Lao PDR Integrated Emergency Response Training 2025

Chiang Khong Crown Prince Hospital, Chiang Rai Province, Thailand.

June 25-27, 2025

Circulation & Bleeding Control - bleeding control, Tourniquet, shock management

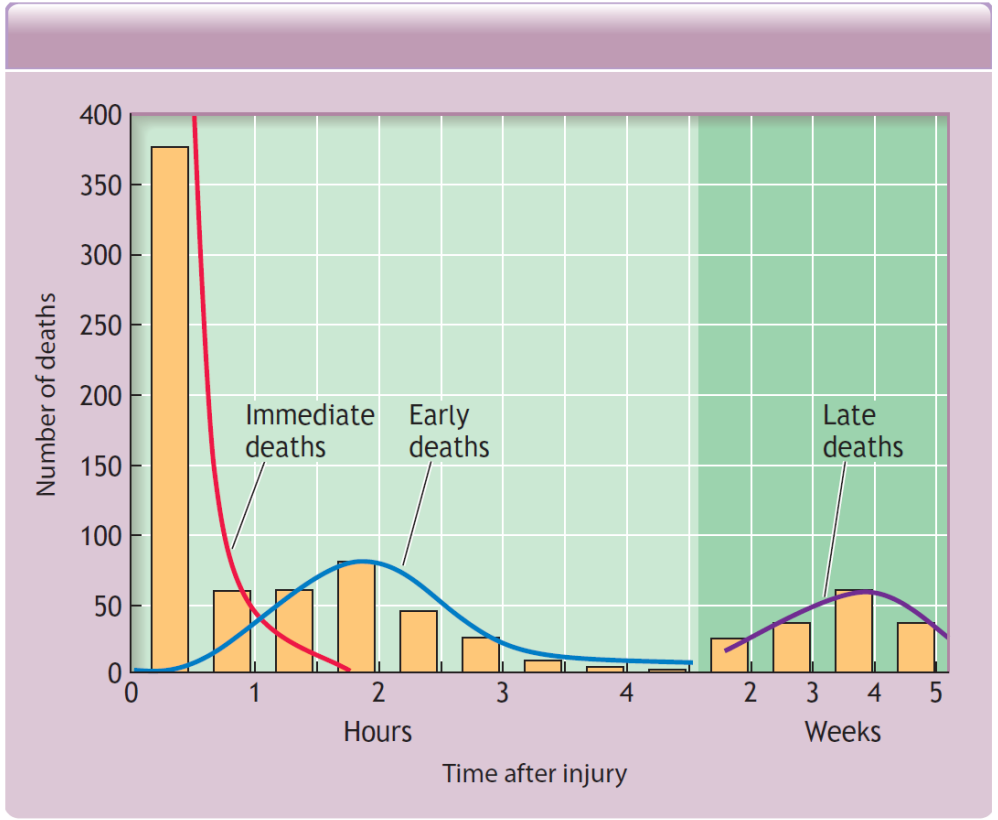


Table 250-1 Trimodal Distribution of Trauma Deaths

Peak	Environment	Injuries	Approaches to Reduce Mortality
First peak	Prehospital	Devastating head and vascular injuries	Comprehensive injury prevention program:
			Safe road construction
			Seat belt, helmet, airbag, drunk driving laws
			Handgun control
			Violence prevention
Second peak	Minutes to hours after ED arrival	Major head, chest, and abdominal injuries	Rapid transport to appropriate hospital, prompt resuscitation and identification of injuries needing surgical intervention
Third peak[19]	Intensive care unit	Systemic inflammatory response syndrome, sepsis, multiorgan failure	Evidence-based resuscitation practices

