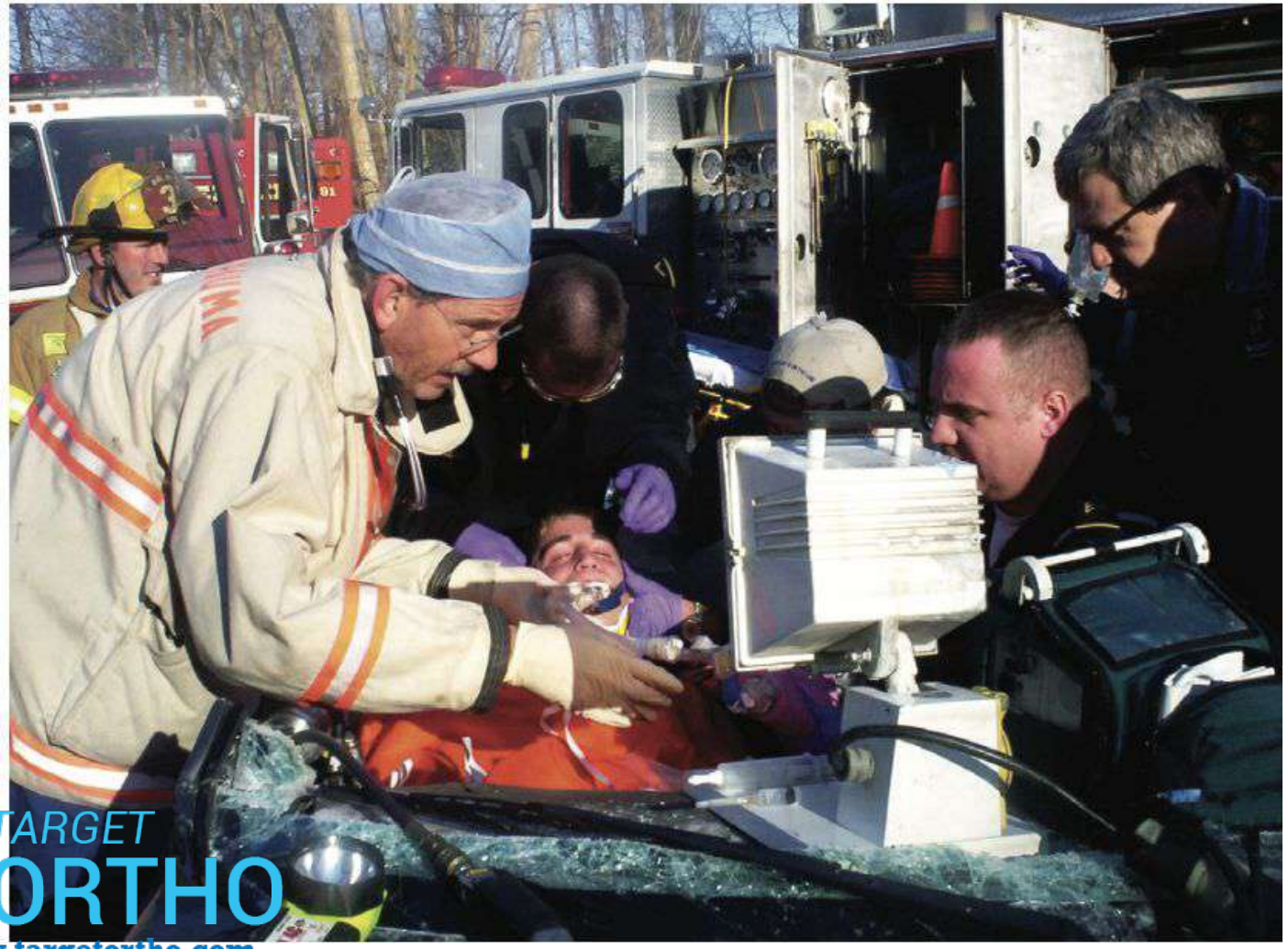
Timing Distribution of Trauma Deaths Compared With the Historical Trimodal Distribution



ATLS approach

- Triage
- Primary survey (A[C]BCDE)
- Resuscitation
- Adjuncts to Primary survey
- Secondary survey
- Continue post resuscitation monitoring and re-assessment
- Tertiary survey
- Definitive care

Pre-Hospital Phase



Hospital phase

Trauma team

- Trauma team leader
- ED nurses – 2
- Emergency room physician
- Anesthetist
- Orthopedics
- General surgery
- Radiographer

Critical aspects of hospital preparation

- A resuscitation area is available for trauma patients.
- Properly functioning airway equipment (e.g., laryngoscopes and endotracheal tubes) is organized, tested, and strategically placed to be easily accessible.
- Warmed intravenous crystalloid solutions are immediately available for infusion, as are appropriate monitoring devices.
- A protocol to summon additional medical assistance is in place, as well to ensure prompt responses by laboratory and radiology personnel.
- Transfer agreements with verified trauma centers are established and operational

Triage

- Prioritization or ranking of patients according to their clinical needs

- Four color code
  - Red need immediate treatment
  - Yellow need urgent treatment
  - Green: stable patient, can be delayed
  - Black: dead or near dead

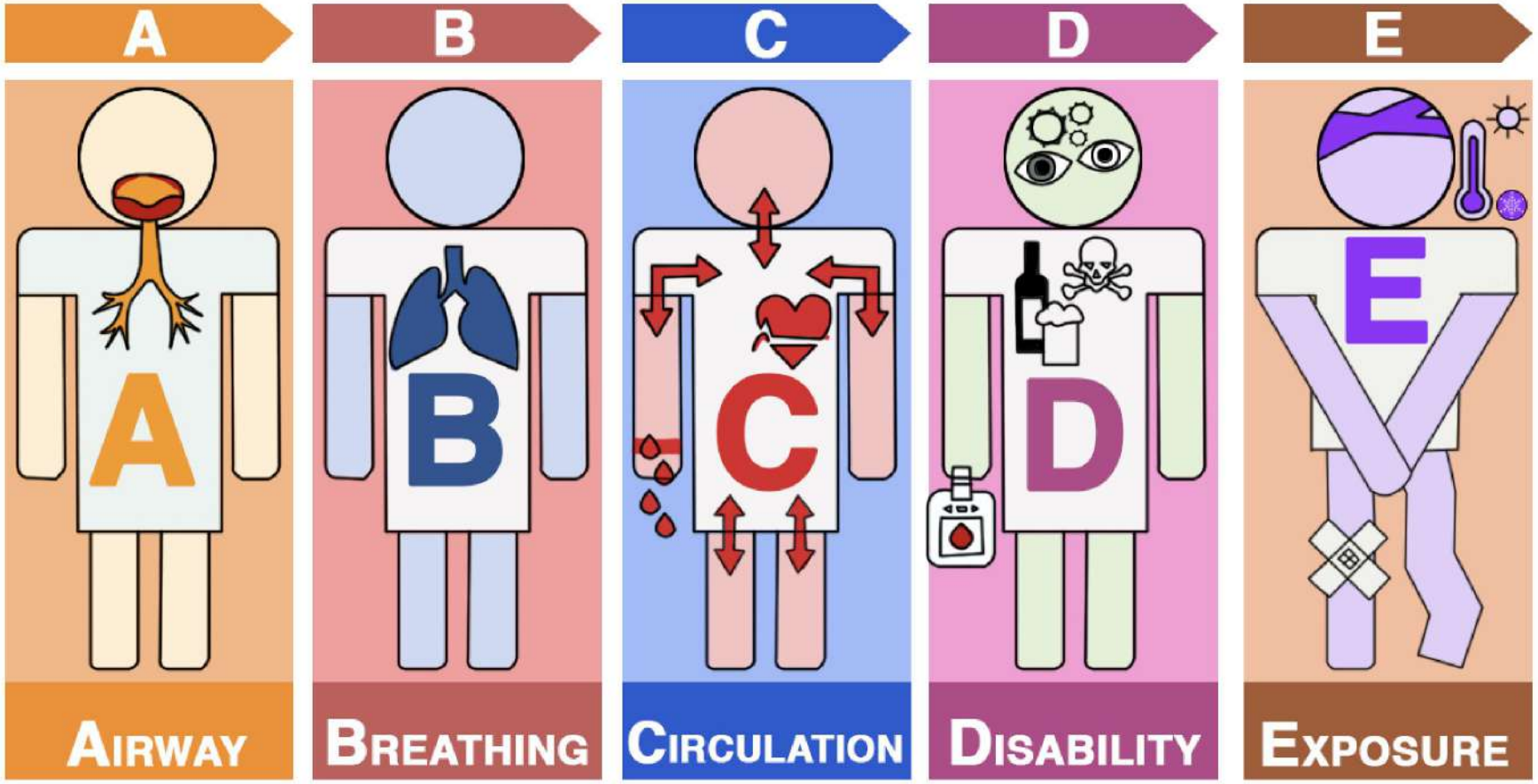
Triage (ATLS 10)

MULTIPLE CASUALTIES

- Multiple-casualty incidents are those in which the number of patients and the severity of their injuries *do not* exceed the capability of the facility to render care. In such cases, patients with life-threatening problems and those sustaining multiple-system injuries are treated first.

