Deriving the full EOM

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Expiratory time constant for determinations of

plateau pressure, respiratory system compliance, and total resistance

# Hypothesis:

Expiratory time constant (TE) can be usecd to determine Pplt, Crs and Rtot. Since TE contains information regarding the mechanical properties of the respiratory system, namely elastance and resistance.

# **Material and Methods**

TE is expressed in seconds, and one TE represents the time required for the lungs to reach 63% of its equilibrium value. TE was measured 0.10 to 0.50 seconds after beginning of exhalation, using available Vt and flow measurements. Specifically, the slope of the least square fit between Vt and Flow constituted TE. A straight line between the linear fit is necessary, as it ensures relacation of the patients respiratory muscles.

# Derivation of equations

***Rtot***

For Rtot, we again start with the EOM, disregarding Pmus

Paw – PEEP = VT / Crs + Rtot X Inhaled flow

Multiply Vt/Crs by Rtot/Rtot:

Paw – PEEP = VT  X Rtot / Crs X Rtot + Rtot X Inhaled flow

Substitute TE for Rtot\*Crs on the right side gives:

Paw – PEEP = VT  X Rtot / ƬE  + Rtot X Inhaled flow

Factoring the right side gives:

Paw – PEEP = Rtot (VT / ƬE  + Inhaled flow)

Divide both sides by Vt/TE:

***Paw - PEEP***

***Rtot =***

***VT***

***+ Inhaled flow***

***ƬE***

TE is traditionally the product of Crs and Rtot.

***Crs***

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***Pplat***

Plateau pressure = (tidal volume / static compliance

) + PEEP

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