Shock

RESULTS FROM INADEQUATE ENERGY PRODUCTION TO SUSTAIN LIFE

ANY CONDITION THAT CAUSES GENERALIZED CELLULAR HYPOPERFUSION

LEADS TO INADEQUATE CELLULAR OXYGENATION THAT DOES NOT MEET METABOLIC NEEDS

Hypoperfusion

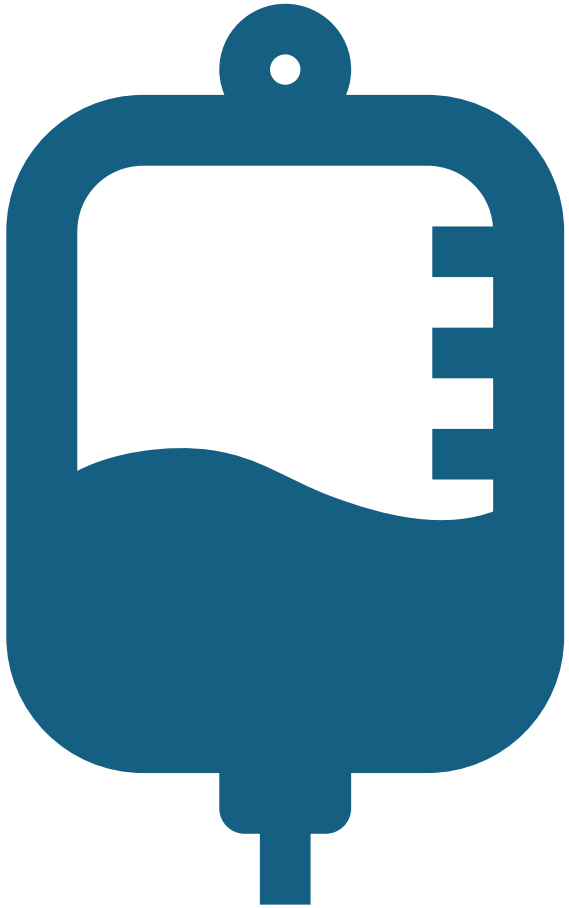
- Results from:
  - Loss of blood (either externally or internally)
    - Most common cause of shock in trauma
  - Impaired pumping of blood
  - Dilation of the blood vessels (increased vascular space)

Hypoperfusion

The end result is a decrease in circulating volume and red blood cells (RBCs) moving through the capillary beds to deliver oxygen to the cells

Lack of oxygen impairs metabolism

Impaired metabolism decreases energy production



Shock in Trauma

- Classifications
  - Hypovolemic
  - Distributive
  - Cardiogenic

Hypovolemic Shock

The most common cause of shock in the trauma patient

– Due to hemorrhage

Loss of RBCs impairs oxygen transportation

– In any trauma patient with shock, assume hemorrhage is the cause until proven otherwise

Hemorrhagic Shock

TABLE 3.1 Estimated Blood Loss[1] Based on Patient's Initial Presentation

	CLASS I	CLASS II	CLASS III	CLASS IV
Blood loss (mL)	Up to 750	750–1500	1500–2000	>2000
Blood loss (% blood volume)	Up to 15%	15%–30%	30%–40%	>40%
Pulse rate (BPM)	<100	100-120	120-140	>140
Systolic b pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	>35
Urine output (mL/hr)	>30	20–30	5–15	Negligible
CNS/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic
Initial fluid replacement	Crystalloid	Crystalloid	Crystalloid and blood	Crystalloid and blood

[1] For a 70-kg man.

Distributive Shock

Neurogenic “shock”

- – Decreased systemic vascular resistance due to vasodilation

Most common cause is spinal cord injury

Cardiogenic Shock

Intrinsic

- – Blunt cardiac trauma leading to muscle damage and/or dysrhythmia
- – Valvular disruption

Extrinsic

- – Pericardial tamponade
- – Tension pneumothorax

Assessment

- Evaluate:
  - Hemorrhage
  - Level of consciousness
  - Skin
  - Pulse
  - Respiration
  - Blood pressure
  - Confounding factors

Assessment

- Level of consciousness (LOC)
  - Decreased cerebral perfusion results in altered LOC
  - Assume altered LOC is due to shock, andtreat accordingly
  - Other causes of altered LOC will not kill as rapidly as shock

Assessment

- Skin
  - – Color
  - – Temperature
  - – Moisture
  - – Capillary refill
- Pulse
  - – Rate
  - – Quality
  - – Location

Assessment

- Respiration
  - Hypoxia, hypercarbia, and acidosis stimulate the respiratory center
  - Increasing ventilatory rate may be the earliest sign of shock
  - Intolerance of oxygen face mask suggests hypoxia

Assessment

Blood pressure (BP)

- – Not the determinant of shock

30% blood loss before BP drops

- – Not part of the primary assessment
- – Trends are crucial
- – Adequate blood pressure does not equate to adequate tissue perfusion
- – Treatment is not aimed at returning BP to normal

Big 5

External bleeding

Chest – Hemothorax

Abdomen – Hemoperitoneum

Pelvis – pelvic fracture

Long bone fracture

Circulation with Hemorrhage Control

An initial, warmed fluid bolus is given. The usual dose is 1 to 2 L for adults and 20 mL/kg for pediatric patients.

