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No Place Like Hospital: Initiation of Home Noninvasive Ventilation in Hypercapnic Chronic Obstructive Pulmonary Disease

To the Editor:

I read with great enthusiasm the American Thoracic Society (ATS) Guidelines and the summary for clinicians about home noninvasive ventilation (NIV) in stable hypercapnic chronic obstructive pulmonary disease (COPD) (1, 2). I would like to thank the experts for providing guidance regarding how to implement home NIV in everyday clinical practice. The Guidelines do recommend NIV initiation in patients with a recent hospitalization because these patients are at high risk for rehospitalizations and mortality. They recommend NIV initiation 2–4 weeks after discharge and resolution of the acute respiratory failure. This recommendation is driven mainly based on findings of the landmark trial by Struik and colleagues (3). The study recruited 201 patients with COPD with forced expiratory volume in 1 second % predicted <50% hospitalized with acute hypercapnia respiratory failure. Eligible participants were patients with persistent hypercapnia (average arterial carbon dioxide tension/pressure of 59 mm Hg) but normal pH 48 hours after ventilatory support was discontinued, which indicates transition from acute-on-chronic to chronic respiratory failure. Study participants were randomized to NIV or standard of care and underwent NIV initiation during the hospital stay. The average expiratory positive airway pressure and inspiratory positive airway pressure were 4.8 and 19.2 cm H_2O, respectively. There was no difference in hospitalizations or mortality rates at 1 year between NIV and standard of care. This is the only recent well-conducted large randomized controlled trial showing no benefit from home NIV with high inspiratory positive airway pressure–expiratory positive airway pressure difference. A nonoptimal randomization may be the reason for those findings, as the intervention group included sicker patients (53% of the participant taking oral steroids) than the participants in the control group (38% of them taking oral steroids). Study participants in both arms may not have had severe disease despite poor lung function, as the median exacerbation rate before their enrollment was two as opposed to three exacerbations per year in Murphy and colleagues' trial (4). The authors assumed that their cohort of patients with presumable acute-on-chronic hypercapnic respiratory failure may have been "diluted" with those who had transient hypercapnia due to acute respiratory failure as arterial carbon dioxide tension/pressure normalized in 26% of participants after 3 months. The rationale of the ATS Guidelines not to initiate NIV during a hospital stay presumes that it is difficult to distinguish between a transient acute hypercapnic respiratory failure and an acute-on-chronic hypercapnic respiratory failure. Patients with chronic hypercapnic respiratory failure are likely those patients with COPD who benefit from home NIV. However, there are often data from previous encounters (e.g., arterial blood gases) to confirm whether the patient is experiencing an acute versus acute-on-chronic hypercapnic respiratory failure. Hospital stay is thus the ideal time to initiate NIV because the patient has the chance to try the equipment for two to three nights under the supervision of the healthcare professionals and address issues with its use. Patients with COPD who experience a near fatal event and received NIV as treatment for it may be more willing to consider home NIV for the outpatient care of their COPD. In addition, discharging the patient and scheduling a follow up does not guarantee the appropriate follow up will take place. Patients may have another acute exacerbation of COPD (AECOPD)-related hospitalization before the follow up. Moreover, 75–80% of patients hospitalized with hypercapnic respiratory failure due to AECOPD have persistent hypercapnia 6 weeks after discharge (4, 5), and hypercapnia is a strong predictor of rehospitalization (6). Thus, the hospital is potentially the ideal place to initiate home NIV in patients hospitalized with acute-on-chronic hypercapnic respiratory failure owing to AECOPD if there is sufficient data to confirm that the patient has chronic hypercapnic respiratory failure. ■

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Ventilator Options for COVID-19: Quality Trumps Quantity

To the Editor:

Over the past year, coronavirus disease (COVID-19) has caused "mechanical ventilator" to become a household word and discussions of predicted dire ventilator shortages spurred a multitude of proposed solutions. These ranged from invoking the Defense War Powers Act, encouraging automobile manufacturers to ramp up ventilator production, to development of ventilators by groups for the first time. "Experts" in mechanical ventilation proliferated among the medical, political, and lay communities.

Dar and colleagues cover a number of these issues in their recent paper (1). We congratulate the authors regarding their detailed discussions related to the challenges of anesthesia ventilators in the intensive care unit (ICU), a procedure far more difficult than anticipated. Anesthesia devices are meant for short-term use with an attendant nearby, as such alarms are quiet by ICU standards. The rebreathing system of the anesthesia ventilator and use of carbon dioxide absorbent complicates management and leads to excess humidity issues. Fresh gas flow, a critical setting on an anesthesia device, doesn't exist in an ICU ventilator. Performance and operation of the anesthesia ventilator requires training and expertise. Competence with an ICU ventilator does not translate to the quite different anesthesia ventilator (2).

However, we believe that the suggestion to include "ventilation devices" such as the oxylator and GO2VENT lacks justification and could lead to inappropriate decisions by planners. To begin with, both devices are automatic resuscitators, not ventilators. By definition, they are only intended for use when attended by a caregiver, one-on-one. We must be careful and explicit in the words we use to prevent misinterpretation. Neither device has alarms and monitoring is limited to a disposable analog gauge in one and nothing in the other. These devices are small and cheap, perhaps a desirable feature to logisticians with no understanding of the intricacies of ventilatory support in the ICU.

Jonkman and colleagues have recently evaluated the oxylator, characterizing its performance and concluding that short term attended use is the only safe application (3). Previous work by Babic and colleagues demonstrated routine, unannounced failure of the Vortran resuscitator associated with changes in device position (4). The authors appear to have ignored or been unaware of these issues when making this unwarranted recommendation.

Had the authors discussed these devices with the same scrutiny given anesthesia ventilators, they would have listed limitations to include lack of alarms, lack of monitoring, inability to guarantee a tidal volume, inability to set a respiratory rate, changes in ventilator settings with changes in respiratory mechanics, and need for an external positive end-expiratory pressure valve. Both devices also have a limited inspiratory flow (<40 L/min), leading to flow starvation in a patient, triggering the ventilator. These are major limitations even in patients without COVID-19.

They also suggest trading these devices to emergency medical services' ambulances for devices used in the field. Again, knowledge of the field would yield the finding that ventilators are rarely used in emergency medical services (5). It would be difficult to know what you are getting in return with the trade.

As the medical community begins to feel relief from the crush of the current pandemic, we should look back and assess successes and failures. We must take care in the words we use and in our recommendations. In an attempt to cover all the bases, the authors do not appear to have given this recommendation the thought and caution it deserves. We add this to our list of COVID-19 ventilator lessons learned: *1*) don't make a ventilator for the first time, and *2*) don't encourage the use of devices that are ill-suited to the task (6). ■

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