



تقنيات اجهزة تخدير الكورس الاول

Spirometer

Sawa University

College of health and medical
techniques

Department of Anesthesia

Four Stage

جامعة ساوة

الاهلية

كلية التقنيات الصحية

والطبية

قسم تقنيات التخدير

المرحلة الرابعة

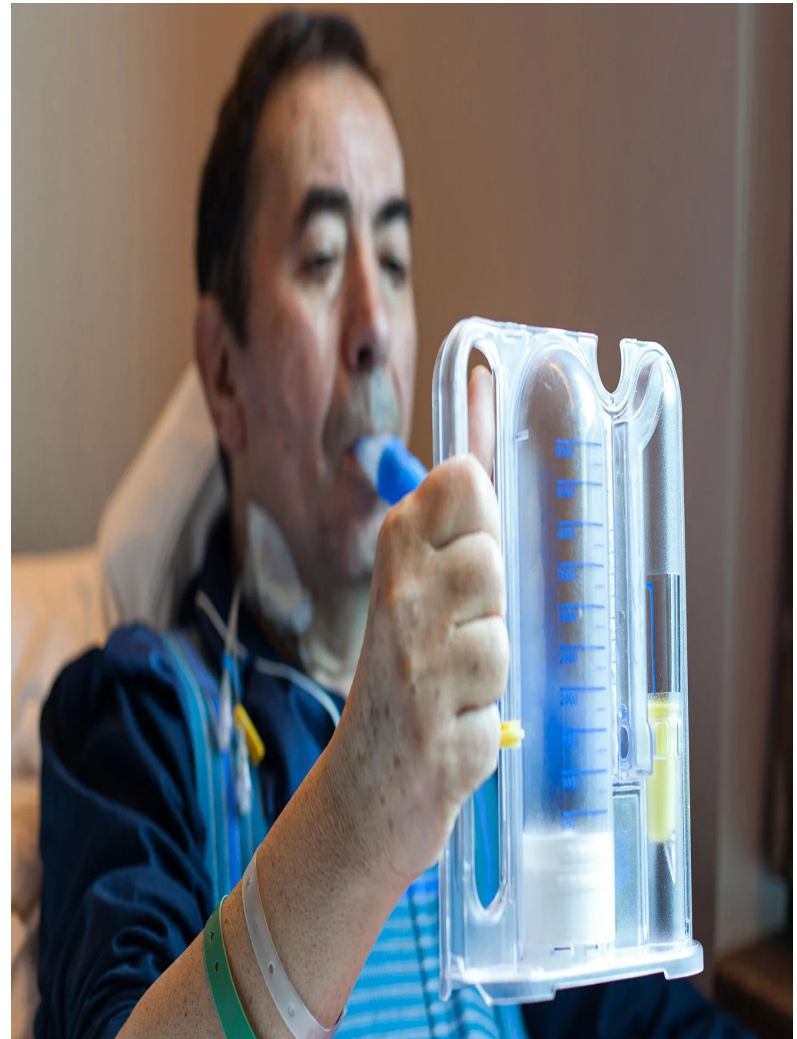
محاضرة رقم 9 الجانب النظري

Lecture No 9. Theoretical

استاذ المادة :م.د سامي رحيم حسن

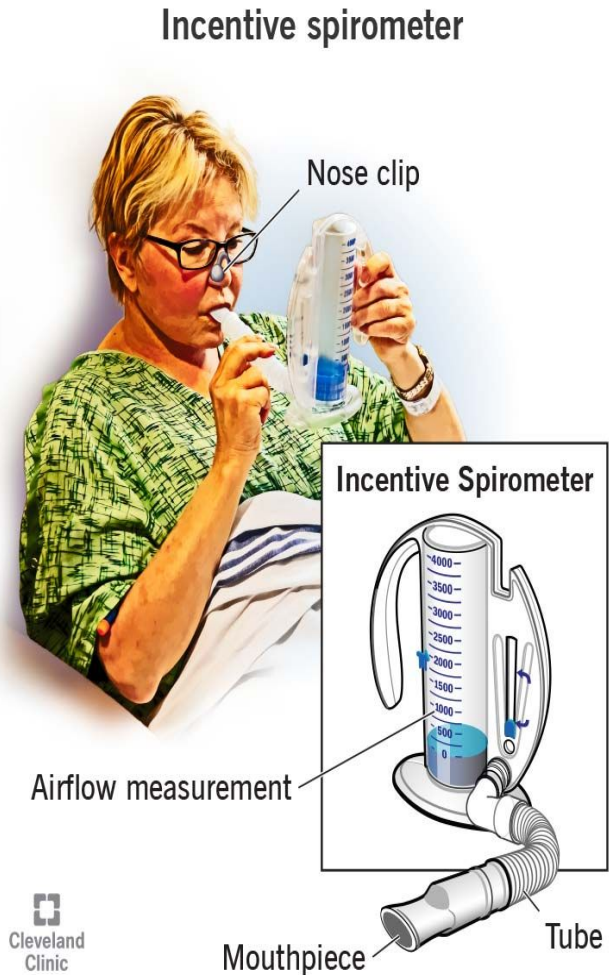
Introduction

- The spirometer is a device used to measure lung volumes and airflow.
- It is a basic pulmonary function testing (PFT) instrument.
- Commonly used in preoperative assessment to evaluate patient's respiratory function before anesthesia.