MASS CASUALTIES

- In mass-casualty events, the number of patients and the severity of their injuries *does* exceed the capability of the facility and staff. In such cases, patients having the greatest chance of survival and requiring the least expenditure of time, equipment, supplies, and personnel are treated first



+

Cervical

A = Airway

- Approach patient from head side
- Stabilize cervical spine using in line immobilization

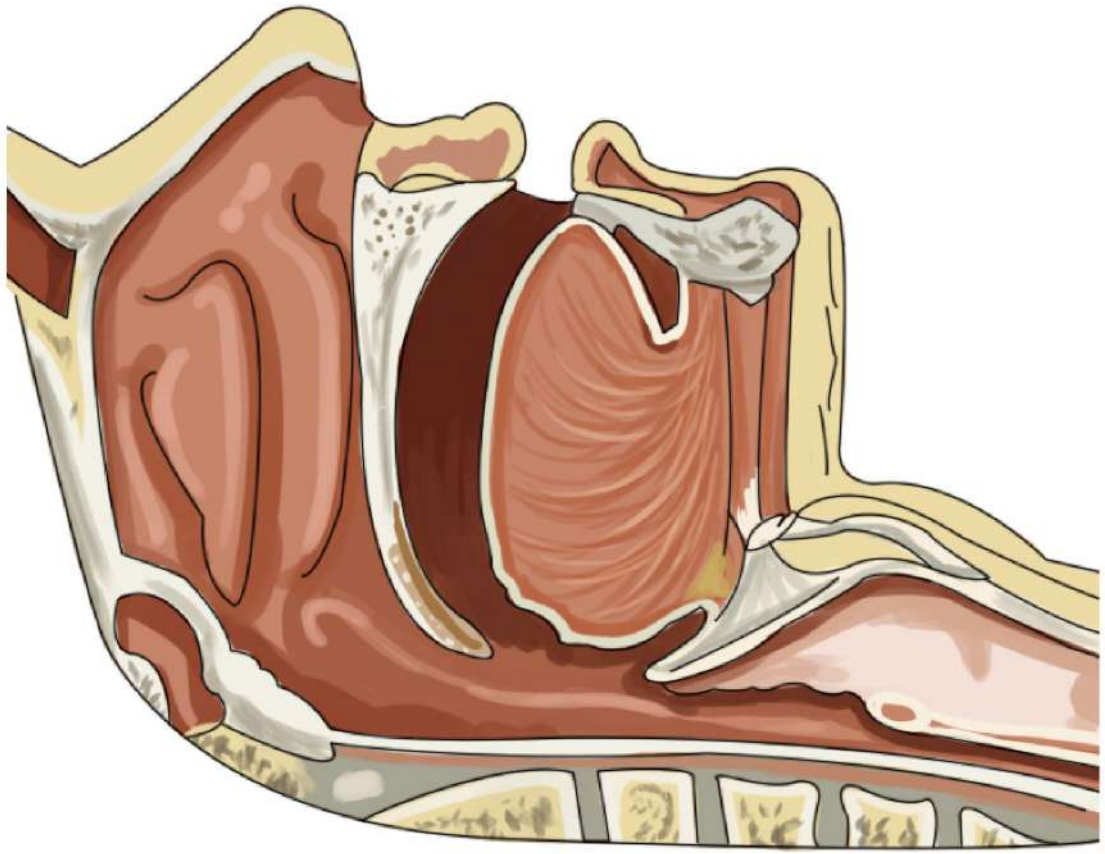
Suction out airway

↓

Jaw thrust/ chin lift

↓

Insertion of oropharyngeal or nasopharyngeal airway



Definitive airway of choice

- Oral endotracheal intubation with cuffed ET tube

- Nasotracheal intubation – advantage in cervical spine trauma

Two assailants beat a 49-year-old man with a wooden bat in his home during robbery. He is taken to the emergency department hemodynamically stable with hemoptysis and cervical subQ emphysema
Which of the following statements is true?

a) Fiber optic assisted intubation should be used

b) Insert gastric tube immediately to prevent aspiration

c) Immediately begin needle decompression

d) Bronchoscopy should be avoided because it may aggravate the injury

In suspected tracheobronchial injury

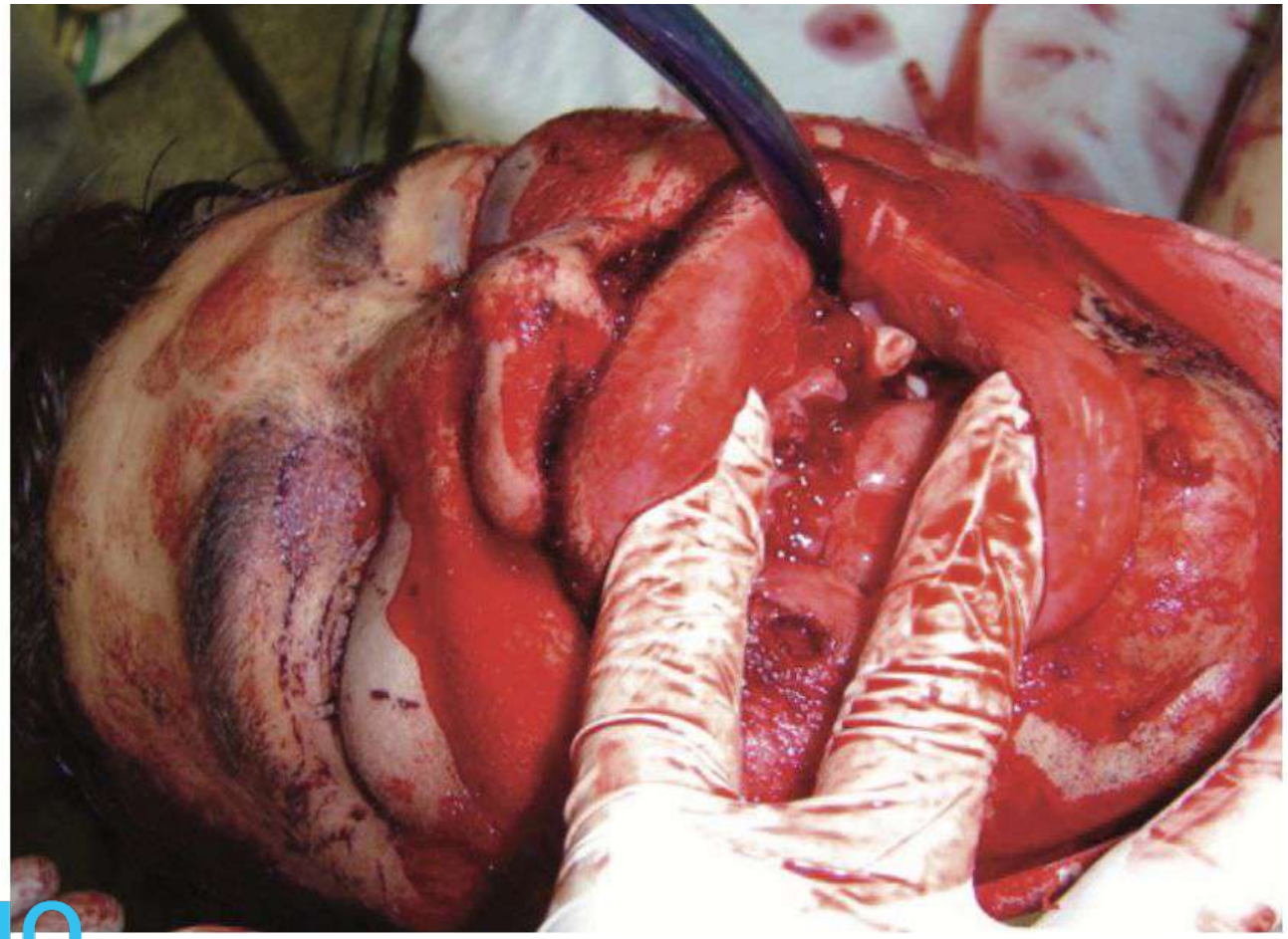
ATLS 10

Extremely difficult airway suspected

Fiber optic intubation with tube placed below the level of injury

Bronchoscopy can confirm the diagnosis and prevent worsening the injury by intubating the patient blindly

Maxillofacial, laryngeal and Neck trauma



Severe Maxillofacial injuries

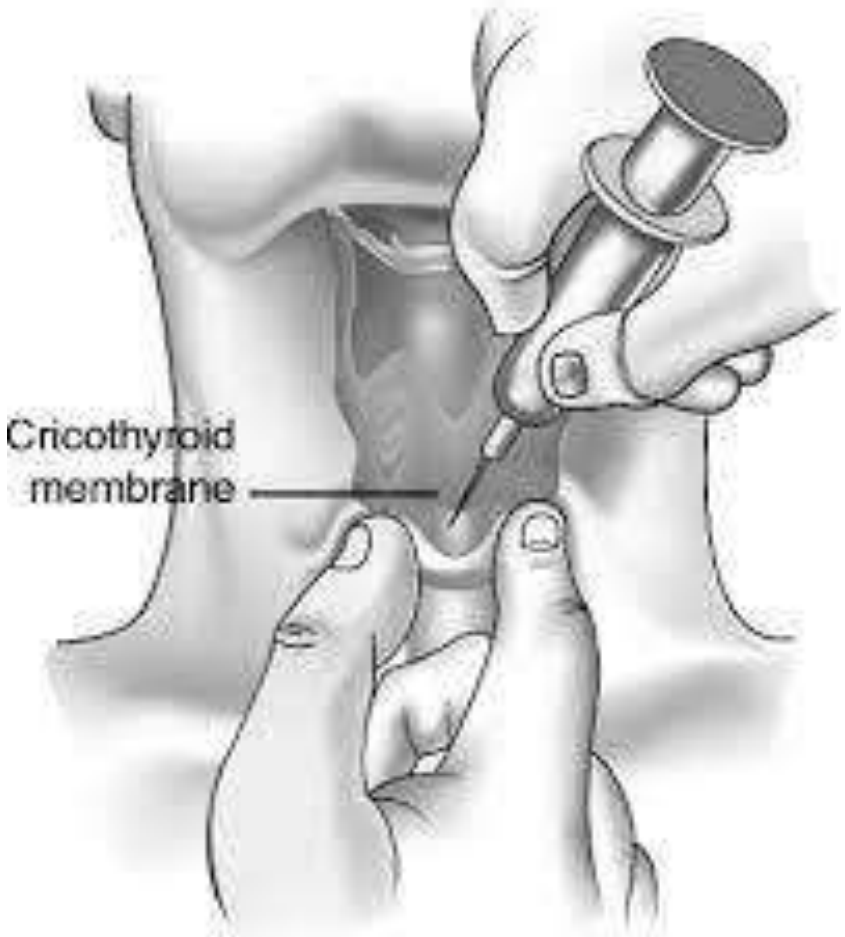
- Emergency airway of choice : NEEDLE CRICOTHYROIDOTOMY

