A Mathematical Model of Ventilation and Perfusion

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TECHNOLOGY DESCRIPTION

This work consists of a series of derived mathematical equations that describe the distribution of gas and pulmonary perfusion in various physiological states. These equations calculate intrathoracic pressure with various lung conditions (varying maximum volume, compliance, and baseline pressures) and the manipulation of ventilator settings (tidal volume, PEEP, and ventilation rate). The equations also integrate PaCO2 and PetCO2 as a function of pulmonary perfusion, as well as airflow through the lung, based on values obtained in a population of ED patients with and without obstructive lung disease.

APPLICATIONS

Together, these equations allow for multiple potentially useful functions:

- Predict cardiac output from the PaCO2-PetCO2 difference.
- Predict PaCO2 from PetCO2 and pulmonary airflow.
- Adjust ventilation settings based on predicted cardiac output from PetCO2 and predicted oxygenation.
- Predict tidal volume from PetCO2.
- Predict relative oxygenation with various ventilation settings and input values for cardiac output.
- Predict pulmonary airflow from capnograph shape.

In addition, these equations serve as an educational and research tool to better define optimal ventilation in various physiological conditions.

CONTACT

University of California, San Diego
Office of Innovation and Commercialization
innovation@ucsd.edu
tel: 858.534.5815.

OTHER INFORMATION

CATEGORIZED AS

- **Medical**
  - Research Tools
- **Research Tools**
  - Other

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