


بسم الله الرحمن الرحيم

Respiratory Failure

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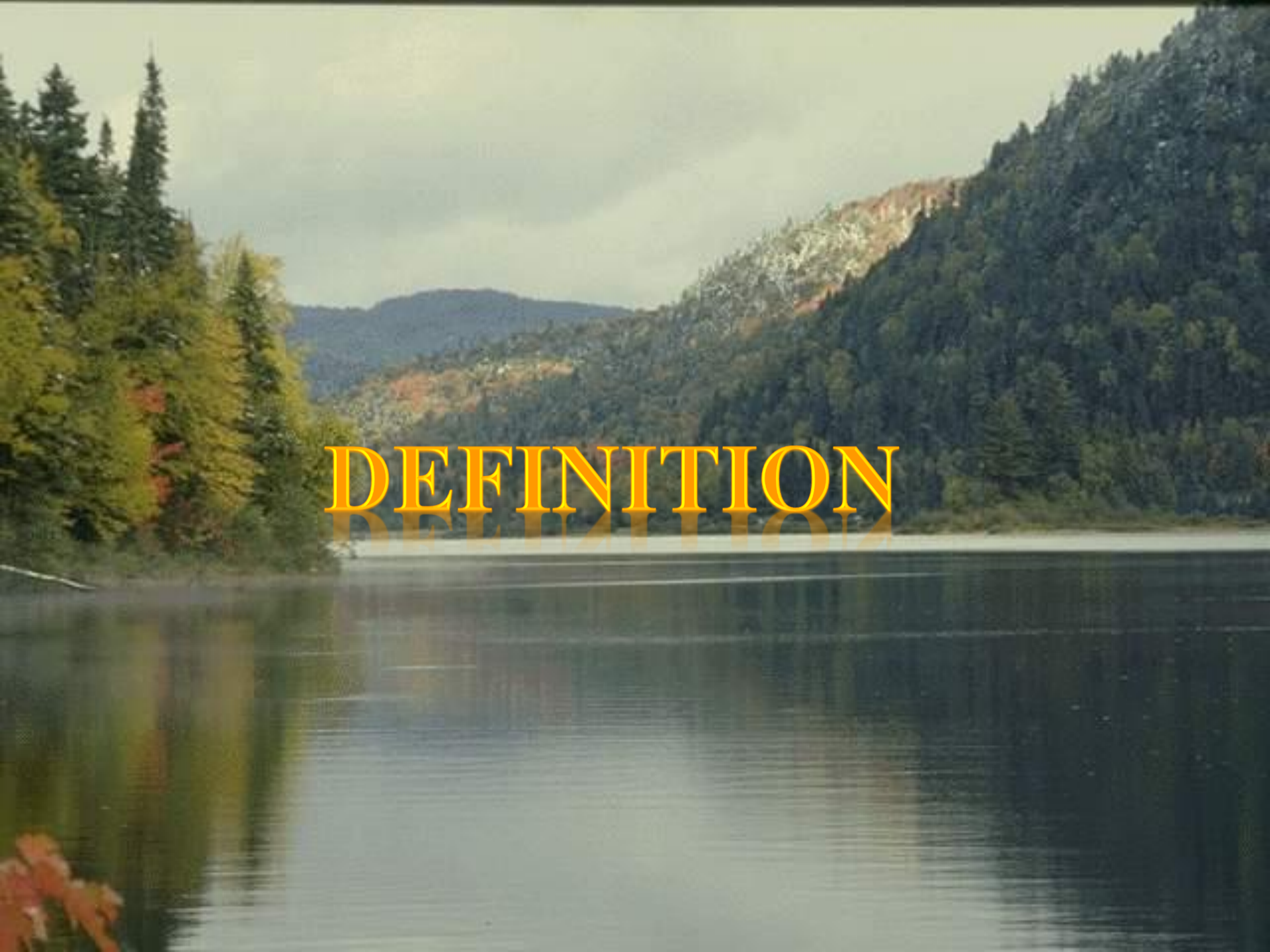
Learning Points

-Definition
-Types
- Aetiology
-Diagnosis
-Treatment
-Oxygen Therapy
-Complications


INTRODUCTION

The respiratory system supplies the body with adequate oxygen for aerobic metabolism and simultaneously removes its major metabolic waste product carbon dioxide.

- Respiratory failure occurs due to inadequate gas exchange resulting in an abnormally low oxygen (O2) level in blood.
- It is a potentially life-threatening condition that can lead to respiratory arrest and death if untreated.


DEFINITION

- **Hypoxaemia:**

Is an arterial oxygen level that is below normal and which can result in hypoxia.

- **Hypoxia:**

Is a reduction in the oxygen delivery to tissues despite adequate perfusion.

- **Hypocapnoea:**

is a reduced level of carbon dioxide (CO_2) in blood.

- **Hypercapnoea** :

Is an elevated level of CO_2 in blood.

- **Respiratory failure:**

Is defined as hypoxaemia, with a partial pressure of oxygen (PaO_2) of <60 mmHg.