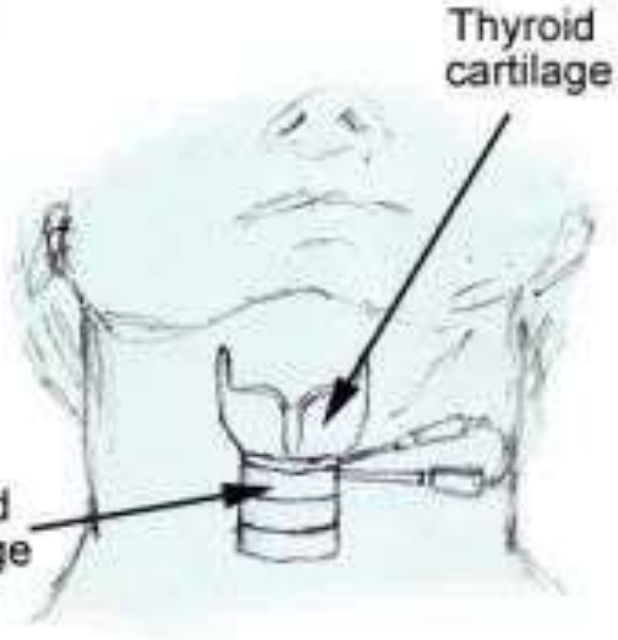
High flow oxygen

4-6mm tube inserted

Contraindicated in children <12 years – Subglottic stenosis

- Definitive airway : TRACHEOSTOMY





Laryngeal trauma

Laryngeal trauma is indicated by a triad of clinical signs:

1. **Hoarseness**
2. **Subcutaneous emphysema**
3. **Palpable fracture**

To assess patency : Elicit verbal response

- Not able to speak

Airway obstruction

Mental status depression

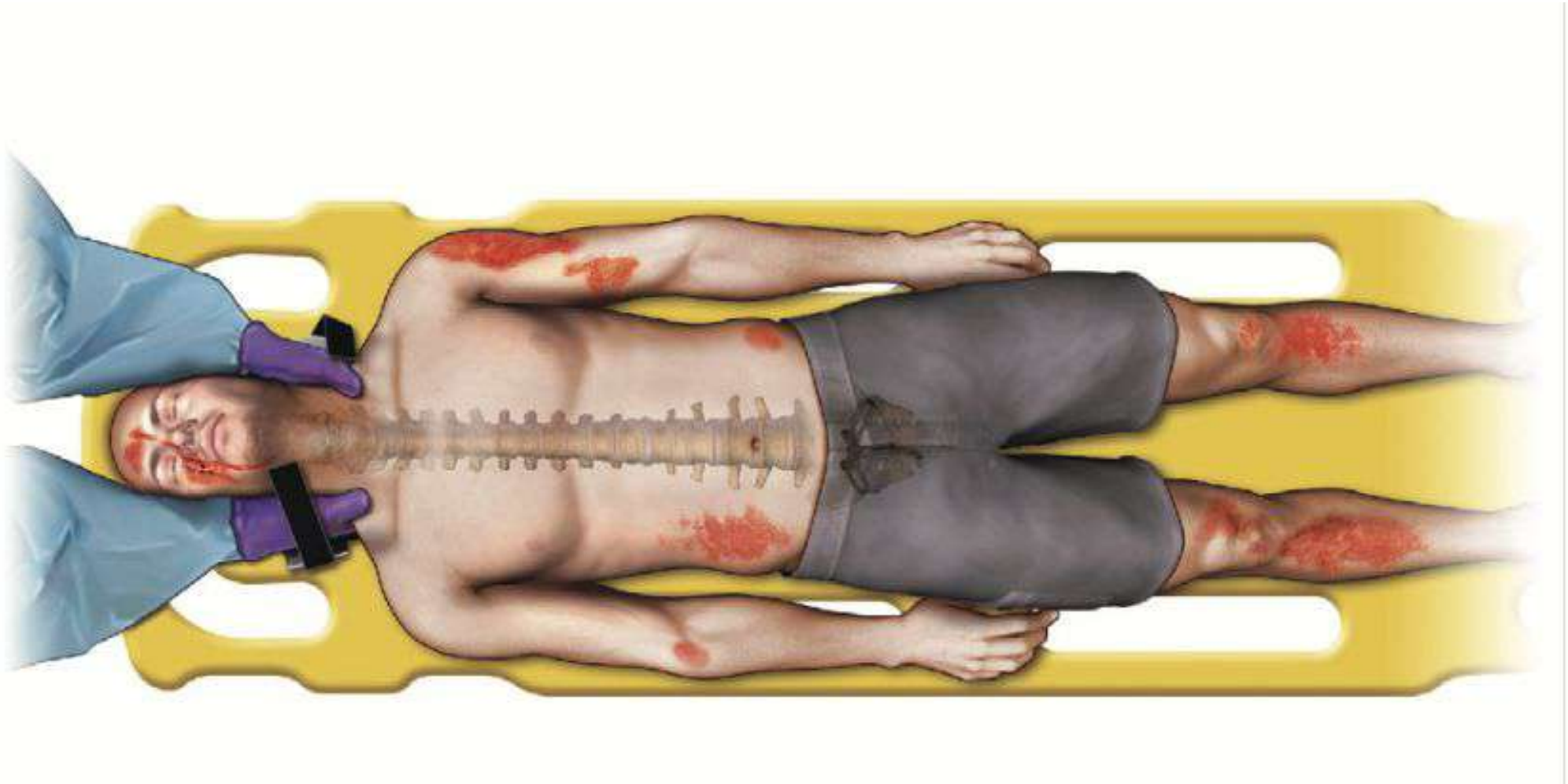
Noisy breathing
Facial trauma
GCS </= 8

Cervical Spine Control

- Protection of spine and spinal cord is key component of ATLS management
- Neurological exam alone does not exclude cervical spine injury

- Assume a cervical spine injury in ANY patient with multisystem trauma especially with an altered level of consciousness or blunt injury above the clavicle

TRIPLE IMMOBILISATION-COLLAR-BLOCKS-TAPE with C-Spine in line and head in Neutral position



- A 45-year-old patient presents to the emergency department following a motor vehicle accident. The patient complains of neck pain and tenderness. On examination, there is no midline cervical tenderness, but no focal neurologic deficits or altered level of consciousness. The patient denies any intoxication and has no distracting injuries. Based on the ALTS (AANS/CNS Section on Disorders of the Spine and Peripheral Nerves) Nexus criteria, which of the following is the most appropriate next step in the management of this patient?

A) Order cervical spine X-rays

B) Order a CT scan of the cervical spine

C) Proceed with immediate surgical consultation

D) No need for Radiographs, Prescribe analgesics and advise follow-up in a few days

National Emergency X-Radiography Utilization Study (NEXUS) Criteria

Meets ALL low-risk criteria?

1. No posterior midline cervical-spine tenderness
   and...
2. No evidence of intoxication
   and...
3. A normal level of alertness
   and...
4. No focal neurologic deficit
   and...
5. No painful distracting injuries

