

Physician-Ordered Aerosol Therapy Versus Respiratory Therapist-Driven Aerosol Protocol: Effect on Resource Utilization

To the Editor:

The article by Kallam and colleagues¹ about the potential financial advantages of protocol-driven bronchodilator therapy provides an important perspective. However, there are no data about the validation of the scoring tool or the evidence supporting the correlation of the bronchodilator orders with the assessment score. While we await their report on their before-and-after project examining clinical outcomes, can they provide this missing information?

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The author has disclosed no conflicts of interest.

REFERENCES

1. Kallam A, Meyerink K, Modrykamien AM. Physician-ordered aerosol therapy versus respiratory therapist-driven aerosol protocol: the effect on resource utilization. *Respir Care* 2013;58(3):431-437.

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The authors respond to: Physician-Ordered Aerosol Therapy Versus Respiratory Therapist-Driven Aerosol Protocol: Effect on Resource Utilization

We appreciate Ms Carroll's question. The respiratory-therapist-driven bronchodilator protocol we described¹ was based on one previously published.² Importantly, we would like to clarify that the aim of our study was not the validation of a tool. We just described a phase of a quality improvement project, which eventually showed that systematization and homogeneity of a process (bronchodilator administration) can, hypothetically, save costs, when compared with a heterogeneous physician-driven strategy. We are currently in the process of an-

alyzing the data from before and after implementation of this protocol. Our results should be available soon.

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REFERENCES

1. Kallam A, Meyerink K, Modrykamien AM. Physician-ordered aerosol therapy versus respiratory therapist-driven aerosol protocol: the effect on resource utilization. *Respir Care* 2013;58(3):431-437.
2. Stoller JK, Mascha EJ, Kester L, Haney D. Randomized controlled trial of physician-directed versus respiratory therapy consult service-directed respiratory care to adult non-ICU inpatients. *Am J Respir Crit Care Med* 1998;158(4):1068-1075.

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Practice of Excessive F_{IO₂} and Effect on Pulmonary Outcomes in Mechanically Ventilated Patients With Acute Lung Injury

To the Editor:

Rachmale et al¹ evaluated prospectively the electronic medical records of 289 patients with acute lung injury, of whom 210 patients met their inclusion criteria, which were summarized in Table 1 in their article. One-hundred fifty-five patients (74%) were exposed to excessive oxygen.¹ Prolonged exposure to excessive oxygen correlated with worsening of the oxygenation index at 48 hours, in a dose-response manner, and more days on mechanical ventilation, longer ICU and hospital stay, and worsening lung function.¹ Given the importance of avoiding excessive F_{IO₂}, understanding oxygen delivery (D_{O₂}) and balancing that with oxygen consumption should be stressed in the education of nurses and

respiratory therapists. If D_{O₂} is reduced but remains above a critical value, oxygen consumption tends to be maintained at its normal value by increasing oxygen extraction.²

Oxygen delivery is commonly calculated using the equation:

$$D_{O_2} = (S_{aO_2}) (Hb) (1.34) + (P_{aO_2}) \times (0.003) \times CO \times 10$$

Where S_{aO₂} is percentage of oxygen saturation, Hb is hemoglobin, P_{aO₂} is the arterial partial pressure of oxygen, and CO is cardiac output. Increasing P_{aO₂} from 60 mm Hg to 100 mm Hg would only increase oxygen-hemoglobin concentration by around 10% (S_{pO₂} from 90% to 100%), and increase oxygen content from dissolved O₂ by 40 × 0.003 = 0.12 mL/L, which is negligible, considering that the normal D_{O₂} is approximately 1,000 mL/min. Further improvement in D_{O₂} occurs when treating anemia and optimizing the cardiac output. Therefore, treating the anemia or low cardiac output should be done first, and mild hypoxemia may be acceptable in some situations, as reported by Martin et al.³ They suggested that hypoxia triggers a complex network of cellular signaling pathways that may result in protective responses.³

Protocol-driven F_{IO₂} titration should be combined with a clear understanding that high F_{IO₂} only slightly increases D_{O₂}. Healthcare providers need to be educated on the fundamentals of D_{O₂} to avoid hyperoxygenation lung injury in mechanically ventilated patients.

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REFERENCES

1. Rachmale S, Li G, Wilson G, Malinchoc M, Gajic O. Practice of excessive F_{IO₂} and effect on pulmonary outcomes in mechanically ventilated patients with acute lung injury. *Respir Care* 2012;57(11):1887-1893.
2. Lumb AB, Pearl RG. Oxygen. In: Nunn's applied respiratory physiology. Philadelphia: Elsevier; 2005;116-200.