Absolute volumes of resuscitation fluids should be based on patient response.

• Excessive fluid administration can exacerbate the lethal triad

Coagulopathy

Acidosis

Hypothermia

Activation of the inflammatory cascade

Circulation with Hemorrhage Control

- Massive transfusion : defined as >10 units of pRBCs within the first 24 hours of admission.
- Early administration of pRBCs, plasma, and platelets in the ratio of 1:1:1
- Minimizing aggressive crystalloid administration in these patients may result in improved survival.

Pelvis exam

- **Palpation of a high-riding prostate gland is a sign of a significant pelvic fracture**

- **When necessary, mechanical instability of the pelvic ring may be tested and should be performed only once.**
- **It should NOT be performed in patients with shock and an obvious pelvic fracture.**

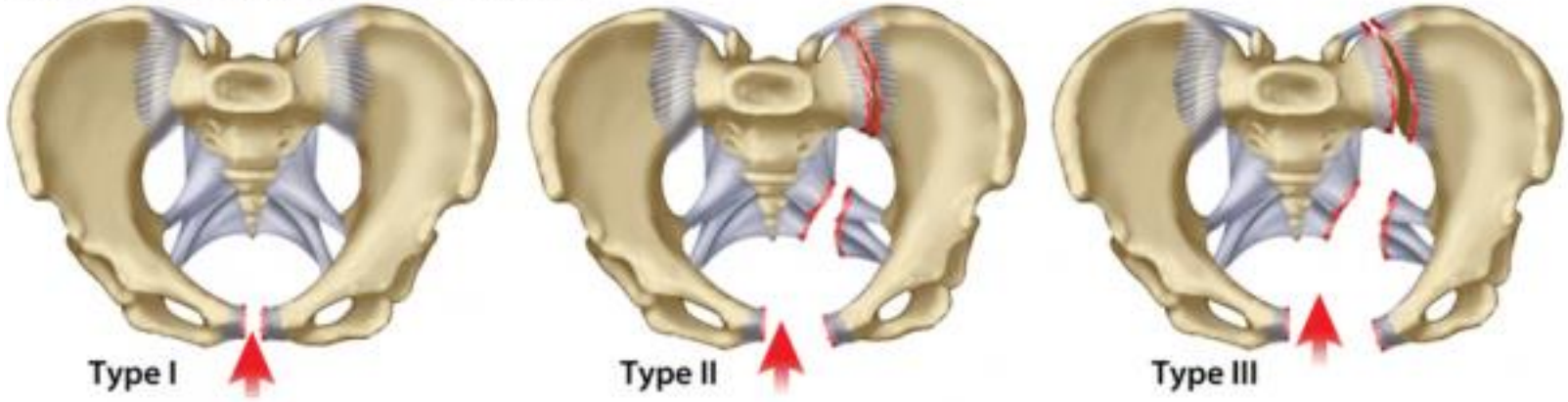
Pelvis: Diagnosis of Pelvis fracture

- Step 1: Identify the mechanism of injury
- Step 2: Inspect the pelvic area for ecchymosis, perineal or scrotal hematoma, and blood at the urethral meatus
- Step 3: Inspect the legs for differences in length or asymmetry in rotation of the hips.
- Step 4: Perform a rectal examination.
- Step 5: Perform a vaginal examination.

