Care of the Patient with Respiratory Dysfunction and Thoracic Trauma:

ILO: State the normal arterial blood gas (ABG) levels:

Arterial Blood Gases:

Arterial blood gases (ABGs) are a laboratory test used to evaluate acid-base balance and gas exchange.

- Arterial blood is used because it reflects acid-base balance better than venous blood.
- Provides effectiveness of the lungs oxygenating blood.
- Generally taken from the radial artery, is severely painful and requires local anaesthesia.

Normal Arterial Blood Gas Levels:

Measurement	Rationale	Normal Adult Range
$PaCO_2$ (Partial Arterial CO_2 Levels)	▪ Measures the pressure exerted by dissolved CO_2 in the **blood**. ▪ Reflects the respiratory component of acid-base regulation and balance. ▪ Regulated by the lungs.	**35 - 45 mmHg** < 35 mmHg = state of ↓ CO_2 in the blood. > 45 mmHg = state of ↑ CO_2 in the blood.
PaO_2 (Partial Arterial O_2 Levels)	▪ Measures the pressure exerted by oxygen that is dissolved in the **plasma**. ▪ Evaluation of respiratory function but not main measurement for acid-base balance.	**80 – 100 mmHg** < 80 mmHg = Hypoxaemia
pH	▪ Reflects hydrogen ion (H+) concentration.	**7.35 – 7.45**
HCO_3^- (Serum Bicarbonate)	▪ Reflects the renal regulation of acid-base balance. ▪ Metabolic component of arterial blood gases.	**22-26 mEq/L** in the plasma.

ILO: Define 'blunt' and 'penetrating' trauma to the thoracic cavity:

Blunt Trauma:

- Includes a large impact, but the skin is not broken, and is not always visible from the skin.
- Examples: Pulmonary Contusion, pneumothorax, fractured ribs.

Penetrating Trauma:

- An injury that occurs when an object pierces the skin and enters the tissue.
- Creates an open wound.
- Examples: Gun-shot wound, knife wound.

ILO: Describe major effects of 'Flail Chest', 'Pulmonary Contusion' and 'Cardiac Tamponade' have on the Respiratory System:

Flail Chest:

A flail chest occurs when a segment of the rib cage breaks due to trauma and becomes detached from the rest of the chest wall.

- Occurs when multiple adjacent ribs are broken in multiple places, separating a segment, so a part of the chest wall moves independently.
- Physiological function of the chest wall is impaired, as the flail segment is sucked inwards during inhalation and moves outwards during exhalation. This is called the '**Paradox Movement**'.
- Flail chest can affect the normal mechanics of breathing, ventilation and impairs gas exchange.
- Lung expansion is impaired, leading to ↑ WOB.

Pulmonary Contusion:

A pulmonary contusion or lung contusion is a bruise of the lung, caused by blunt thoracic trauma.

- Often results from abrupt chest compression, followed by sudden decompression (i.e. a significant fall or crushing injury).
- Damage to capillaries leads to blood and other fluids accumulating in the lung tissue.
- This excess fluid impairs gas exchange, leading to inadequate oxygen levels (hypoxia).

Cardiac Tamponade:

Cardiac tamponade is the compression of the heart by an accumulation of fluid in the pericardial sac.

- Cardiac tamponade is a type of pericardial effusion, in which fluid, pus, blood, clots or gas accumulate in the pericardium (heart sac).
- This leads to the slow or rapid compression of the heart.
- This pressure or compression on the heart muscle occurs when the pericardial sac fills up with fluid faster than it can stretch.
- Caused by both penetrating and blunt thoracic trauma.
- Causes pulmonary oedema and impaired gas exchange.

ILO: Define 'tension', 'traumatic' and 'spontaneous' pneumothorax:

Tension Pneumothorax:

A tension pneumothorax develops when an injury to the chest wall or lungs allows air to enter the pleural space but prevents it from escaping and increasing intrathoracic pressure.

- This causes the organs to shift and ↑ intrathoracic pressure.
- Causes rapid air accumulation with each breath.
- Ventilation is severely impaired and venous return to the heart is impacted.
- Symptoms:
  - Deviated trachea, absent breath sounds, hyper expansion of the chest and distended neck veins.

Traumatic Pneumothorax:

A traumatic pneumothorax is caused by a blunt or penetrating injury to the chest wall that disrupts the pleural membrane. There are two types: