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# Oxygen therapy

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# Definitions:



## Hypoxia

- Lack of  $\text{o}_2$  availability in tissues

## Hypoxemia

- Relative deficiency of  $\text{o}_2$  in blood
- Arterial  $\text{Po}_2 < 80$  mmhg

## Dysoxia

- Lack of  $\text{o}_2$  utilization by tissues

# Asphyxia vs Hypoxia

- Asphyxia and hypoxia are two related conditions that occur due to the inadequate supply of oxygen to the cells and tissues. Asphyxia is defined as a medical condition where the body does not receive enough oxygen due to abnormal breathing. On the other hand, hypoxia is a medical condition where the body tissues and organs are not supplied with an adequate level of oxygen to sustain normal bodily functions due to an underlying illness. So, this is the key difference between asphyxia and hypoxia



# Anoxia

an absence or deficiency of oxygen reaching the tissues; severe hypoxia.

"death due to anoxia resulting from strangulation"



- Oxygen therapy is the administration of oxygen at concentrations greater than ambient air(21%)  
With the intent of treating or preventing the symptoms and manifestations of hypoxia(a deficiency of oxygen reaching the tissues of the body)

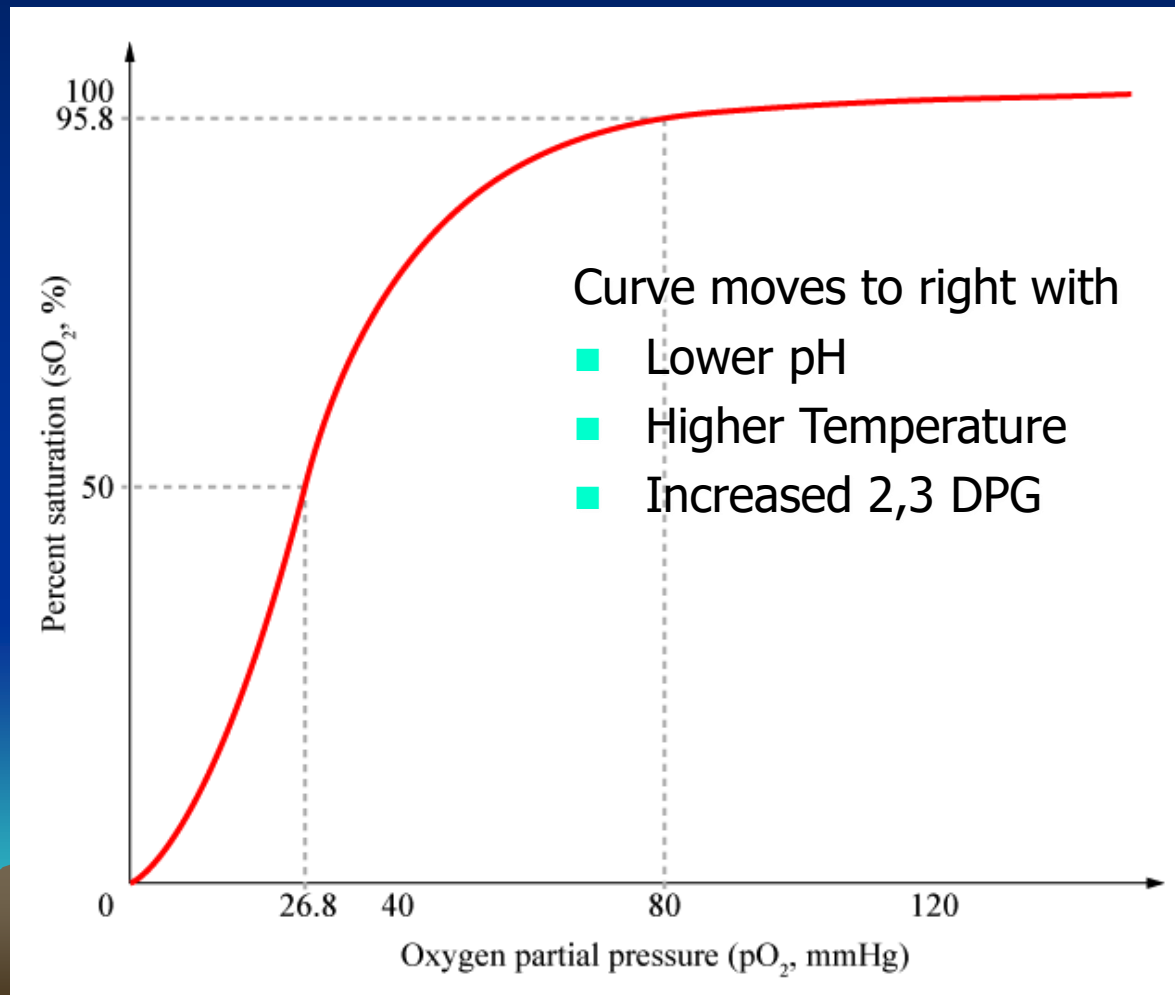


- $FiO_2$  = Fraction of inspired oxygen, or the percent of oxygen in the inspired gas
- Oxygen toxicity is cellular injury of the lung parenchyma and airway epithelium due to release of cytotoxic free oxygen radicals.
- There is no exact threshold at which  $O_2$  toxicity occurs, however signs of gas exchange abnormalities occur within 24-48 hours if on 100% oxygen. Atelectasis leading to drop in  $PO_2$ , decreased lung compliance, infiltrates on x-ray.
- Breathing  $FiO_2$  up to .5 for 2-7 days usually does NOT result in toxicity.





# Given a $\text{PaO}_2$ , what is the $\text{SaO}_2$ (and vice-versa)



# Respiration

The process of gas exchange;  
specifically at the alveolar and  
cellular level.

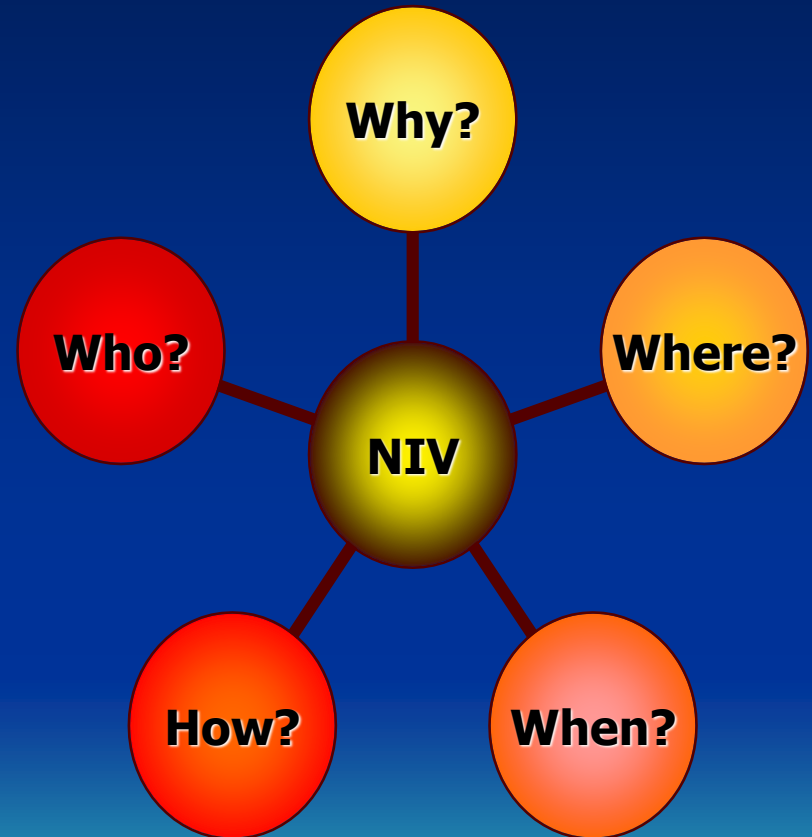


# Ventilation

The process of inspiration and expiration. Inspiration is an active process and expiration is a passive process.