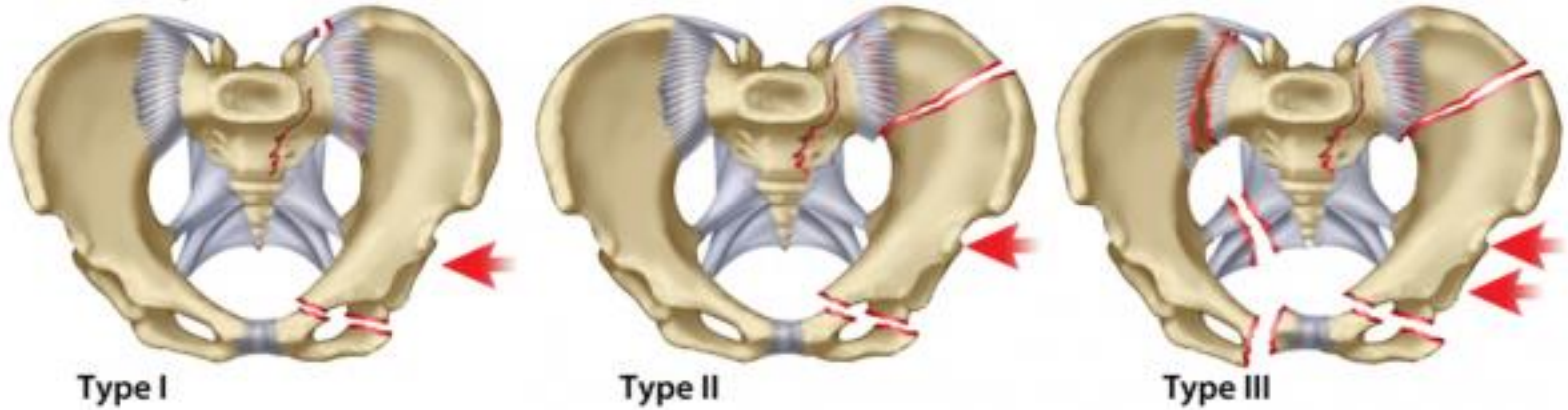
Pelvis: Diagnosis of Pelvis fracture

- Step 6: If Steps 2 through 5 are abnormal, or if the mechanism of injury suggests a pelvic fracture, obtain an AP x-ray film of the patient's pelvis
- Step 7: . If Steps 2 through 5 are normal, palpate the bony pelvis to identify painful areas.
- Step 8: determine pelvic stability

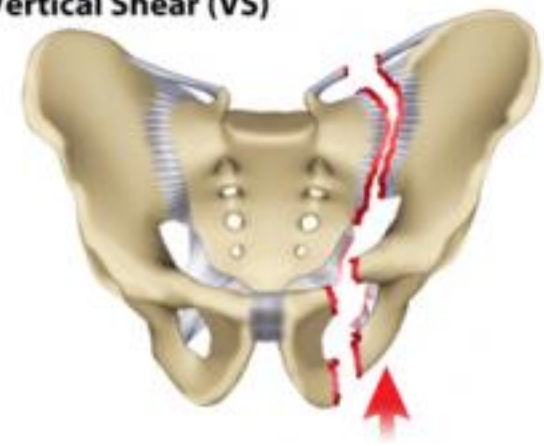
Anterior Posterior Compression (APC)



Lateral Compression (LC)

