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Novel Equations of Motion for Ventilator Graphics Interpretation

T Rajini Samuel*

Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth Deemed to be University, Tamil Nadu, India.

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ABSTRACT

Ventilators play a major role in the management of COVID-19 patients. The understanding and interpretation of Ventilator Graphics plays an indispensable role for monitoring of the mechanical ventilation at the bedside and is considered the most important part in management of critically ill patients. The variation in pressure during inspiration and expiration results in changes in lung volume but this process is a time consuming one. The concept of time constant is used to analyze the speed of this process and it gives necessary information about the time needed to inhale and exhale adequate tidal volume during inspiration and expiration respectively. Understanding the relationship of physical concepts like pressure gradient, resistance, compliance, frequency, total cycle time, tidal volume, flow and work forms the basics of mechanical ventilation. The single compartment model of respiratory system is the basic mathematical models of breathing mechanics. The parameters like pressure, volume and flow are all continuous functions of time which is known as the force balance equation or the Equation of Motion for the respiratory system. Novel equations are derived by modifying the equations of motion of the respiratory mechanics which are to be considered as differential equations. The application of these newer equations may result in better understanding of the respiratory mechanics in mechanical ventilation that plays a significant role in the interpretation of invaluable ventilator graphics for the intensive care unit patients.

Keywords: Novel equation of Motion, Ventilator graphics, Respiratory mechanics

Corresponding author: T Rajini Samuel, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth Deemed to be University, Tamil Nadu, India, E-mail: samuel.rajini@gmail.com

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