# Setting up an acute non-invasive ventilation service



# OXYGEN THERAPY

- Aims to improve  $PaO_2$  by increasing  $FiO_2$
- Effective  $FiO_2$  - 0.24 - 0.50
- $FiO_2 > 0.50$  not indicated

# Indications for Oxygen Administration

- Any patient:
- with difficulty breathing or who is cyanotic or has (partially) obstructed airway
- suffering stroke, head injury, heart attack, or cardiac arrest
- who is unresponsive or in shock
- with spinal injuries
- with chest injuries other than bruised ribs



# O2 Administration cont...

- with suspected internal hemorrhage
- with open fractures, or closed fractures with possible internal hemorrhage
- with multiple injuries
- with moderate to severe burns, especially facial burns with possible affected airway
- with anemia or carbon monoxide poisoning
- Essentially any disease, injury, or environmental condition resulting in the amount of oxygen reaching the cells (perfusion) being inadequate.



# Types of Hypoxia

1-Hypoxic Hypoxia

2-Circulatory Hypoxia

3-Hemic Hypoxia

4-Demand Hypoxia

5-Histotoxic Hypoxia





# Hypoxic Hypoxia

- \*Low PaO<sub>2</sub>(arterial oxygen tension) secondary to FiO<sub>2</sub><.21 or decreased barometric pressure(altitude)
- \*Impaired ventilation secondary to neuromuscular weakness or narcotic overdose
- \*Impaired oxygenation secondary to Pulmonary Fibrosis, ARDS



# Circulatory Hypoxia

- \*Inadequate pumping of the blood from the heart to tissues , maybe secondary to disorders causing decreased cardiac output such as MI,low fluid volume, hypotension,poor supply of arteries. If the patient has myocardial ischemia supplemental O<sub>2</sub> is definitely indicated.



# Hemic Hypoxia

- Decreased oxygen carrying capacity as in anemia or carbon monoxide poisoning



# Demand Hypoxia

- Increased tissue consumption of oxygen in hypermetabolic states: like fevers



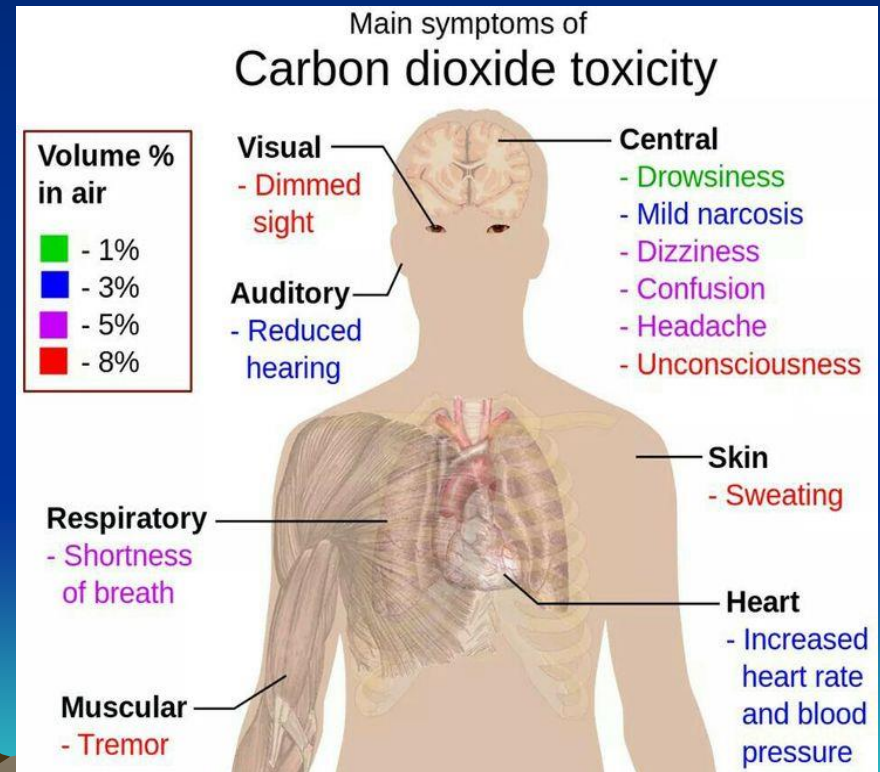
# Histotoxic Hypoxia

- Utilization of oxygen is abnormal such as in cyanide poisoning



# O2 therapy for **Non-Hypoxic** conditions

- Indicated in carbon monoxide poisoning where the carbon monoxide has combined with the haemoglobin to form carboxyhaemoglobin