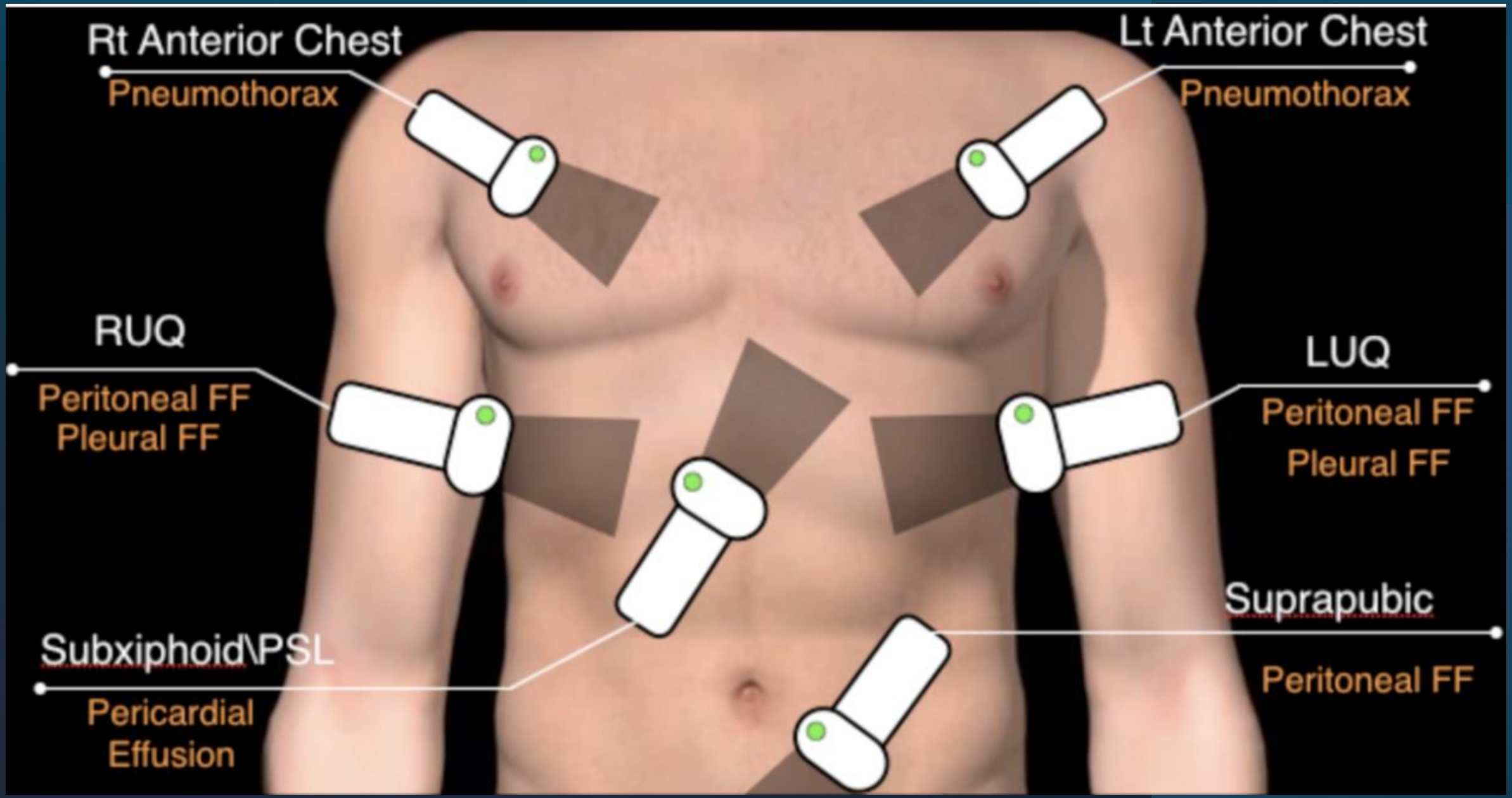


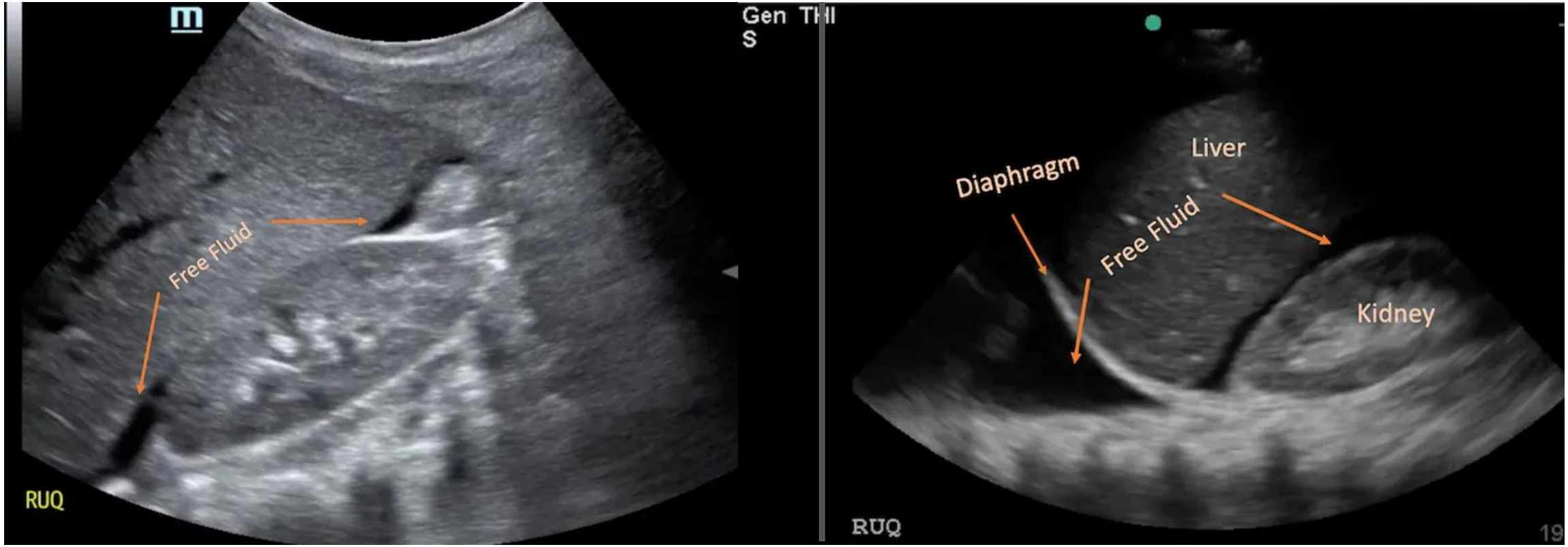
Vertical Shear (VS)