Principle of Spirometer

1. Based on measurement of air flow and volume during inhalation and exhalation.
2. The patient breathes into a mouthpiece connected to the spirometer.
3. The device converts airflow into electrical signals, producing a graph called a spirogram.



Types of Spirometers

1. Water-sealed (Bell)

Spirometer – uses an **inverted bell** floating in water.

2. **Dry Spirometer** – uses mechanical parts (bellows or turbine).

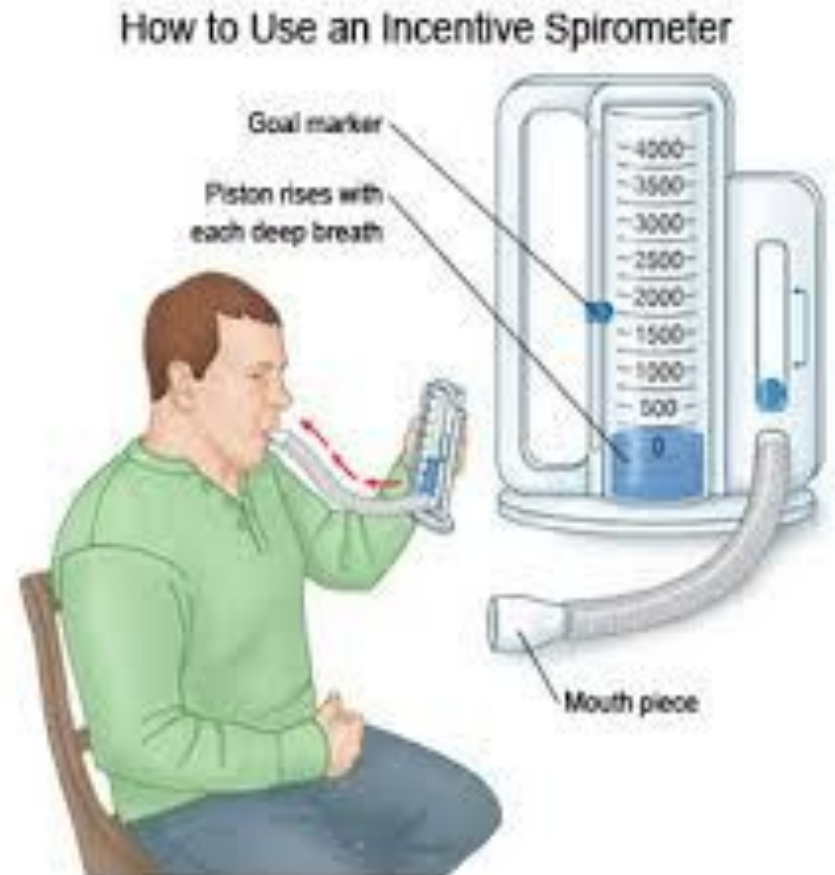
3. **Electronic (Digital)**

Spirometer – uses **sensors and computer** software for precise measurement.



