general procedure limits oxygen to no more than 10 L for F_{IO_2} approximately 0.4–0.5. I would need a machine that has a blender that would guarantee a delivered F_{IO_2} for higher concentrations to obtain an accurate P_{aO_2}/F_{IO_2} . Examples of calculated flows based on the formula would be as follows: 5 L = 36%, 10 L = 51%, 15 L = 66%, or 20 L = 81%.

I recently cared for a patient with acute hypoxemic respiratory failure and an S_{pO_2} of 89% on 6 L nasal cannula. The patient was placed on a CPAP device without an oxygen blender as I waited for a different machine with a blender. No matter what flow, based on the limitations of that machine, the saturation did not change. The patient required an F_{IO_2} of >0.6 before the S_{pO_2} began to increase. At 8, 10, 15, and 20 L bled into the mask port, S_{pO_2} remained doggedly fixed at 89–90%. Indeed, the limitations on this device did not agree with the formula for F_{IO_2} described in the paper.

The use of this equation may represent some false acceptance that the F_{IO_2} is truly delivered to the patient and may lead to false assumptions regarding the seriousness of the subject's condition. Although the paper has merit with regard to volume or pressure targeting, the authors should have reported flow and P_{aO_2} so that readers could make their own assumptions about oxygenation.

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REFERENCES

- Cao Z, Luo Z, Hou A, Nie Q, Xie B, An X, et al. Volume-targeted versus pressure-limited noninvasive ventilation in subjects with acute hypercapnic respiratory failure: a multicenter randomized controlled trial. *Respir Care* 2016;61(11):1440-1450.
- Dean NC, Jones J, Herrero FS, Jephson A, Brown S, Jones BE, Vines C. Calculating PaO_2/fiO_2 from Spo_2 in emergency department patients with pneumonia; comparison of the Severinghaus and Rice equations in a Utah population. Meeting (Abstract) 2012. http://www.atsjournals.org/doi/abs/10.1164/ajrcm-conference.2012.185.1_MeetingAbstracts.A1806. Accessed November 13, 2016.
- Bilan N, Dastranji A, Ghalehgholab Behbahani A. Comparison of the SpO_2/FIO_2 ratio and the PaO_2/FIO_2 ratio in patients with acute lung injury or acute respiratory distress syndrome. *J Cardiovasc Thorac Res* 2015;7(1):28-31.
- Mehta TR, Shah CT, Lakhani, JD. Can pulse oximetric saturation (SpO_2)/fraction of inspired oxygen (FiO_2) ratio surrogate PaO_2/FiO_2 ratio in diagnosing acute respiratory failure? *Int J Biomed Adv Res* 2016;7(5):242-246.
- Rice TW, Wheeler AP, Bernard GR, Hayden DL, Schoenfeld DA, Ware LB. Comparison of the SpO_2/FIO_2 ratio and the PaO_2/FIO_2 ratio in patients with acute lung injury or ARDS. *Chest* 2007;132(2):410-417.

P_{aO_2}/F_{IO_2} Is Not a Guestimation—Reply

In Reply:

We thank Ms Couture for her interest and for commenting on our work.¹ We agree that P_{aO_2}/F_{IO_2} could not be accurately calculated in our study, because supplemental oxygen was delivered through a port in the mask, and the non-invasive ventilator that we used did not provide accurate F_{IO_2} .

According to the protocols of Mehta et al² and Bellone et al³ to determine P_{aO_2}/F_{IO_2} ratios while subjects are receiving noninvasive ventilation, F_{IO_2} is calculated using the following conversion factor: (21% + [3% × oxygen flow in L/min of supplemental oxygen]). This conversion factor is influenced by minute ventilation, breathing patterns, and air leakage. We agree that S_{pO_2}/F_{IO_2} , as an alternative to P_{aO_2}/F_{IO_2} , may be a novel and noninvasive way to rapidly assess respiratory failure. However, the determination of F_{IO_2} remains inaccurate and is influenced by minute ventilation, breathing patterns, and air leakage.

Ms Couture found that a patient with acute hypoxemic respiratory failure had an S_{pO_2} of 89% on 6 L/min of supplemental oxygen, and S_{pO_2} remained unchanged when the supplemental oxygen was increased to 20 L/min. Two possible reasons deserve attention. First, the increment of F_{IO_2} was indeed less than the increment of supplemental oxygen. Second, if acute hypoxemic respiratory failure is caused by serious intrapulmonary shunt, it

might be difficult to improve S_{pO_2} by increasing F_{IO_2} .

Finally, the main purpose of the present study was to verify whether, compared with pressure-controlled mode, volume-controlled mode would be more effective in correcting hypercapnia, hence reducing the need for intubation and improving survival in subjects with acute hypercapnic respiratory failure. P_{aO_2}/F_{IO_2} was not the primary end point of the present study and was not the primary issue in our subjects. Hence, despite the inaccurate determination, the P_{aO_2}/F_{IO_2} values from the 2 groups remained comparable, and changes in their values could be used to demonstrate changes in subjects' oxygenation, because F_{IO_2} was determined using an identical formulation.

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REFERENCES

- Cao Z, Luo Z, Hou A, Nie Q, Xie B, An X, et al. Volume-targeted versus pressure-limited noninvasive ventilation in subjects with acute hypercapnic respiratory failure: a multicenter randomized controlled trial. *Respir Care* 2016;61(11):1440-1450.
- Mehta S, Jay GD, Woolard RH, Hipona RA, Connolly EM, Cimini DM, et al. Randomized, prospective trial of bilevel versus continuous positive airway pressure in acute pulmonary edema. *Crit Care Med* 1997;25(4):620-628.
- Bellone A, Monari A, Cortellaro F, Vettorello M, Arlati S, Coen D. Myocardial infarction rate in acute pulmonary edema: noninvasive support ventilation versus continuous positive airway pressure. *Crit Care Med* 2004;32(9):1860-1865.