Adjunct to Primary Survey

- **Urinary catheter**
  - **If meatal blood is present or the prostate is displaced, suggesting a urethral injury, perform retrograde urethrography before inserting a Foley catheter.**


Rt Anterior Chest
Pneumothorax
Lt Anterior Chest
Pneumothorax
RUQ
Peritoneal FF
Pleural FF
LUQ
Peritoneal FF
Pleural FF
Suprapubic
Peritoneal FF
Subxiphoid\PSL
Pericardial
Effusion


Free Fluid
RUQ
Diaphragm
Liver
Free Fluid
Kidney
RUQ

CIRCULATION WITH

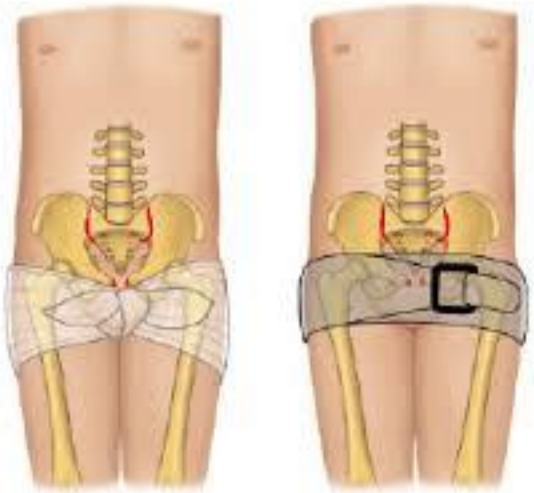
Considered hypovolemic shock

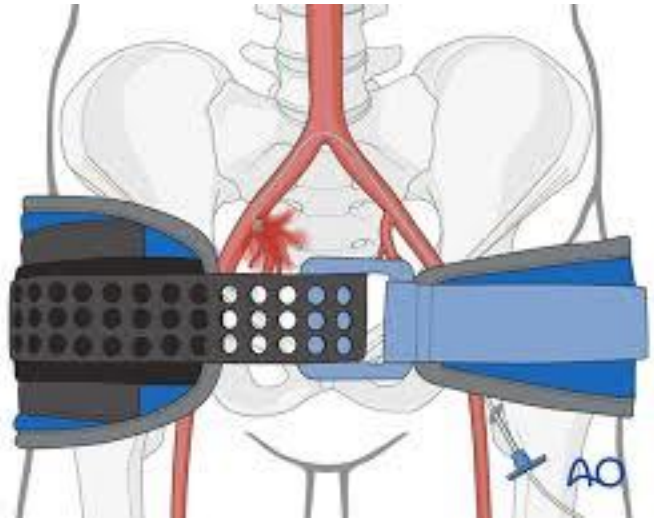
Assessment

- Altered level of Consciousness
- Gray facial skin and pale extremities
- Rapid, thready pulse

External bleed : direct pressure, tourniquet

Internal bleed : chest decompression, pelvic binders, splint, surgical intervention