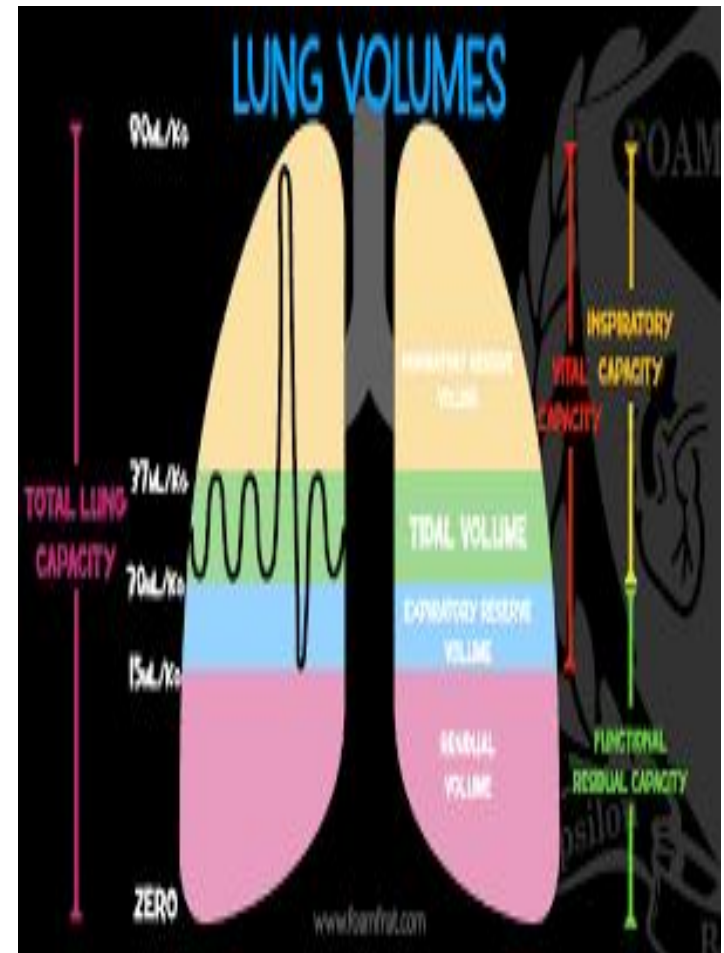
Components of Spirometer

1. Mouthpiece
2. Flow sensor or turbine
3. Filter (for infection control)
4. Nose clip
5. Display monitor or chart recorder
6. Calibration system



Parameters Measured

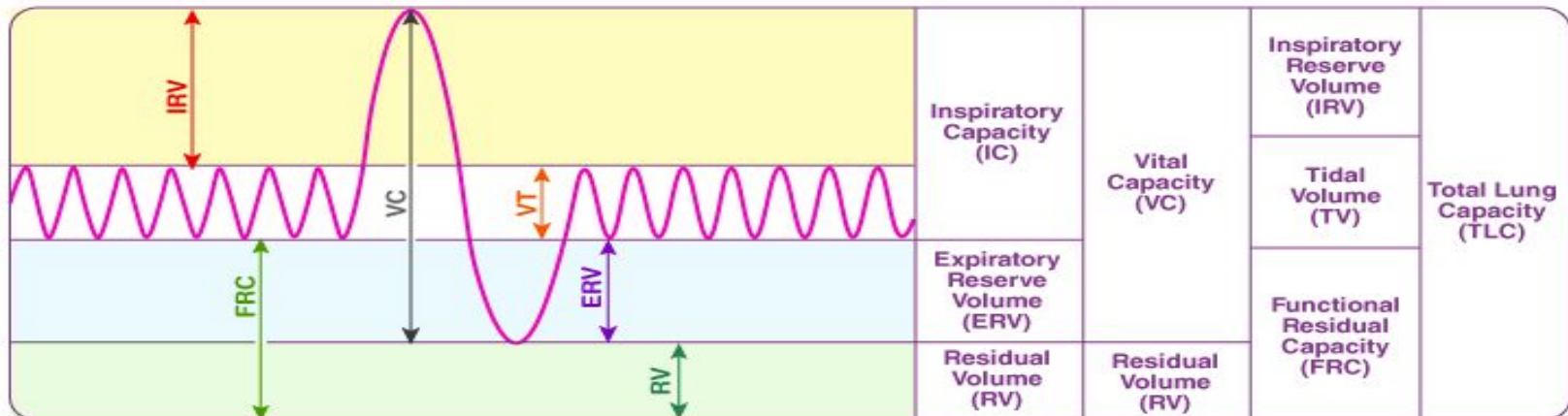
- Tidal Volume (TV) – Normal breath in and out
- Inspiratory Reserve Volume (IRV) – Extra air inspired after normal inspiration
- Expiratory Reserve Volume (ERV) – Extra air exhaled after normal expiration
- Forced Vital Capacity (FVC) – Maximum exhaled air after deep inspiration
- Forced Expiratory Volume (FEV₁) – Volume exhaled in the first second



The Spirogram

- Graph of volume vs. time or flow vs. volume.
- Used to detect obstructive (e.g., COPD, asthma) and restrictive (e.g., fibrosis, scoliosis) diseases.

SPIROGRAM



Clinical Applications

1. Preoperative evaluation before anesthesia.
2. Monitoring patients with chronic respiratory disease.
3. Assessing response to bronchodilators.
4. Detecting early pulmonary impairment in smokers or workers exposed to dust/gas.

Limitations and Precautions

1. Requires patient cooperation.
2. Contraindicated in:
Pneumothorax, Recent eye/chest/abdominal surgery, Unstable cardiac conditions.
3. Maintain infection control:
use disposable mouthpieces and filters.

References

1. Miller RD, Miller's Anesthesia, 9th Edition.
2. West JB, Respiratory Physiology.
3. American Thoracic Society (ATS) Spirometry Standards, 2023.

