

Ventilator Pocket Guide

**Foundational Equations**

<b>Ohm's Law</b>	$\Delta P = FR = P_{aw} - P_{alv} = P_{pl} - PEEP_{total}$						
<b>Equation of Motion</b>	$P_{aw} = FR + \frac{V_t}{C} + PEEP_{total}$						
<b>Compliance</b>	$C = \frac{\Delta V}{\Delta P}$						
<b>Natural Decay Equation</b>	$V_i(t) = \frac{V_o}{e^{\frac{t}{RC}}} = \frac{V_o}{e^{\frac{t}{\tau}}}$						
<b>Calculating <math>\tau</math>, General Case</b>	$\tau = \frac{V_t \cdot F}{PIP - P_{plt} - PEEP_{total}}$						
<b>Patient</b>	<b>Mode</b>	<b>TV</b>	<b>Rate</b>	<b>Ppeak</b>	<b>Pplat</b>	<b>PEEP<sub>auto</sub></b>	<b>PEEP<sub>set</sub></b>

- [Vent Waveforms](#)

**Alveolar Gas Equation**

$$PAO_2 = FiO_2(P_{atm} - P_{H_2O}) - \frac{PaCO_2}{RQ}$$

substituting back in to  $RQ$  equation:  $RQ = \frac{P_{ACO_2}}{\frac{V_{AP_{ACO_2}}}{V_{O_2}} - \frac{V_A}{V_a}} = \frac{V_{O_2}}{V_a} k$

$$V_T = V_A + V_D, \text{ where } V_A = 350 \text{ and } V_D = 150$$

**Dead Space Fraction**

$$\frac{V_D}{V_T} = \frac{P_{ACO_2} - P_{ECO_2}}{P_{ACO_2}}$$

Formal measurement of  $P_{ECO_2}$  requires volumetric capnography, which requires a capable ventilator or a dedicated measurement device.

Thankfull,  $P_{ECO_2} \approx ETCO_2$ , so an approximation would  $\frac{V_D}{V_T} = \frac{P_{ACO_2} - ETCO_2}{P_{ACO_2}}$

**Alveolar ventilation**

$$P_{A}O_2 = F_{iO_2}(P_{atm} - P_{H_2O}) - \frac{P_{AO_2}}{RQ}$$

$$\dot{V}_A = k \frac{\dot{V}CO_2}{P_{ACO_2}} \implies \dot{V}CO_2 = \frac{\dot{V}_{AP_{ACO_2}}}{k}$$

To convert  $F_{ACO_2}$  into  $P_{ACO_2}$ , we have  $F_{ACO_2}(P_{atm} - P_{H_2O}) = P_{ACO_2}$  Similarly, using  $F_{ECO_2}$ , we can show  $P_{ECO_2} = F_{ECO_2}(P_{atm} - P_{H_2O})$

$$Volume_{expiredCO_2} = Volume_{producedAlvCO_2}$$

$$V_{TF_{ECO_2}} = V_{AF_{ACO_2}}$$

$$V_{TF_{ECO_2}} = (V_T - V_D)F_{ACO_2}, \text{ and we can convert } F_{ACO_2} \text{ into } P_{ACO_2}$$

Last update: 2023/12/22 19:08 resources:checklists:ventilator\_rounding [https://ewrobbins.com/doku.php?id=resources:checklists:ventilator\\_rounding&rev=1703272128](https://ewrobbins.com/doku.php?id=resources:checklists:ventilator_rounding&rev=1703272128)

---

From: <https://ewrobbins.com/> - ewrobbins.com

Permanent link: [https://ewrobbins.com/doku.php?id=resources:checklists:ventilator\\_rounding&rev=1703272128](https://ewrobbins.com/doku.php?id=resources:checklists:ventilator_rounding&rev=1703272128)

Last update: **2023/12/22 19:08**