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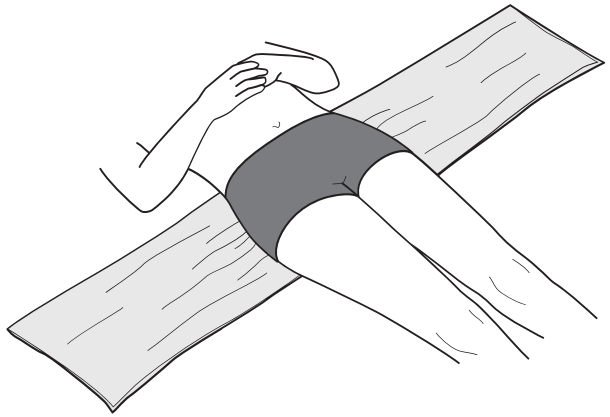
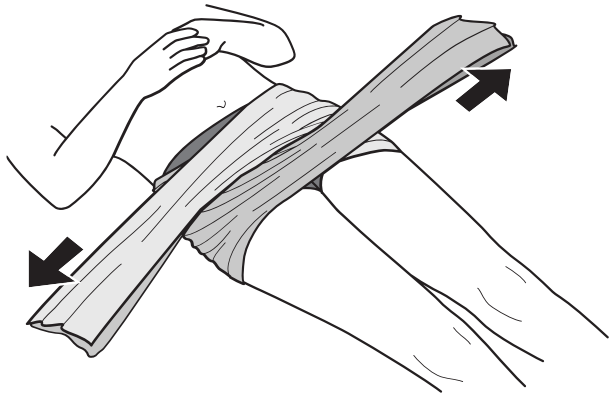




Resuscitation

Definite bleeding control

IV access + volume resuscitation

- Not substitute for bleeding control
- Two large bore IV catheters
- Preferred peripheral upper extremity
- Blood for crossmatch ± VBG, lactate
- Bolus 1-2L of isotonic crystalloid then blood

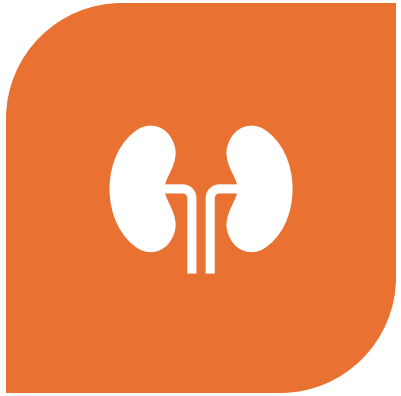
PITFALLS

Elderly may not be tachycardia when shock, BP not correlate with cardiac output, may take anticoagulant medication

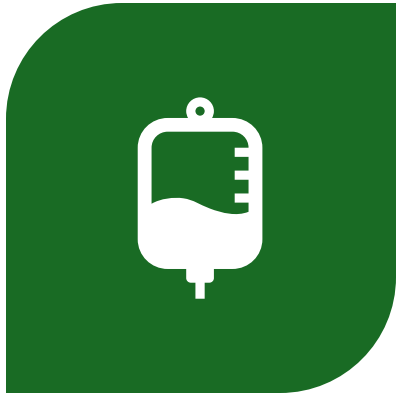
Children have more reserve => late detection of shock

Athlete may not tachycardia

Types of Bleeding



1. ARTERIAL – BRIGHT RED, SPURTING



2. VENOUS – DARK RED, STEADY FLOW

3. CAPILLARY – OOZING

Initial Bleeding Control Techniques

- Scene safety & PPE
- Apply direct pressure
- Elevate limb if no fracture
- Use pressure points
- Consider tourniquet if bleeding persists

When to Use a Tourniquet

- Life-threatening limb bleeding

- Uncontrolled by direct pressure

- Amputation/crush injury

- Mass casualty or dangerous environment

Tourniquet: Equipment Overview

- Preferred: Commercial (CAT®, SOFTT®)

- Last resort: Improvised

- Must have strap, windlass, retention

How to Apply a Tourniquet

1. Place 2–3 inches above wound
2. Avoid joints
3. Tighten strap
4. Twist windlass until bleeding stops
5. Secure windlass
6. Mark time

Signs of Effective Application

- BLEEDING STOPS

- NO DISTAL PULSE

- PALE/COOL SKIN BELOW

- PAIN EXPECTED

Time Limit & Precautions

- Record time
- Safe: under 2 hours
- Do NOT remove in field
- Inform hospital

Common Mistakes

- Over joints
- Not tight enough
- Narrow material
- Covered tourniquet
- No time record

Complications of Tourniquet Use

- Nerve damage
- Ischemia
- Compartment syndrome
- Reperfusion injury
- Pain/anxiety

USER INSTRUCTIONS

1 Pull the free end of the tourniquet to make it as tight as possible and secure the free end.

2 Spinning the windlass(rod) until bleeding stops.

3 Secure the windlass(rod) to keep the tourniquet tight.

4 Record the time the tourniquet was applied.

Wound Packing (If Tourniquet Not Possible)

- For neck, groin, armpit
- Pack with gauze/hemostatic agent
- Apply pressure for 3 minutes