YES → **No Radiography**

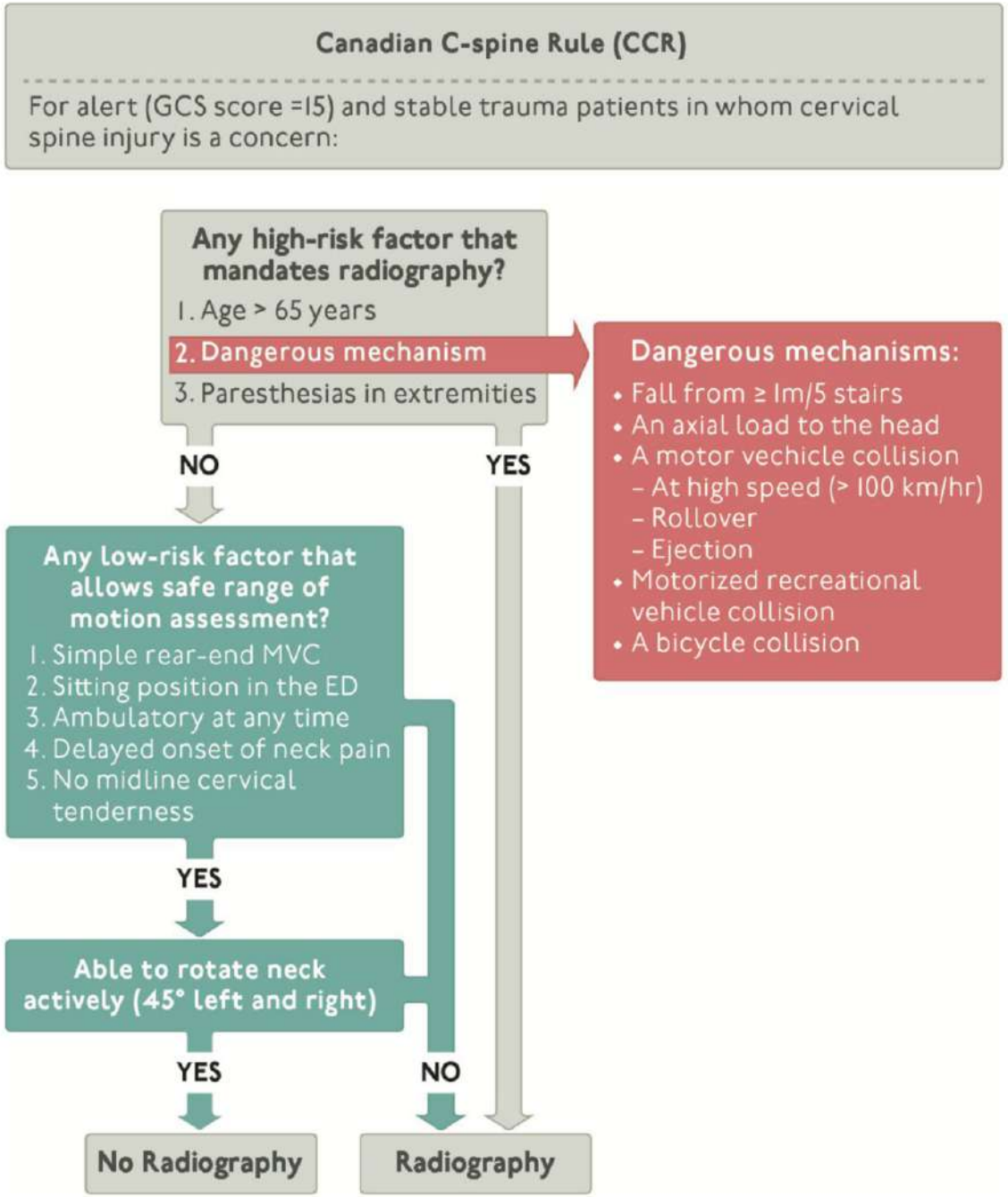
NO → **Radiography**

NEXUS Mnemonic

N– **N**euro deficit
E– **E**tOH (alcohol)/intoxication
X– e**X**treme distracting injury(ies)
U– **U**nable to provide history (altered level of consciousness)
S– **S**pinal tenderness (midline)

- Which of the following patients would not require radiographic evaluation per the Canadian C-spine Rule?

1. 12 \/o boy who fell from 3 ½ feet
2. 68 y/o man who was ambulatory at the scene
3. 42 y/o woman rear ended by a city bus
4. 35 y/o woman with delayed onset of neck pain who can actively rotate her neck 45 degrees left and right
5. 23 y/o man with midline cervical spine tenderness



- Which of the following patients would not require radiographic evaluation per the Canadian C-spine Rule?

1. 12 Vo boy who fell from 3 ½ feet – high risk factor
2. 68 y/o man who was ambulatory at the scene – high age risk factor
3. 42 y/o woman rear ended by a city bus – high risk factor
4. 35 y/o woman with delayed onset of neck pain who can actively rotate her neck 45 degrees left and right
5. 23 y/o man with midline cervical spine tenderness – low risk factor

Preemptive Intubation

- Burns patients
- Potential inhalational injury

B = BREATHING

- Is the chest moving normally ?
- Rate and depth of respiration ?
- Airway patency does not ensure adequate ventilation

Ventilation problems :

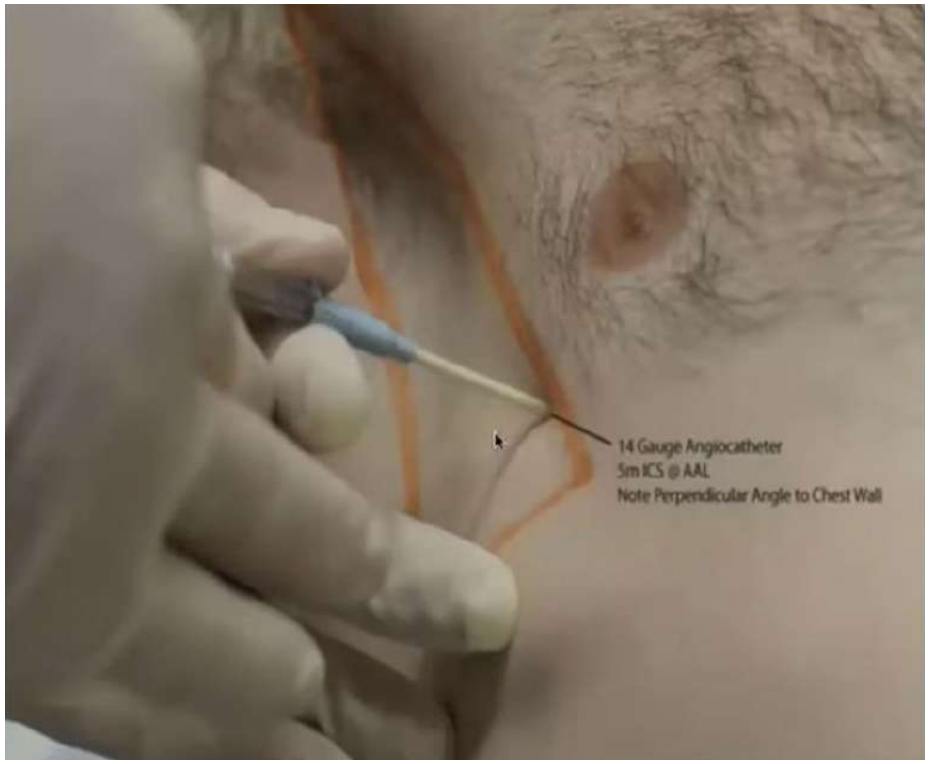
- **Tension Pneumothorax (ATLS 2018)**

Wide bore needle

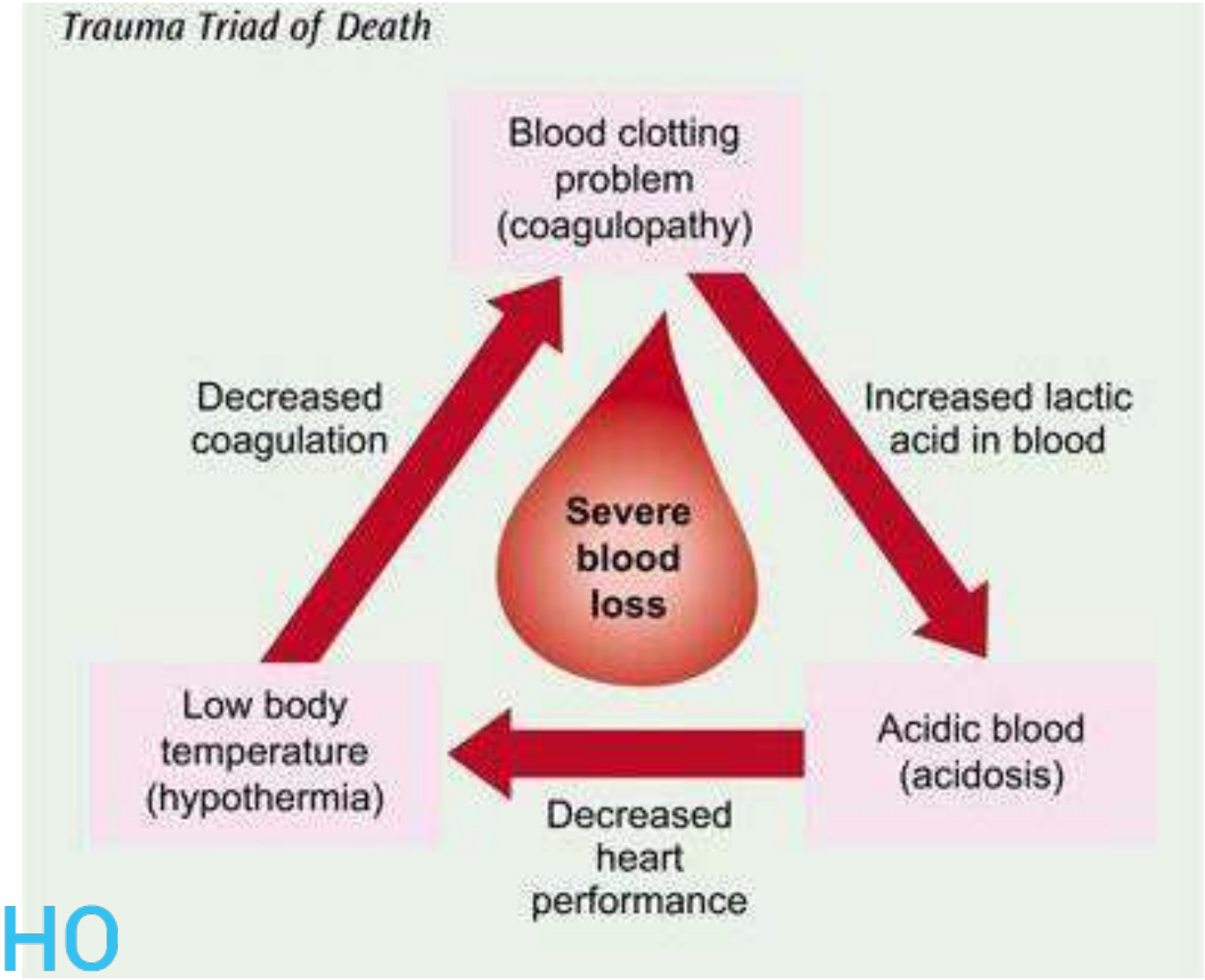
Children – 2nd intercostal in mid clavicular line

Adults – 4th or 5th intercostal middle axillary line

4th or 5th intercostal space anterior to the mid axillary line ABOVE the rib



Circulation (with hemorrhage control)



