

Documents

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FiO₂ prediction formula during low flow oxygen therapy in an adult model: a bench study

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Abstract

During low-flow oxygen therapy, the true value of inspired oxygen fraction (FiO₂) is generally unknown. Knowledge of delivered FiO₂ values may be useful as well as to adjust oxygen therapy, as well as to predict patient deterioration. This study proposes a New FiO₂ Prediction Formula (NFiO₂) for low-flow oxygenation and compares its predictive value to precedent formulas. In a bench study, the O₂ Flow rate was delivered through a T-piece connected to a dual-compartment artificial lung controlled by a mechanical ventilator. To test the NFiO₂ formula, a set of ventilatory parameters were tested: Tidal Volume was set from 400 to 600 ml, Respiratory Rate (RR) was set from 18 to 30 CPM, Ti/Ttot was set at 0.33 and 0.25, and O₂ flow rates from 3 to 10 L/min. A data acquisition system measured all parameters. To quantify the accuracy of the NFiO₂ compared to other FiO₂ prediction formulas, Bland and Altman agreement analyses were performed. To make use of the Duprez Formula 2018 in clinical practice, we simplified the formula to estimate the FiO₂ during oxygenation at low flow. This NFiO₂ formula makes use of only O₂ Flow Rate and RR. Bias and limits of agreement between predicted FiO₂ and benchtop FiO₂ highlighted consistent differences between different FiO₂ prediction formulas. The NFiO₂ and the Duprez Formula 2018 seemed to be the most accurate formulas, followed by the Vincent Formula, and lastly the Shapiro Formula. A New FiO₂ Prediction Formula was developed using clinical readily available variables (RR and O₂ Flow rate) which showed good accuracy in predicting FiO₂ during oxygenation at low flow. © 2023, The Author(s), under exclusive licence to Springer Nature B.V.

Author Keywords

FiO₂; Hypoxemia; Hypoxia; Low flow oxygen therapy; Prediction formula

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oxygen; adult, artificial ventilation, breathing rate, human, lung, oxygen therapy; Adult, Humans, Lung, Oxygen, Oxygen Inhalation Therapy, Respiration, Artificial, Respiratory Rate, Ventilators, Mechanical

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