Characteristic of Subjects Who Fail a 120-Minute Spontaneous Breathing Trial: When Minutes Are Taken Into Account

To the Editor:

Both a failure of a spontaneous breathing trial (SBT) and extubation are markers of poor outcomes in critically ill patients.[1,2] However, the determinants of risk in selected populations have not been well characterized. We read with interest the manuscript published in the Journal by Liang et al,[3] which endeavored to characterize patients at risk of late SBT failure; however, several key considerations warrant further discussion.

First, the population in this study, as described in the first table, appears to include many subjects who could be easily weaned from the ventilator and few subjects who required long-term mechanical ventilation or were difficult to wean. Specifically, using the Weaning according to a New Definition (WIND) classification, we do not know the proportion of subjects in this study who could have been weaned on the first attempt within the first day (simple classification); within the first 2–7 d with 1–3 weaning attempts (difficult classification); or at least 7 d after the first weaning attempt or requiring > 3 weaning attempts, or those who were never weaned (prolonged classification).[4] This is likely an important consideration in liberating otherwise heterogeneous critically ill patients from invasive ventilation.

Second, the SBT technique utilized in this study (ie, pressure support with zero PEEP) is infrequently used in clinical practice,[5] so these results may have limited utility to clinical practice except for selected populations (eg, patients with COPD or congestive heart failure).

Third, regarding the identified predictors of SBT failure, several factors, including the presence of chronic cardiopulmonary disease, the number of previous SBT attempts before achieving success at 30 min, subject age, and elevated P_{CO_2}, were independently associated with SBT success at 30 min and failure at 120 min. However, it is not clear why P_{aCO_2}, the rapid shallow breathing index, $\Delta P_{aO_2}/F_{IO_2}$ (T30–T0), Δbreathing frequency (T30–T0), and ΔpH (T30–T0) were all independently associated with 30 min success and 120 min SBT failure. One is left to postulate that unmeasured variables, such as patient-related factors (eg, neuromuscular or diaphragm weakness, frailty, malnutrition, or baseline spirometry parameters) may have influenced these measures.

Fourth, with only 41 subjects who passed a 30-min SBT and failed a 120-min SBT, the data are insufficient and underpowered to generate accurate prediction scores. Questions remain regarding the optimal SBT duration and which patients may benefit from SBTs of longer duration.

As a preliminary investigation, the study by Liang et al[3] highlights the need for additional studies in this area to identify the patients at risk of SBT failure, the best SBT technique to utilize in clinical practice, and the optimal SBT duration. This study could have been complemented by use of the WIND classification to characterize subjects on the basis of the number of weaning attempts and the duration of invasive ventilation. In addition, more robust baseline data and concurrent physiologic measurements may have aided in characterizing subject work of breathing and would have provided insight into reasons for SBT failure. Considering the clinical consequences associated with SBT and extubation failure and the frequency with which clinicians identify SBT candidates and conduct SBTs in clinical practice, weaning should be identified as key research priority in critical care.

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Lung Ultrasound: Just B Lines?

To the Editor:

We enjoyed reading the interesting article by Antonio et al[1] regarding the use of lung ultrasound to predict extubation in critical care subjects. Studies with neutral or negative results like this one are extremely important, in the same tenor as those with positive findings. In this era, in which point-of-care ultrasound seems to be a panacea, this article teaches us that we are treating patients, not images, and this is a concept we should always keep in mind. As a matter of fact, point-of-care ultrasound should be never used in isolation in any application related to patients in need of critical care. However, we would like to make some constructive comments about this work.

First, the assertion that lung ultrasound is not helpful prior to a spontaneous breathing trial (SBT) seems to be imprudent, primarily because this article does not study the direct effects of other alterations detected by lung ultrasound prior to SBT, such as large pleural effusions, consolidations, or diaphragmatic dysfunction, regardless of the presence or absence of B lines.[2]

Second, while the 4-zone lung-study protocol allows rapid scanning as noted by the authors, this is not representative of the whole picture of the lungs, espe-

cially in the case of B-line assessments, as described by Lichtenstein and Mezière.[3] Exploring the lateral and posterior regions aids in recognizing other important lung findings that may contribute to a failed SBT, and this is not necessarily time-consuming in trained hands.

Third, given the alterations in systolic and diastolic function intrinsically related to the critically ill patient and the fact that the echocardiographic data were collected at an excessively distant time for the subjects enrolled in this study, an actual cardiac mechanism could not be entirely ruled out in failed SBT cases.

The take-home message is that we, as practitioners, need to consider lung ultrasound in all the ways it contributes to deterioration, not only interstitial syndrome. Even more importantly, we need to point out the relevance of always integrating lung ultrasound into a multimodality approach and avoiding its use in isolation.

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In Reply:

We thank Dr Blanco and Dr Bello for their interest and comments on our manuscript.[1] Bedside lung ultrasound has become a primary tool in daily ICU management. Indeed, it is our concern that, despite its diagnostic success and accuracy, lung ultrasound does not have the same remarkable impact when it comes to patient-centered outcomes. Laursen et al[2] elegantly showed that point-of-care ultrasonography was superior to standard diagnostic tests alone to establish the correct diagnosis in individuals presenting to the emergency department with respiratory impairment. However, no effects on mortality or length of hospital stay were observed, and there was a significant increase in downstream testing in the point-of-care ultrasonography group.

Certainly we do not rule out the usefulness of echocardiography and lung, diaphragm, and vein ultrasound in many critical and emergency scenarios. Nevertheless, withholding a safe test such as a spontaneous breathing trial up to vanishing of B-lines may be harmful or, at least, pointless. It must be highlighted that simple weaning, which is the most common scenario for an ordinary medical-surgical ICU, comprised 75.6% of our study population.[1]

Regarding pleural ultrasound, a systematic review and meta-analysis was unable to identify any evidence to support or refute the use of pleural drainage to promote liberation from mechanical ventilation.[3] Llamas-Álvarez et al[4] raised applicability concerns of diaphragm ultrasound for weaning management after a large number of studies performed it in populations with higher likelihood of weaning failure.

Because de-aeration found in lower lung regions implies gravitational changes after a few days on mechanical ventilation,[5] our simplified 4-zone approach seemed plausible for the purposes of our study. We did recognize that, based on our data, no inference could be made regarding either entire lung assessment or its integration with echocardiography. We cannot completely agree, however, with the argument that an intensivist could perform this approach accurately without consuming a great deal of time.

We fully agree with the compelling need to explore the full potential of lung ultrasound. We do, however, question whether additional diagnostic testing will truly improve the patient's prognosis, given their current presentation of signs and symptoms.

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Noninvasive Ventilation after Surgical Myocardial Revascularization for Left-Ventricular Dysfunction: A Hypothesis-Generating Study

To the Editor:

Noninvasive ventilation (NIV) affects both the pulmonary and the cardiovascular systems. Indeed, it restores lung volume by opening atelectatic areas, increases alveolar ventilation, and reduces the work of breathing. Moreover, NIV reduces left ventricle afterload and improves cardiac output.

Currently, high-quality evidence supports the use of NIV after cardiac surgery because it significantly improves the patient's oxygenation and decreases the need for endotracheal intubation without significant complications. However, data about improvement of cardiovascular function are scarce, and a mild reduction of the cardiac function due to NIV has been reported. Thus, a judicious application is wise, with constant hemodynamic monitoring in case of reduced left ventricular function. In this line,