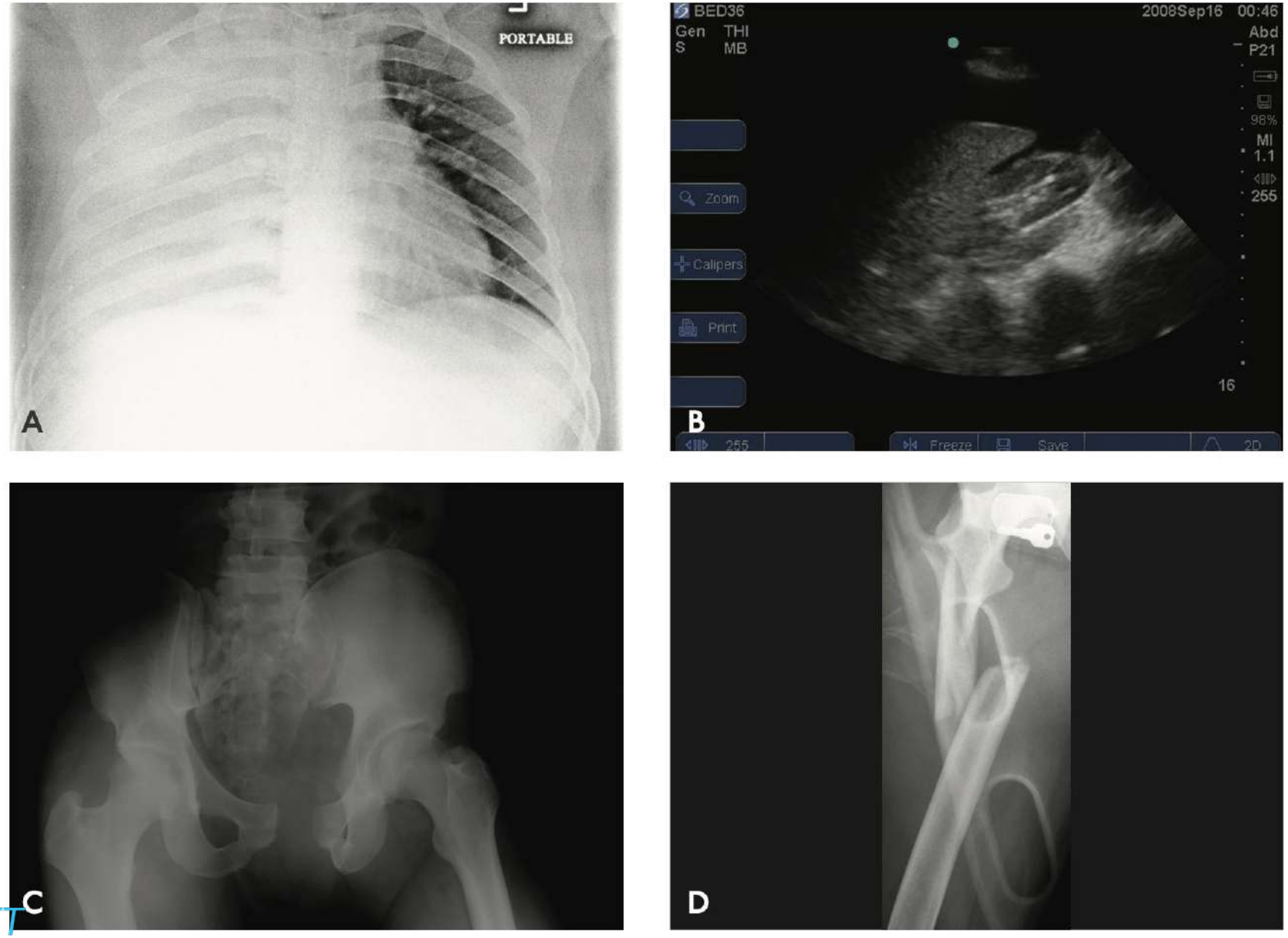
C = Circulation with Hemorrhage control

- Most common cause of Shock in trauma = Bleeding = Hypovolemic shock

- Vitals –

SBP <100 mm Hg

PR > 100/min



■ IGURE 3-3 Assessment of circulation includes rapidly determining the site of blood loss. In addition to the floor, blood may be in four other places ("on the floor plus four more"): **A.** the chest; **B.** the abdomen; **C.** the pelvis and retroperitoneum; and **D.** major long bones and soft tissues.

A 20-year-old man fell 20 feet through a rotten plank on an old wooden bridge to the rocky stream below. He was taken to the emergency within 30 minutes, complaining of chest pain. On arrival to ED, he is hypotensive

What are you going to do?

a) Send to OR

b) 2L bolus crystalloid

c) 1L bolus crystalloid

d) Crack the chest

Management

- Two large IV cannula
- Blood – cross match

1L Warm Isotonic Crystalloids
ATLS 10 has reduced 2L to 1L

In children (<40kgs) – 20ml/kg

Mildly hypotensive patient, tachycardic, BP returns to normal after 1L fluid bolus but then drops again.
What are you going to do?

a) Begin transfusing blood

b) Transfer to higher level of care

c) Distribute 2L bolus of crystalloid

d) Obtain a CT scan to determine source of bleeding

TABLE 3-2 RESPONSES TO INITIAL FLUID RESUSCITATION[a]

	RAPID RESPONSE	TRANSIENT RESPONSE	MINIMAL OR NO RESPONSE
Vital signs	Return to normal	Transient improvement, recurrence of decreased blood pressure and increased heart rate	Remain abnormal
Estimated blood loss	Minimal (<15 %)	Moderate and ongoing (15%–40%)	Severe (>40%)
Need for blood	Low	Moderate to high	Immediate
Blood preparation	Type and crossmatch	Type-specific	Emergency blood release
Need for operative intervention	Possibly	Likely	Highly likely
Early presence of surgeon	Yes	Yes	Yes

Non - responding patients

- Manage ongoing bleeding – FAST scan

- Blood transfusion

“Trauma transfusion protocol”

Packed cell : Plasma : Platelets

1:1:1

- Best indicator of tissue perfusion in trauma : Urine Output

- Best indicator to determine Fluid replacement : CVP

Urine Output

- Adequate volume replacement during resuscitation should produce a urinary output of approximately

0.5 mL/kg/hr in adults

1 mL/kg/hr is adequate urinary output for paediatric patients

For children under 1 year of age, 2 mL/kg/hr should be maintained.

The inability to obtain urinary output at these levels or a decreasing urinary output with an increasing specific gravity suggests inadequate resuscitation

Pediatric Mass Transfusion protocol - 2018

- Bolus : 20ml/kg warm, isotonic crystalloids
- Followed by

10-20 ml/kg packed cells

10-20 ml/kg plasma

10-20ml/kg platelets

A 26-year-old woman was hit by a van while walking across a busy intersection. She has an obvious broken right femur and 3 broken ribs on the right side. She requires a blood transfusion.
Which of the following is true:

a) Everyone requiring massive transfusion should receive calcium supplementation
b) < 12u pRBC in 24hrs would not be considered a massive transfusion
c) > 4u pRBC in 1hr is considered a massive transfusion
d) The ACS has developed a universal MTP that should be adopted br all trauma centers

ATLS 10 - Transfusion

- A Massive transfusion is considered to be the administration of >10 units pRBC in 24 hrs or >4 units pRBC in 1 hour.
- Most patient requiring transfusion do not need calcium supplementation
- There is no universal MTP guidelines

Coagulationopathy is a serious risk in severely injured patient
Which of the following statements is true ?

a) Tranexamic acid should be prescribed within first four hours injury

b) After the initial bolus, tranexamic acid should not be re-dosed

c) To reduce the risk of coagulopathy, keep the patient cool

d) Resuscitation procedures increase the risk of coagulopathy

CRASH 2 trial – ATLS 10

Tranexamic acid – Hypotensive trauma patients

Decreases mortality in blunt and penetrating trauma

Bolus - 1 gram IV over 10 minutes
Followed by 1 gram IV over 8 hours
Within 3 hours of trauma

Coagulopathy

- Severe injury and hemorrhage result in the consumption of coagulation factors and early coagulopathy
- Massive fluid resuscitation with the resultant dilution of platelets and clotting factors contributes to coagulopathy in injured patients.
- Prothrombin time, partial thromboplastin time, and platelet count are valuable baseline studies to obtain in the first hour
- Thromboelastography (TEG) and rotational thromboelastometry (ROTEM) can be helpful in determining the clotting deficiency and appropriate blood components to correct the deficiency

In a patient with hemorrhagic shock, a base deficit of -4 would indicate what class of shock?

