

dence, and complete independence). Hence, there is a need for the ventilator, in general, to provide for both spontaneous and mandatory breaths on an intermittent basis. This was the motivation for inventing IMV in the first place, as Kacmarek and Branson mentioned in their paper.¹

How does recognition of only type 1 IMV (as in the article by Kacmarek and Branson¹) impair our understanding of modes? There are only 3 basic goals of mechanical ventilation (safety, comfort, and liberation),^{7,8} and the unique benefit of IMV is that can serve all three. All forms of IMV allow presetting of a minimum minute ventilation, serving the goal of *safety*. Allowing spontaneous breaths to suppress mandatory breaths serves the goal of *comfort* because spontaneous breaths are invariably more synchronous with patient breathing efforts than mandatory breaths (ie, allowing the patient to control the timing of breaths is better than imposing arbitrary values for frequency and inspiratory time). Finally, elimination of mandatory breaths (through automatic suppression) and automatic reduction in ventilatory support is a safe and effective approach to serving the goal of *liberation*.^{9,10} But if we only perceive the existence of type 1 IMV and its service of the goal of safety, then we fail to recognize how IMV can effectively serve the all 3 goals of ventilation.

Furthermore, perceiving only type 1 IMV, we fail to observe that type 3 IMV is the new paradigm for advanced modes of ventilation (with adaptive, optimal, or intelligent targeting schemes⁸) that will likely become more common in the future¹¹. Over the last 30 years or so, we have seen modes of ventilation evolve from simple volume assist/control, serving only the goal of safety,⁷ to complex modes like Intellivent-ASV¹² that use artificial intelligence tools to serve all 3 goals.⁷ This makes sense in light of the levels of mandatory breath dependence as men-

tioned above. And if you accept that those levels may occur in any patient at any time, then it follows that the “ultimate mode” of ventilation (yet to be invented) would be able to provide all levels: full support with all mandatory breaths, partial support with IMV, or some level of assistance with all spontaneous breaths, switching between levels automatically according to patient need. It does not take much imagination to see that this ultimate mode of ventilation would be, by definition, some sort of IMV. What remains to be developed are the ultimate targeting schemes⁸ for controlling and coordinating the mandatory and spontaneous breaths. Other modes will not be needed except (perhaps) in rare specialty applications. Hence, I assert that in the not too distant future, virtually all modes will be some form of IMV.

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**Intermittent Mandatory
Ventilation: What's in a Name?**

In Reply

That which we call a rose, By any other name would smell as sweet.
—William Shakespeare

Chatburn finds fault in our description of intermittent mandatory ventilation (IMV),¹ as we primarily discuss IMV as first described by Downs.² That is, a preset mandatory rate with spontaneous breaths allowed between mandatory breaths. And although we appreciate the work Chatburn has done³ in further refining the work of Mushin et al⁴ in classifying ventilators and ventilator operation, in his letter he also does not use his classification system when making reference to modes. He refers to IMV as IMV and pressure support and proportional assist ventilation and neurally adjusted ventilatory as-

sist and automatic tube compensation. None of these terms are part of his classification system. So why has he used them in his letter? The only reason we can conceive for this is “clarity of communication.” One problem with the classification system he has devised is that it speaks more to engineers than to clinicians and is rarely used in day-to-day clinical practice. In addition, as far as we can determine, no ventilator manufactured anywhere in the world is using this classification system to identify the modes of ventilation available on the manufacturer’s ventilator.

He goes on to provide trade names for his 3-level classification of IMV, including ASV (Hamilton Medical) and the S/T setting on Respironics devices. These modifications of IMV operate by allowing an increased spontaneous breathing frequency to alter the mandatory rate. And although both of these modes have been available for more than 20 years in the United States, he can muster only 2 references that marginally support ASV, and none to support the S/T version of IMV. In both cases, spontaneous breaths are pressure supported, obfuscating the only real advantage of IMV, maintenance of the thoracic pump.

But to the point, Chatburn lists the goals of mechanical ventilation as safety, comfort, and liberation; all of which he believes can be addressed by IMV. The evidence proves him incorrect. Comfort, best assessed by evaluating synchrony, patient appearance, and measures of work, have all demonstrated that IMV routinely fails to unload the respiratory muscles, increases asynchrony and in some cases promotes fatigue.⁵⁻⁷ Liberation has only been facilitated by daily spontaneous breathing trials, and the sharing of mandatory breaths with spontaneous breaths, if anything, has been shown to delay ventilator discontinuation.⁸⁻¹⁰ Similarly, the gradual withdrawal of ventilatory support, heralded

by IMV supporters, has no basis in fact.¹¹ Finally, how can safety be assured in the context of prolonged ventilation times and the failure to meet patient needs?

Chatburn continues work on ventilator classification, often with increasing complexity and contradiction. But these are paper exercises that fail to consider the bedside physiology. So what’s in a name? As kids, we all learned about the plant-eating dinosaur with the long neck featured on the Sinclair gasoline station signs, which we knew as Brontosaurus. Turns out paleontologists made a mistake in classification, and we now know this dinosaur as Apatosaurus. Regardless of the taxonomy, that dinosaur is extinct. Chatburn can ponder such issues from his desk, change the name of IMV, or modify it, but in the end, physiology is a cruel taskmaster and the evidence predicts a similar fate for IMV.

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