# Signs and Symptoms of Hypoxia

- Tachypnea, dyspnea, hyperpnea,
- Tachycardia, dysrhythmias, pulse change, hypertension
- Anemia, polycythemia
- Restlessness, disorientation, lethargy,
- Cyanosis, digital clubbing



# Delivery systems





# Methods of o2 administration:

Method	maximum
	achievable fio2(at 6-10 L/M of o2)
• Nasopharyngeal catheter	50%
• Nasal prongs	50%
• <b>Masks:</b>	
• Without reservoir bag	50%
• With reservoir bag(partial rebreathing)	70%
• With reservoir bag(non rebreathing)	95%
• Venturi	24,28,35,40%
• Incubator	40%
• Canopy tent	50%
• Head box	95%
• Mouth to mouth(outside air)	16%

# The non rebreather mask

- This mask provides the highest concentration of
- **oxygen (95-100%)** at a flow rate 6-15 L/min.
- It is similar to the partial rebreather mask
- except two one-way valves prevent conservation of exhaled air.
- The bag is an **oxygen** reservoir





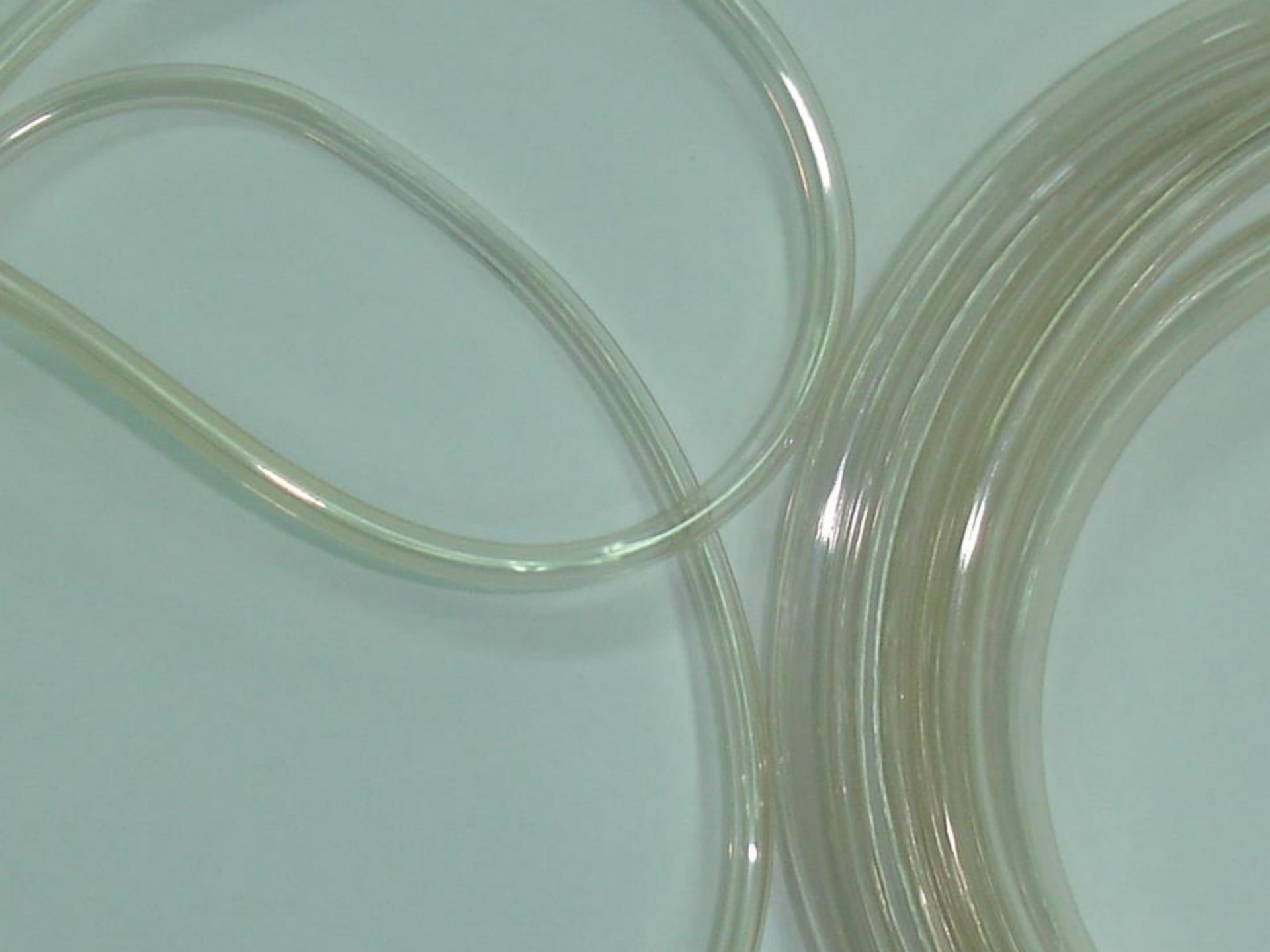








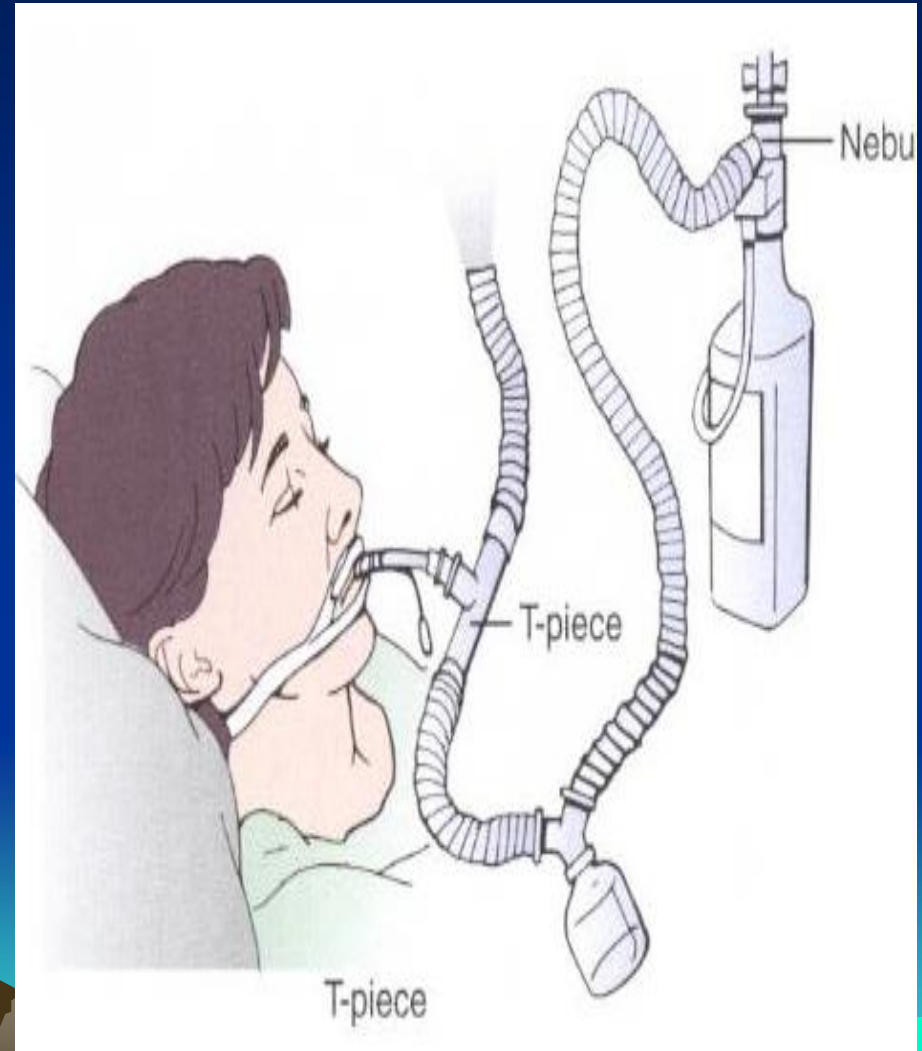
ICU





# T-piece

- Used on end of ET tube when weaning from ventilator
- Provides accurate **FIO<sub>2</sub>**
- Provides good humidity