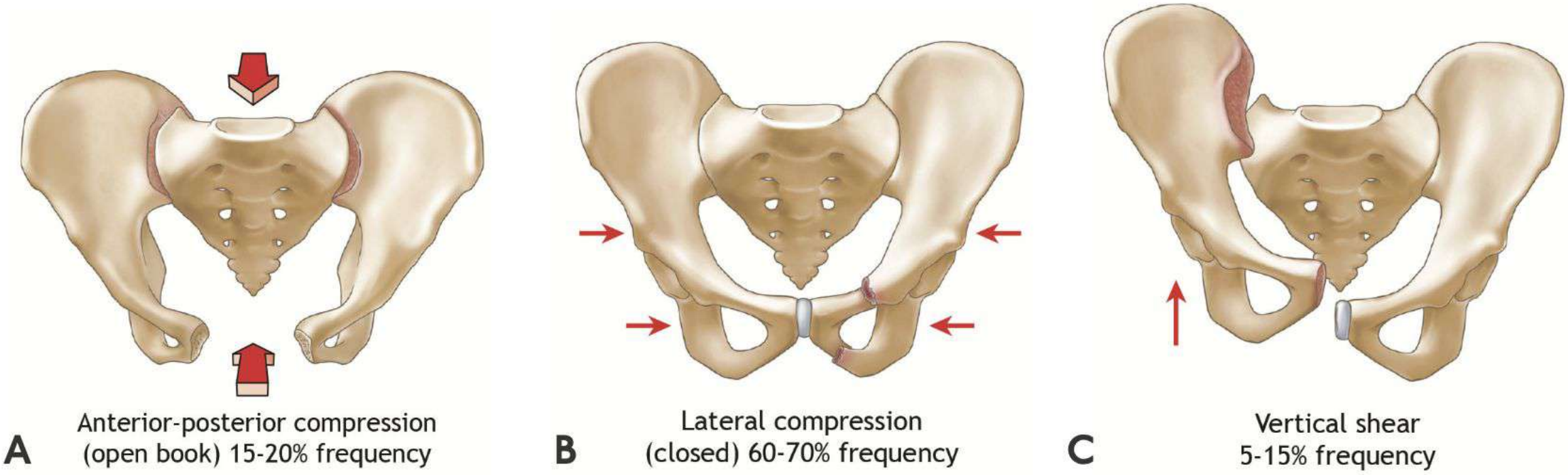
a) Class 1
b) Class 2
c) Class 3
d) Base deficit does not correlate with shock

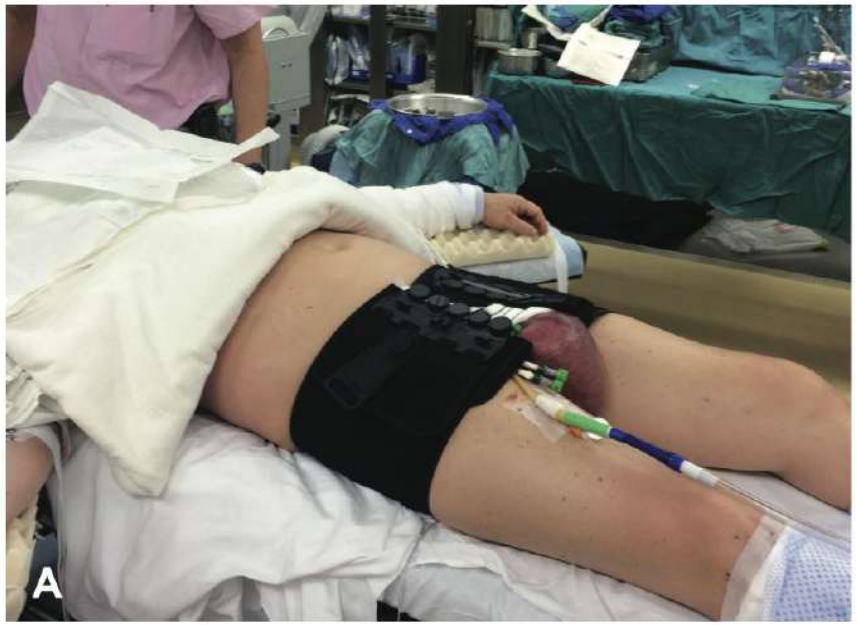
PARAMETER	CLASS I	CLASS II (MILD)	CLASS III (MODERATE)	CLASS IV (SEVERE)
Approximate blood loss	<15%	15–30%	31–40%	>40%
Heart rate	↔	↔/↑	↑	↑/↑↑
Blood pressure	↔	↔	↔/↓	↓
Pulse pressure	↔	↓	↓	↓
Respiratory rate	↔	↔	↔/↑	↑
Urine output	↔	↔	↓	↓↓
Glasgow Coma Scale score	↔	↔	↓	↓
Base deficit[a]	0 to −2 mEq/L	−2 to −6 mEq/L	−6 to −10 mEq/L	−10 mEq/L or less
Need for blood products	Monitor	Possible	Yes	Massive Transfusion Protocol

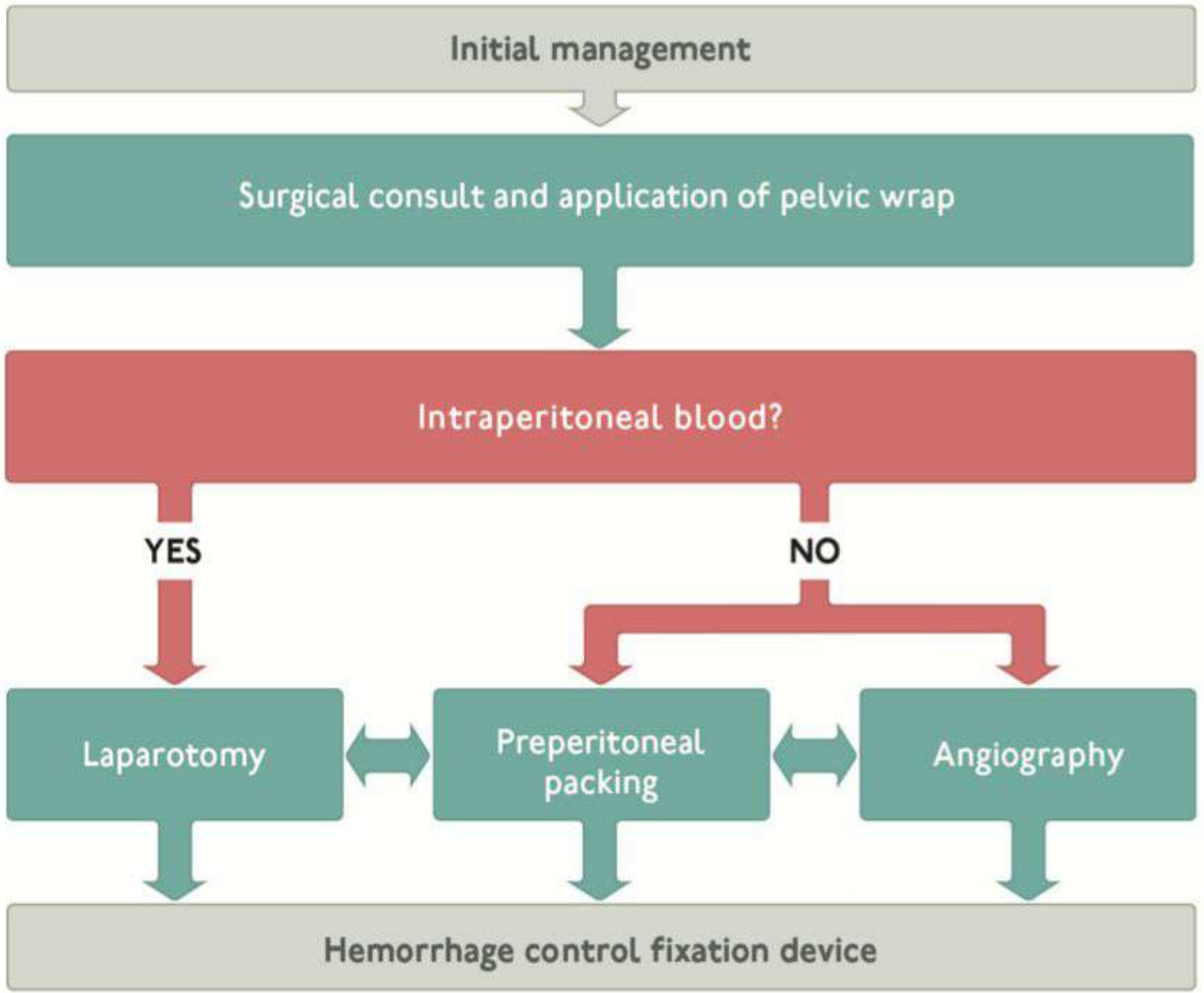
In a patient with hemorrhagic shock, a base deficit of -4 would indicate what class of shock?

a) Class 1
b) **Class 2**
c) Class 3
d) Base deficit does not correlate with shock

Pelvic fractures and Associated injuries

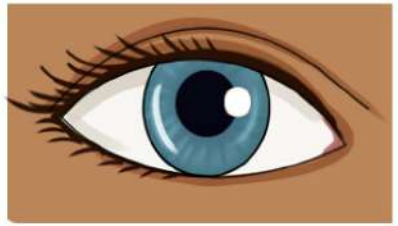
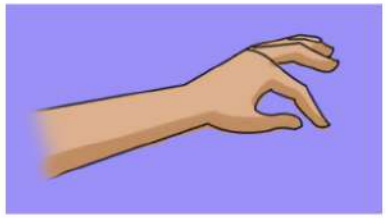






D = DISABILITY EVALUATION

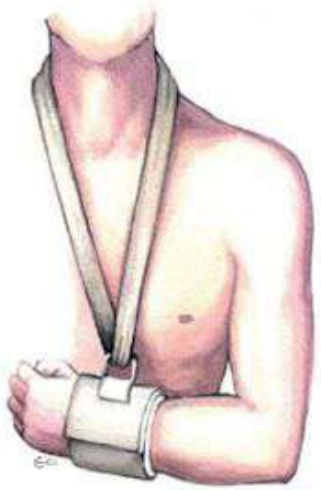
- CHECK FOR NEUROLOGICAL DEFICITS
- GLASGOW COMA SCALE (GCS) – 2014

EYE OPENING		VERBAL RESPONSE		MOTOR RESPONSE	
					
Spontoneous	4	*Oriented*	5	*Obeys commands*	6
To sound	3	*Confused*	4	*Localising*	5
To pressure	2	*Words*	3	*Withdrawal*	4
None	1	*Sounds*	2	*Abnormal flexion*	3
		None	1	*Extension*	2
				None	1

