

## DISCONTINUING MECHANICAL VENTILATION: EXTUBATION AS LIBERATION *by David Wheeler RRT, NPS*



I am sensing the residue of an interminable debate in critical care as to the most effective method of weaning from mechanical ventilation. The most common intervention in Critical Care today is mechanical ventilation. Indeed, the successful discontinuation has been argued. However, the debate rages on and with this in mind I will examine the various aspects of the discussion and make a valiant effort towards a clinically applicable resolution.

The art and science of liberation from mechanical ventilation is indeed undergoing a revolution of sorts that is both obvious to the long standing observers of "current" thinking in critical care and ironic to even the newest practitioners. The debate has raged between a gradual liberation and one that had been seen as abrupt, between a more reserved slow assisted approach and an aggressive spontaneous manner of release.

It seems that the days of wildly dissimilar weaning protocols are behind us for the moment and it is the intent of this column to encapsulate the most recent studies into reasonable and clinically applicable blueprints for weaning success. The most recent investigations reveal that the most efficacious weaning outcomes are the result of some form of spontaneous breathing trial either with or without some form of pressure or flow augmentation.

The first thought many of you will have when reading the previous sentence will be that the addition of pressure or flow support is, by definition, the very antithesis of a spontaneous breath. It is my intent to clearly differentiate between a weaning

attempt with an assessed effort and one that is totally spontaneous.

The assessment of the mechanically ventilated patient is a topic I have written about in prior columns. Therefore, I will restrict my comments to a cursory review of assessment techniques.

There can be no overstatement of the fact that the single most effective tool in the weaning process remains the daily examination of the mechanically ventilated patient in the context of a weaning protocol. The Rapid Shallow Breathing Index, (RSBI), Maximal Inspiratory Pressure, (MIP) and PaO<sub>2</sub>/FiO<sub>2</sub> ratio remain the most reliable triad of weaning indicators.

The RSBI allows the clinician to evaluate the patient's spontaneous breathing with an eye towards endurance capability. The RSBI is calculated by dividing the patient's spontaneous breathing frequency per minute by the average spontaneous tidal volume in liters. If the calculated number is less than 104 it is probable that the patient will wean successfully. If the calculated number is greater than 104 the patient, again in all probability, will not be capable of performing the work of breathing when extubated. The RSBI is an extremely accurate predictor of the patient's ability to perform endurance related work after extubation.

The MIP is a measure of relative muscle strength. This value should typically be greater than 20-25 cmH<sub>2</sub>O and is best performed after the RSBI. The astute clinician must bear in mind that this test will fluctuate with patient/therapist coordination.

The PaO<sub>2</sub>/FiO<sub>2</sub> index quantifies the relationship between arterial oxygen tension and available oxygen concentrations. This is a valuable formula when evaluating the extent of lung injury. A PaO<sub>2</sub>/FiO<sub>2</sub> index of less than 300 is commensurate with Acute Lung Injury while an index of less than 200 is an essential criteria of Acute Respiratory Distress Syndrome. (NOTE: There must also be patchy infiltrates and heart failure must have been ruled out) The PaO<sub>2</sub>/FiO<sub>2</sub> index is an indispensable toll in assessing readiness to wean. It is also essential that every assessment be placed in context. The prudent clinician will look at the entire picture and make a clinical decision based on the evidence before her.

Every patient must be assessed every day. This sounds rather simplistic but it remains true. The only way to wean a patient is to first assess them and then decide on a weaning approach. The current thinking seems to be relatively equally divided between a daily T-Tube trial and Pressure Support trials.