# Mechanical Ventilation



# INDICATION

Acute hypoxemic respiratory  
failure

Acute hypercapnic respiratory  
failure



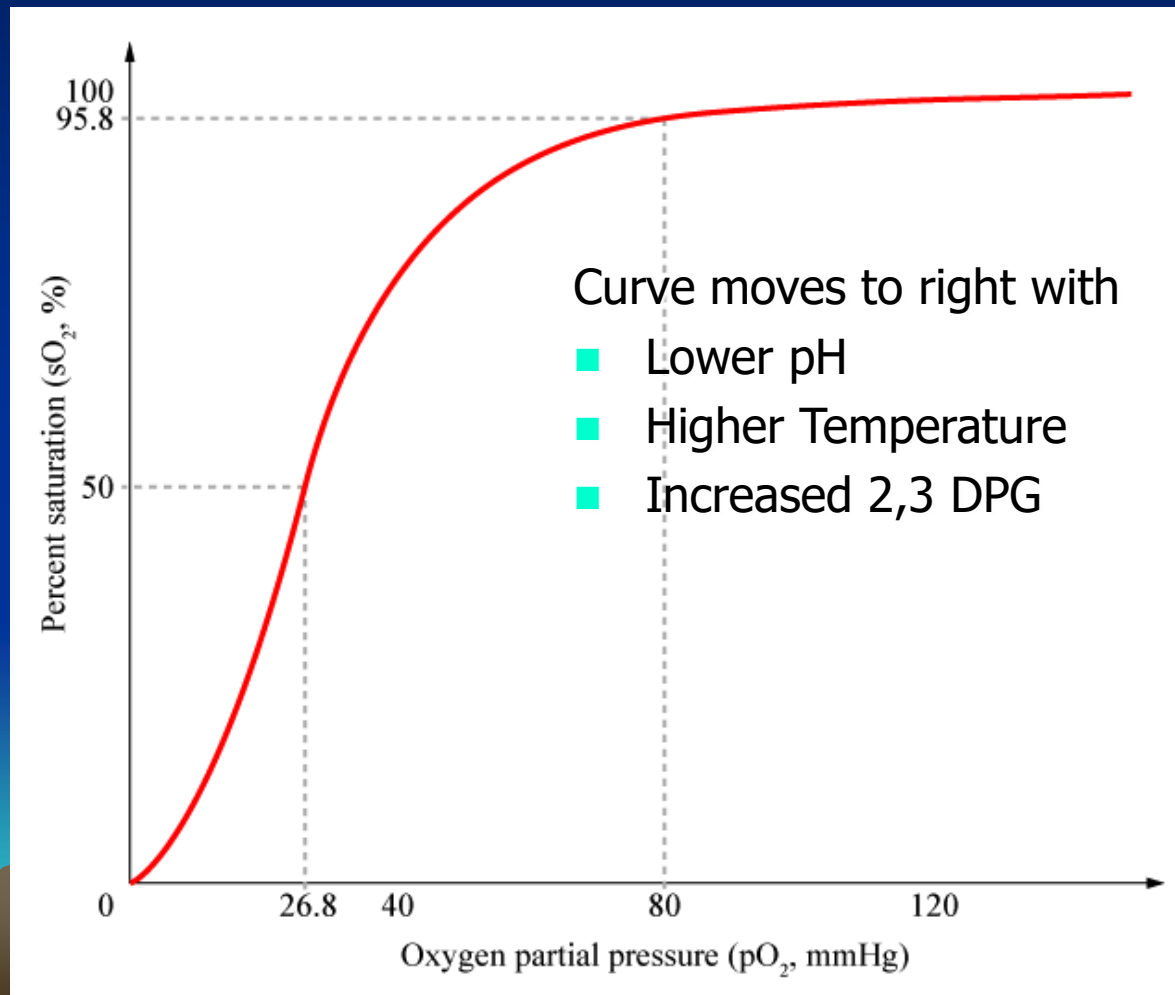
# Definiton:

Pao<sub>2</sub> less than 60% while fio<sub>2</sub> is  
more than 60%

Paco<sub>2</sub> is more than 50%



# Given a $P_{aO_2}$ , what is the $S_{aO_2}$ (and vice-versa)



Thank you for your attention  
any comment?