Classification of respiratory failure

Typically, respiratory failure initially affects the ability either to take up O_2 (oxygenation failure) or to eliminate CO_2 **(ventilatory failure)**.

Respiratory failure may be classified as hypoxemic or hypercapnic

Hypoxemic respiratory failure (type I) is characterized by:-

1. PaO_2 < 60 mm Hg with a **normal or low** $PaCO_2$.
2. This is the most common form of respiratory failure, and it can be associated with virtually all acute diseases of the **lung.**

Hypercapnic respiratory failure (type II) is characterized by-:

1. Pao2 < 60 mm Hg with PaCO2 of > 50 mm Hg.
2. pH depends on the level of bicarbonate, which, in turn, is dependent on the duration of hypercapnia.

Aetiology

Acute Type 1 RF

- Pulmonary edema.
- Pulmonary embolism.
- Pneumonia
- Acute allergic alveolitis
- Severe bronchial asthma without diaphragmatic fatigue.

ChronicType 1 RF

- **Pulmonary fibrosis.**
- **Chronic Pulmonary embolism**

Acute Type 2 RF

- AE of COPD
- Acute severe asthma with diaphragmatic fatigue
- Upper airway obstruction.
- Acute CNS disorder
- Myathenia gravis

Chronic Type 2 RF

- COPD.
- Obesity hypoventilation syndrome.
- kyphoscoliosis
- Chronic neuromuscular diseases

Respiratory failure is not a disease per se but a consequence of the problems that interfere with the ability to breathe

Diagnosis

- Diagnosis of respiratory failure based on **medical history**, **a physical exam**, and the **results from tests**.

- Once respiratory failure is diagnosed, we will look for its underlying cause.

Clinically

- Clinical picture of causative disease
- Manifestations of hypoxaemia.
- Central cyanosis
- Restlessness, irritability.
- Hyperventilation and tachypnea
- Tachycardia,arrythmias.
- Convulsions, coma and death.

Clinically

Manifestations of hypercapnia:

- Elevated blood pressure and heart rate, sweating, and flushing
- CNS can become depressed, causing fatigue, confusion, dizziness, and blurred vision, and the intracranial pressure, will increase.
- Drowsiness,flapping tremors, coma(CO_2 narcosis).

Investigations

- For the cause
- Arterial blood gas (ABG).

ABG

Normal Values

- **PH 7.35 - 7.45**
- **PaCo2 35 - 45 mmHg**
- **HCO3 22 - 26 mEq/L**
- **PaO2 80 - 100 mmHg**
- **SaO2 95 - 100**
- **BE/BD +2 to -2**
- **A-a O2 gradient N < 15**

Respiratory Failure is a Laboratory Diagnosis ABG

Treatment

- **Treatment of the underlying cause**
- **Correction of hypoxaemia**
- **Treatment of complications**

Oxygen Therapy

Oxygen Therapy

- Controlled O2 therapy
- Uncontrolled O2 therapy

Indications for acute oxygen therapy:

1. **Respiratory failure**
2. **Cardiac and respiratory arrest**
3. **Hypotension (systolic blood pressure <100mmHg)**
4. **Low cardiac output**
5. **Metabolic acidosis (bicarbonate<18mmol/L)**
6. **Respiratory distress (respiratory rate>24/min)**
7. **Myocardial infarction.**
8. **Sickle cell crises.**

Indications for long term oxygen therapy

Domiciliary Oxygen:

- Resting PaO2 <55 mmHg;oxygen saturation<88%
- Resting PaO2 of 56-59 mmHg or oxygen saturation of 89% in the presence of secondary Polycythemia, nocturnal hypoxaemia, peripheral oedema or evidence of pulmonary hypertension.

Noncoontinuous oxygen:

- During exercise: PaO2 55 mmHg or oxygen saturation 88% with a low level of exertion
- During sleep: PaO2 55 mmHg or oxygen saturation 88% with associated complications, such as pulmonary hypertension, daytime somnolence, and cardiac arrhythmias

Different equipments of oxygen supply::

A) Central oxygen in hospitals.

B) Home oxygen, includes :

1. Compressed gas cylinders.
2. Liquid oxygen cylinders.
3. Oxygen concentrators.
4. Small devices.

Compressed gas cylinders

Liquid oxygen cylinders

easier to refill, but of higher cost

An oxygen concentrator works by taking in room air which has an oxygen concentration of around 21% and passing it through a series of molecular, bacterial and dust filters to remove any dust particles and unwanted gases. Purified oxygen with a concentration of up to 95% is then delivered to the patient via a flowmeter, with mask or nasal cannulae.

Venturi mask

Ideal for type II respiratory failure (hypercapnia)

as in COPD

Different colors of venturi control parts adjusted to certain O2 flow to deliver different concentrations of O2.

Complications of RF:

- Cardiac arrythmia
- Pulmonary hypertension and cor pulmonale DVT and pulmonary embolism due to polycythaemia secondary to chronic hypoxaemia.
- Complications of oxygen therapy and mechanical ventilation.

Thank You