EVM = E4 V5 M6

MILD
MODERATE
SEVERE

NT



GCS – P

- GCS - Pupil reactivity score

- Number of nonreactive pupils

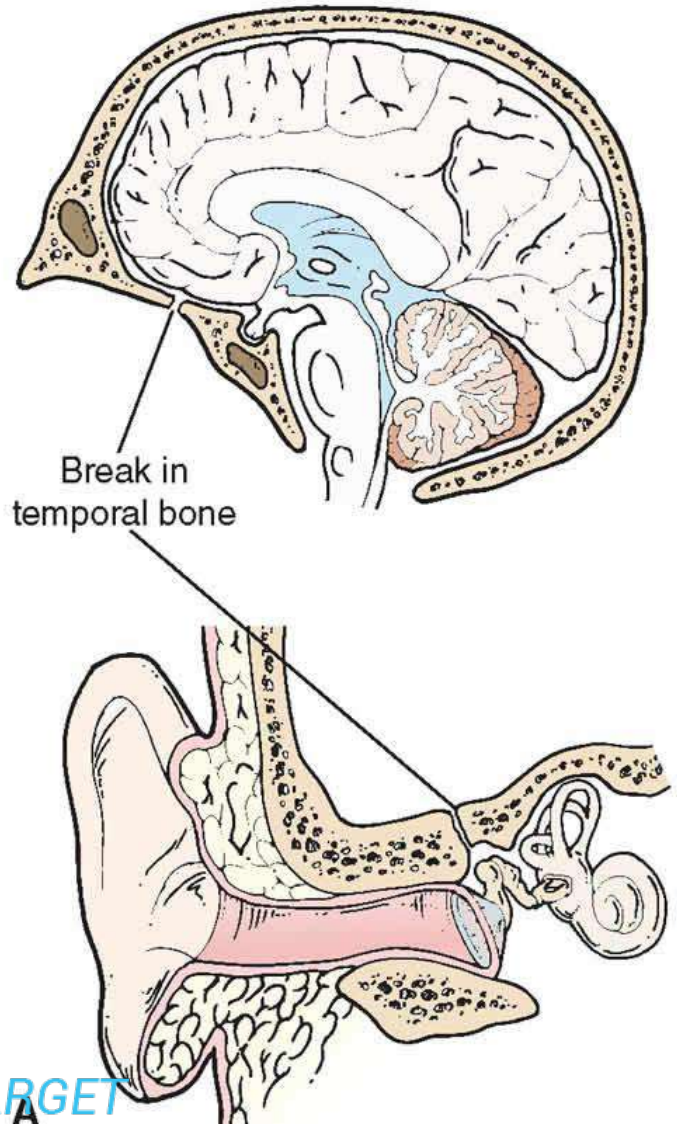
Both Pupils nonreactive – 2
One Pupil nonreactive – 1
Neither Pupil nonreactive – 0

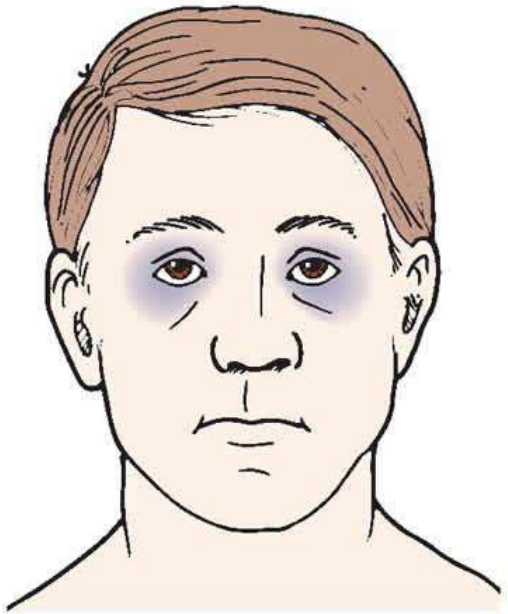
GCS PACT

- GCS
- PUPILS
- AGE
- CT FINDINGS

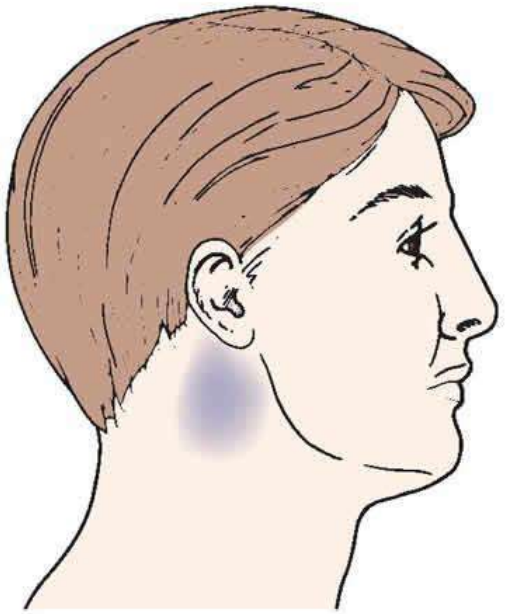
Disability

- Glasgow Coma scale
- Level of consciousness – AVPU (Alert, voice, pain, unresponsive)
- Neurological status





B Raccoon's eyes



C Battle's sign

E = Exposure / Environment Control

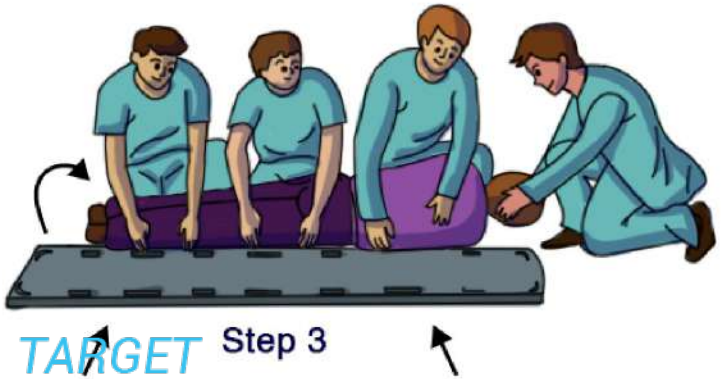
- Body temperature of patient is critical

- Warmed IV fluids

- Bair hugger
- Logroll patient to check for posterior injuries
- Expose the patients
- Expose perineum – Pelvic fractures
- Look For Open Fracture
- Rewarm The Patient

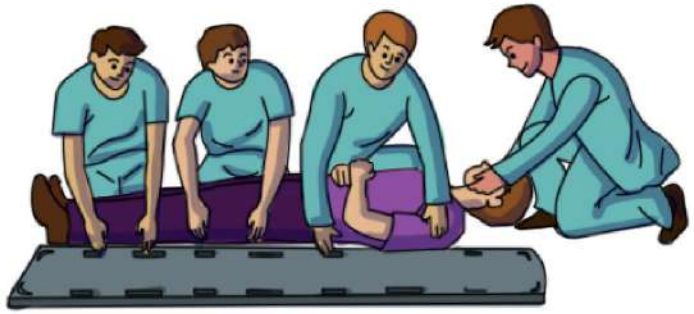
Log Roll Technique (4 people)

Step 1



Step 3

Logroll method



Step 2

Step 4

Ideal number : 5 people

Minimum : 4 people

1 person – Head control
3 people – Supporting body
1 person – Examining

Adjuncts to Primary Survey

- Pulse oximeter
- Cardiac monitoring +/- ECG
- Foley catheter
- NG tube
- CXR/Pelvic X-ray
- Blood glucose

A 29-year-old man diagnosed with scrotum ecchymosis after landing hard on his bike while jumping terrain in the national forest.
Which of the following is appropriate ?

a) A suprapubic catheter should be inserted right away

b) Foley catheter is placed right away

c) First step is Prostate examination, if there is no blood at the urethral meatus, a foley catheter is placed as precaution

d) Retrograde urethrogram is advised

Retrograde urethrogram is advised

- Prostate exam is no longer used as an indicator of urinary tract injury in ATLS 10 due to its inaccuracy
- Retrograde urethrogram is performed prior to placement of Foley's catheter if there is suspicion of Urethral injury
- Even if there is no blood at the urethral meatus or gross blood in urine, a retrograde urethrogram should be performed if there are other signs of urethral injury such as Scrotal ecchymosis or hematoma

Urinary and Gastric catheters

- **Urinary output** is a sensitive indicator of the patient's volume status and reflects renal perfusion. Monitoring of urinary output is best accomplished by insertion of an indwelling bladder catheter

- Transurethral bladder catheterization is contraindicated for patients who may have urethral injury.

- Suspect a urethral injury in the presence of either blood at the urethral meatus or perineal ecchymosis.

- When urethral injury is suspected, confirm urethral integrity by performing a **retrograde urethrogram** before the catheter is inserted.

After Primary Survey

- Re-assess with changes made
- Obtain imaging – CXR/ Pelvis/ CT trauma

Secondary Survey

- Head to toe examination
- Thorough systematic review and history from the patient
- Manage nonlife threatening problems and missed injuries
- Open fracture management – BOAST 4 guidelines
- Consider closing soft tissue injuries
- Determine how stable patient is – DCO vs ETC ?

AMPLE history

- Allergies
- Medications
- Past illness / Pregnancy
- Last meal
- Events related to injury

Tertiary Survey

- Comprehensive evaluation after initial resuscitation (after 24 hours)

❑ Thorough physical examination

❑ Targeted radiographic imaging

Revaluation

- For adult patients, maintenance of urinary output at 0.5 mL/kg/h is desirable.

- In paediatric patients who are older than 1 year, an output of 1 mL/kg/h is typically adequate.

