AHP300 Notes

cmH2O – Centimeters of Water Column at 4 deg C Pressure Unit. Centimeters of Water Column is a manometric unit used to relate a pressure reading to the height of fresh water at a temperature of 4 degC. 1 centimeter of water gauge equals 98.0665 pascals.

Tidal Volume (symbol VT or TV) is the lung **volume** representing the normal **volume** of air displaced between normal inhalation and exhalation when extra effort is not applied. In a healthy, young human adult, **tidal volume** is approximately 500 mL per inspiration or 5 mL/kg of body mass.

Fraction of inspired oxygen (*Fi*O_2) is the fraction of oxygen in the volume being measured. Medical patients experiencing difficulty breathing are provided with oxygen-enriched air, which means a higher-than-atmospheric *Fi*O_2. Natural air includes 21% oxygen, which is equivalent to *Fi*O_2 of 0.21. Oxygen-enriched air has a higher *Fi*O_2 than 0.21; up to 1.00 which means 100% oxygen. *Fi*O_2 is typically maintained below 0.5 even with mechanical ventilation, to avoid oxygen toxicity.

The partial pressure of oxygen, also known as **PaO2**, is a measurement of oxygen in arterial blood. Decreases in PaO2 (partial pressure of oxygen in the arteries) result in less O2 in the blood and increases in PaO2 result in more O2 in the blood.

PaO2/FiO2 ratio. The ratio of partial pressure arterial oxygen and fraction of inspired oxygen, sometimes called the Carrico index, is a comparison between the oxygen level in the blood and the oxygen concentration that is breathed.

CPAP is an important treatment for obstructive sleep apnea, but it's not without its frustrations. ... Continuous positive airway pressure (**CPAP**) therapy is a common treatment for obstructive sleep apnea. A **CPAP** machine uses a hose and mask or nosepiece to deliver constant and steady air pressure.

BiPAP (also referred to as BPAP) stands for Bilevel Positive Airway Pressure, and is very similar in function and design to a CPAP machine (continuous positive airway pressure). Similar to a CPAP machine, A **BiPAP** machine is a non-invasive form of therapy for patients suffering from sleep apnea.

BiPAP machines have two pressure settings. The main **difference between BiPAP** and **CPAP** devices is that **BiPAP** machines have two pressure settings: one pressure for inhalation (IPAP), and a lower pressure for exhalation (EPAP).

Peak inspiratory pressure (PIP) is the highest level of **pressure** applied to the lungs during inhalation. In mechanical ventilation the number reflects a positive **pressure** in centimeters of water **pressure** (cmH_2O).

To provide oxygenation and ventilation. Or to reduce work of breathing. ... **Pressure support** – **pressure** that augments a spontaneous breath. **PEEP** – positive end expiratory **pressure**. **Pressure** that is maintained at the end of expiration to prevent alveolar collapse.

Low pressure alarms are usually caused by a leak or disconnect. **Low-pressure alarms** are often used to detect the drop in peak inspiratory **pressure**(PIP) that occurs when a patient becomes disconnected from a **ventilator.**

High pressure alarm: This will sound when the **pressure** in the circuit has increased. It helps protect the lungs from **high pressures** delivered from the **ventilator**. Secretions, water in the tubing, or kinks in the tubing can cause **high pressure**.

AC mode (Assist/Control) **AC** ventilation is a **volume**-cycled **mode** of ventilation. It works by setting a fixed tidal **Volume** (VT) that the ventilator will deliver at set intervals of time or when the patient initiates a breath.

Volume-controlled ventilation (VCV) and **pressure-controlled ventilation (PCV)** are not different ventilatory modes, but are different control variables within a mode.

VCV offers the safety of a pre-set tidal volume and minute ventilation but requires the clinician to appropriately set the inspiratory flow, flow waveform, and inspiratory time.
During **VCV**, airway pressure increases in response to reduced compliance, increased resistance, or active exhalation and may increase the risk of ventilator-induced lung injury.

PCV, by design, limits the maximum airway pressure delivered to the lung, but may result in variable tidal and minute volume. During PCV the clinician should titrate the inspiratory pressure

to the measured tidal volume, but the inspiratory flow and flow waveform are determined by the ventilator as it attempts to maintain a square inspiratory pressure profile.

PCV offers no advantage over **VCV** in patients who are not breathing spontaneously, especially when decelerating flow is available during **VCV**. **PCV** may offer lower work of breathing and improved comfort for patients with increased and variable respiratory demand.

Synchronized Intermitted Mandatory Ventilation (**SIMV**) describes a method of providing **mechanical** breaths to a patient. In the **SIMV mode**, the patient is allowed to take additional breaths in between the **mechanical** breaths. The patient's own breaths are called "spontaneous breaths".

SIMV - Synchronized Intermittent Mandatory Ventilation - it is a mode in which the ventilator has some minimum breathing frequency - f set, that it will provide to the patient no matter what.

However, if the patient starts his/her own breath it will be counted into the limit. this allows the patient to get more breaths than the set limit - e.g. you set f 12, and the patient starts his own 15 breaths - in other modes this would start an alarm, in SIMV it is ok.

(An "**SIMV** of 12" means that the patient is getting 12 guaranteed (mandatory) breaths per minute from the ventilator.)

In SIMV - if the patient does not initiate his own breaths, she will be given one every 5 secs, but if she starts another one after 4 secs - ventilator will help it and start a new one after next 5 sec (so in sec. 9 instead of 10).

Ventilation calculations require inspiratory and expiratory times. The **inspiratory time** is the time taken for inhalation. For ventilators, the inspiratory time is the amount of time it takes to deliver the tidal volume of air to the lung.

The ratio of inspiratory time to expiratory time is a vital indication of respiration quality and is directly related to the respiration rate. An increased inspiratory rate leads to more efficient removal of CO2 from the body.

Locate the respiration rate by counting breaths per minute. For this example, take 15 breaths/minute as the rate. The average for adults is 12 to 20 breaths per minute.

Divide 60 by the respiration rate. There are 60 seconds in 1 minute. So, this calculation yields 60/15, or 4 seconds, for each complete breath. One complete breath is one inhale and one exhale.