The daily spontaneous weaning trial is restricted to patient's who have passed a weaning assessment protocol. Typically the RSBI is greater than 104, the MIP is greater than 20 and the PaO<sub>2</sub>/FiO<sub>2</sub> ration is greater than 300. The patient meeting these rudimentary standards is now ready for a weaning trial. If a T-Tube trial is your choice the patient is placed on a T-Tube at an FiO<sub>2</sub> equal to his prior level and monitor closely for a period of 30 minutes to two hours. Success is determined by the relative stability of the patient. If the patient can maintain a reasonable RSBI and PaO<sub>2</sub>/FiO<sub>2</sub> index they have successfully passed the weaning trial and are now ready for extubation. Should the patient fail to maintain stable parameters they are to be placed back on assessed ven-

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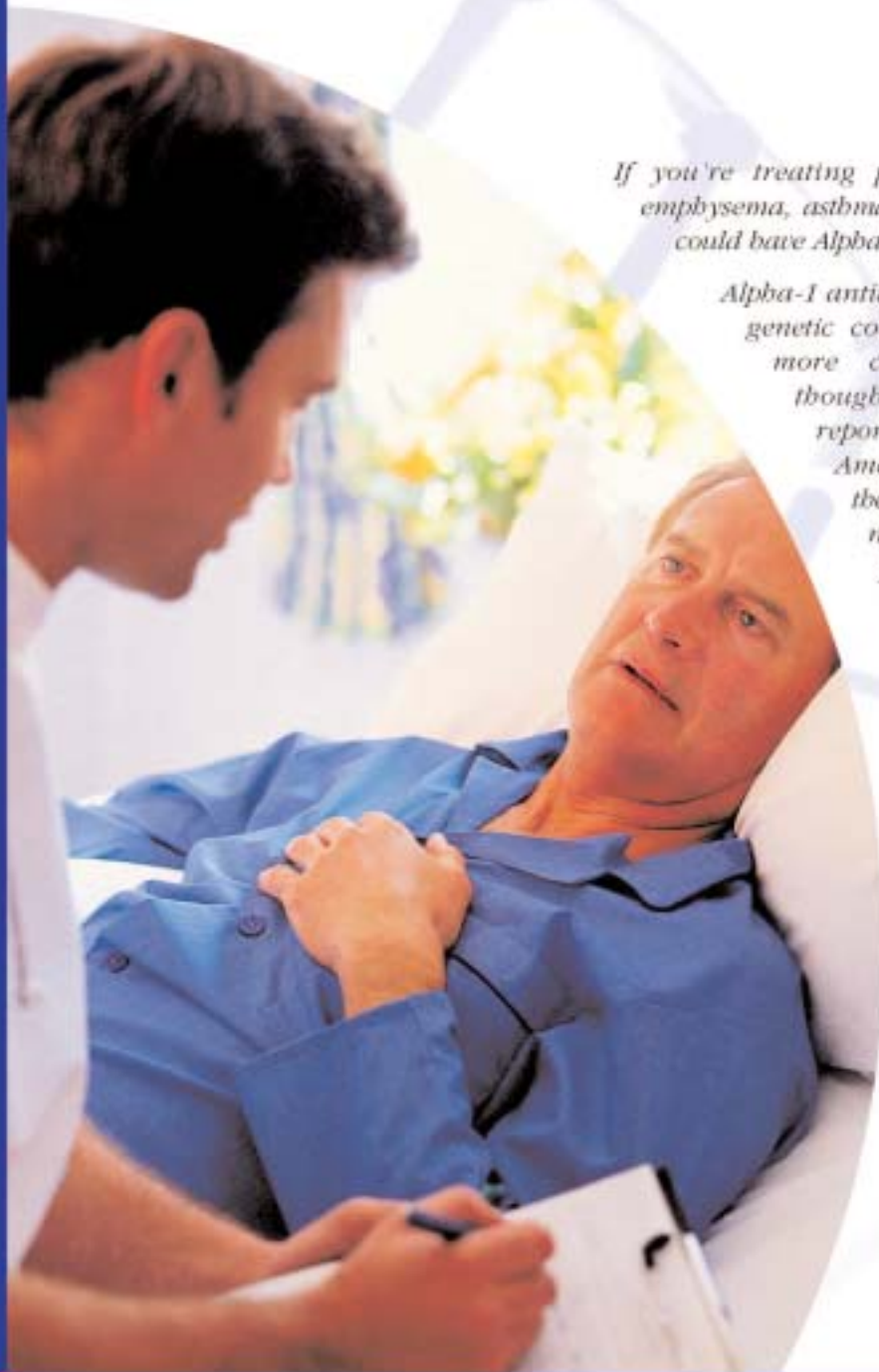


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