ATLS with musculoskeletal trauma

Management of Significant Vascular Injury

- A stepwise approach to controlling arterial bleeding begins with manual pressure to the wound.
- A pressure dressing is then applied, using a stack of gauze held in place by a circumferential elastic bandage to concentrate pressure over the injury.
- If bleeding persists, apply manual pressure to the artery proximal to the injury. If bleeding continues, consider applying a manual tourniquet (such as a windlass device) or a pneumatic tourniquet applied directly to the skin
- A pneumatic tourniquet may require a pressure as high as 250 mm Hg in an upper extremity and 400 mm Hg in a lower extremity

Transfer of trauma patients

“ABC-SBAR”

Airway, Breathing and Circulation problems identified, and interventions performed

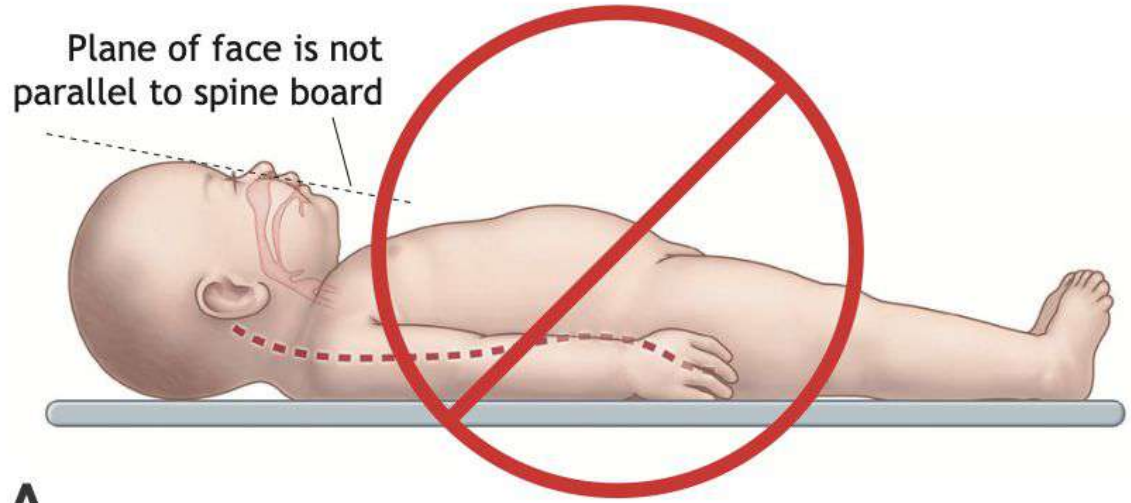
Situation – pt name, age, referring details, IV access site

Background – event history, AMPLE, Blood products, medications, imaging

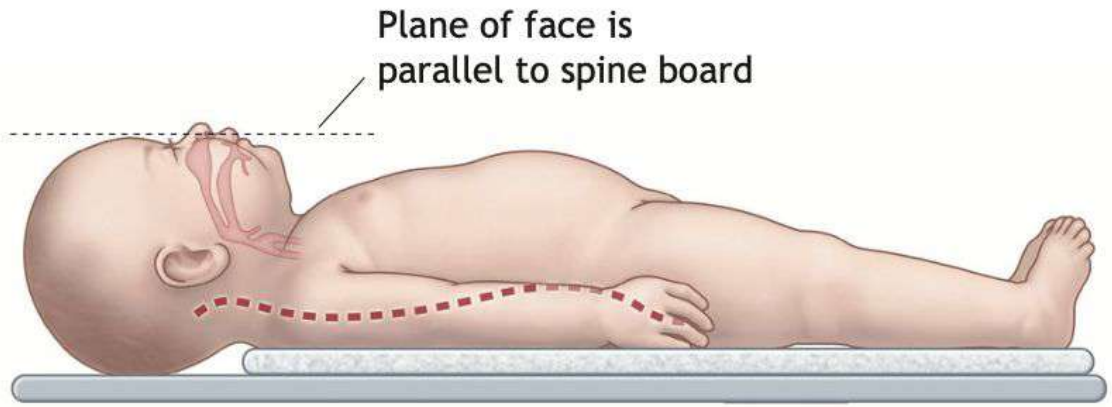
Assessment – vitals, physical exam findings

Recommendation

ATLS in Pediatric Trauma



A



B

Airway

- Orotracheal intubation is the most reliable means of establishing an airway and administering ventilation to a child. The smallest area of a young child's airway is at the cricoid ring, which forms a natural seal around an uncuffed ETT, a device that is commonly used in infants because of their anatomic features

- Before attempting to mechanically establish an airway, fully preoxygenate the child.

- Surgical cricothyroidotomy is rarely indicated for infants or small children. It can be performed in older children in whom the cricothyroid membrane is easily palpable (usually by the age of 12 years).

Breathing

- Use of a paediatric bag-mask is recommended for children under 30 kg.
- Hypoxia is the most common cause of paediatric cardiac arrest
- In case of tension pneumothorax in Children - needle decompression just over the top of the third rib in the midclavicular line
- 14–18-gauge needle

Circulation

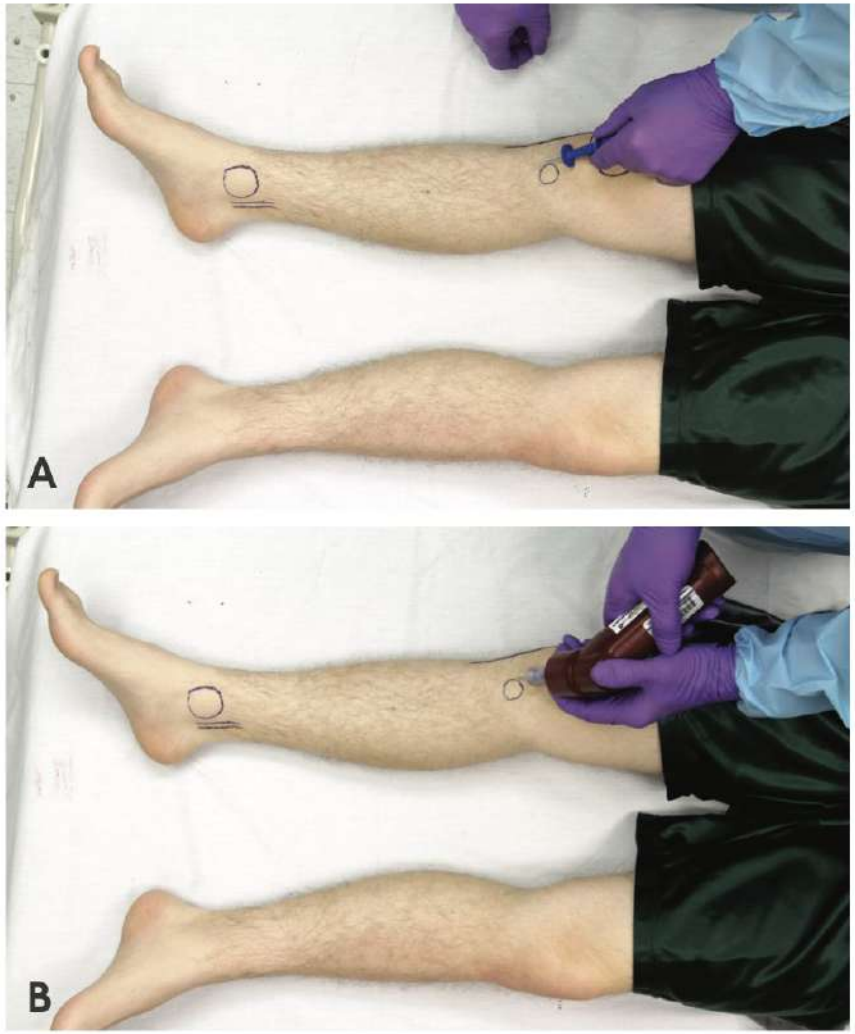
- The goal of fluid resuscitation is to rapidly replace the circulating volume.

An infant's blood volume can be estimated at 80 mL/kg

and a child aged 1-3 years at 75 mL/kg

and children over age 3 years at 70 mL/kg.

Intraosseous insertion



■ **FIGURE 10-5 Intraosseous Infusion, A. Distal femur, B. Proximal tibia.** If percutaneous access is unsuccessful after two attempts, consider starting intraosseous infusion via a bone-marrow needle (18 gauge in infants, 15 gauge in young children).

Old ATLS protocol

- Intravenous administration of warmed isotonic crystalloid solution as an initial 20 mL/kg bolus, followed by one or two additional 20 mL/kg isotonic crystalloid boluses pending the child's physiologic response. If the child demonstrates evidence of ongoing bleeding after the second or third crystalloid bolus, 10 mL/kg of packed red blood cells may be given.

ATLS 10

- initial 20 mL/ kg bolus of isotonic crystalloid followed by weight- based blood product resuscitation with 10-20 mL/kg of packed red blood cells and 10-20 mL/kg of fresh frozen plasma and platelets, typically as part of a paediatric mass transfusion protocol

Urine Output

- The output goal for infants is 1-2 mL/kg/hr
- For children over age one up to adolescence the goal is 1-1.5 mL/kg/hr
- 0.5 mL/kg/hr for teenagers.

ATLS for Pregnant woman

ATLS for Pregnant woman

- If the patient requires spinal motion restriction in the supine position, logroll her to the left 15–30 degrees (i.e., elevate the right side 4–6 inches), and support with a bolstering device, thus maintaining spinal motion restriction and decompressing the vena cava

- Initial fetal heart tones can be auscultated with Doppler ultrasound by 10 weeks of gestation. Perform continuous fetal monitoring with a tocodynamometer beyond 20 to 24 weeks of gestation

Fetus

- Fetal heart rate is a sensitive indicator of both maternal blood volume

- Perform any indicated radiographic studies because the benefits certainly outweigh the potential risk to the fetus.

Thank you