



WEANING TIPS AND TRICKS: THE PREPARATION PHASE

by John Marini MD

Eventually, nearly every intubated patient is evaluated for ventilator support withdrawal and endotracheal tube removal. For those recovering from critical illness, this process generally proceeds in stages: preparation for spontaneous breathing, evaluation of readiness, withdrawal of positive airway pressure (ventilating power and oxygenation support), extraction of the ET tube, and post-extubation care. Clinical perceptions and direct measurements (often formalized into protocols geared to efficiently and safely guide us through this 5-step mine field) usually get the job done, but not always. Too often we are reminded that this usually smooth process can stall, backslide, or break down at any point. The toughest patients require something extra to get them back on track. I'll bet that we all have our own tips and tricks (TnT) to avoid being surprised or delayed in achieving the desired outcome. I know that I have mine.

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First, let's set down the basics upon which most clinicians agree. The reasons for continued machine dependence generally stem from one or more of several fundamental problems that require intervention. These include an imbalance between venti-

lation capability and demand, impaired oxygenation, hemodynamic instability, and psychological factors. Among the most common important concerns are an unacceptably depressed level of consciousness, dramatic fluid retention, impaired electrolytes, unresolved or developing infection, congestive failure, arrhythmia, or cardiac ischemia, severe anemia, anxiety, pain, discomfort, obstipation, sleep deprivation, impaired cough, poor nutrition and delirium. Lingering sedation is so frequently encountered that daily interruption of sedation has become routinely recommended once the very high demand (stabilization) phase of illness is past. Attention to these "usual suspects" goes a long way toward optimal preparation.

Are there any practical TnT for this preparation stage around which there has been little discussion or agreement? In my opinion the answer should be a resounding 'yes'. For example, the few studies that have been done regarding sleep in ventilated patients demonstrate that unconscious hours are plentiful but sleep architecture is badly disrupted. I therefore favor the adjunctive use of hypnotics (sleep inducers - e.g., zolpidem (Ambien)) in the run-up period leading to the weaning attempt. Along this same line, opiates not only relieve pain and lessen sedation requirements but for any given minute ventilation requirement also encourage a deep-

er, slower breathing pattern. For patients who are seriously edematous—too often the case after fluid resuscitation from life threatening illness—their puffy body tissues present more than a cosmetic problem. For those iatrogenic 'Doughboys' and 'Michelin Men' who remain stuck on the ventilator and are headed toward trach, goal-oriented nursing orders to accomplish aggressive diuresis using a loop diuretic (e.g., furosemide drip) coupled, if necessary, with supplemental albumin, or even hemofiltration by peripheral catheter may be their ticket to breathing independence. Because cardiovascular problems are often the limiting problem - whether overt or overlooked, prophylaxis by anti-arrhythmic, anti-ischemic, and anti-congestive measures prior to the weaning trial may pay big dividends. In my experience these patients do not do well when suddenly confronted with a t-piece trial or its CPAP equivalent. Although the cause for failing the spontaneous breathing trial sometimes remains obscure, an inappropriately high, inappropriately low, or erratic heart rate that persists well into the post-trial period may signal that the heart (not the lungs) is the weakest link that breaks under a workload. Ischemia, diastolic dysfunction, and central vascular congestion may develop suddenly during such abrupt transitions. For fragile patients with cardiac disease, COPD, or both, I generally boost hemoglobin to at least 9 gm/dl, address these hear issues, and gradually reduce pressure support over a several hour period, avoiding the sudden stress of an 'all-or-none' T-piece trial.

I suppose that most caregivers would agree that the aforementioned measures qualify as at least semi-legitimate suggestions that are understandable, rational, and at least occasionally utilized. In my own practice there are a few other "tricks" that I employ more commonly than most of my colleagues, and unfortunately with even less back-up from the literature. In our hospital population, ICU delirium and its converse, lack of alertness, are often major factors limiting our attempts to liberate from ventilator support. In such patients, customary sedative agents, especially the benzodiazepines (midazolam [Versed], lorazepam [Ativan]) have a dissociating effect that worsens agitation and simply exacerbates the problem. The elderly are notoriously vulnerable to such 'paradoxical' responses, as are those who have been receiving those agents at coma-inducing levels for long periods. Haloperidol (Haldol) is typically used as an alternative, but in my experience often proves inadequate. On the other hand, quetiapine (Seroquel), risperidone, olanzepine (Zyprexa), and occasionally depakote may work for delirious or combative patients when more usual

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approaches fail. The ECG must be monitored, however to avert the possibility of dangerous Q-T prolongation and arrhythmia induction when any of these are employed. Too often we forget to review the patient's outpatient drug listing, where psychotropics and long acting pain relievers appear commonly. It should be kept in mind that they may also need these in the ICU, either for their underlying pathology or to avert a withdrawal reaction.

Just as commonly encountered as the irrationally excited patient is the one whose grogginess raises concern for airway protection that prevents progression toward extubation. Following lengthy treatment with high doses of continuously infused benzodiazepines, many patients remain unconscious for days after all sedation has ceased. Assuming all sedatives have been withdrawn, the cautious administration of alerting agents such as methylphenadate (Ritalin) or modafenil (Provigil) to patients without contraindications who are slow to awaken has frequently accelerated what is often a tediously slow and hazardous rise toward full awareness and cooperation. I have even averted plans for tracheostomy in a few patients in whom impaired level of consciousness was considered a discouraging sign of underlying organic brain disease rather than lingering sedation. Of course, such drugs must be avoided in those patients with clear contraindications (e.g., epilepsy) to their use. Not uncommonly, adrenal insufficiency is a stealthy contributor to ventilator dependence. Patients who have received therapeutic doses of corticosteroids in the outpatient setting are vulnerable to their with-

drawal. Once insufficiency is documented, cortisol deficiency should be corrected with hydrocortisone.

In patients who have been intubated for lengthy periods and/or have experienced pneumonia, asthma, or an exacerbation of COPD, secretion retention is the rule, rather than the exception. These retained secretions impair gas exchange and elevate the breathing workload. Their presence may pass under the caregiver's radar screen if the secretions are too tenacious to extract by catheter—a situation now seen commonly when passive heat and moisture exchangers inadequately humidify the air-stream. Visual inspection of the airway may be warranted before extubation in those patients with telltale signs of retained central airway secretions on the ventilator's pressure or flow tracings, high measured values for airway resistance, or unexplained patchy atelectasis by x-ray. When thick and copious secretions are encountered, measures taken to thin, lubricate, and extract them are mandatory before extubation. Apart from bronchodilators, actively heated ("old fashioned") humidification of the air stream (to 37°C), vibro-percussion, appropriate body positioning and encouragement to cough, reasonable interventions include therapeutic bronchoscopy, aerosolized acetylcysteine (Mucomyst), guaifenesin (Mucinex) and an old tried and true remedy—aerosolized bicarbonate. If no improvement occurs after a day or two of such treatment, a brief round of systemic steroids (low dose) may help. In those tenuous patients in whom I worry primarily about copious production of secretions and relatively weak cough, I occasionally place a nasal trumpet before orotracheal tube extraction so as to afford an immediate pathway into the retropharynx and lungs and yet avoid the discomfort of its placement afterward when the patient may be struggling and resisting.

Finally, occasional patients call for problem-specific innovations. For example, in the recent past I have treated more than one ventilated patient with inflammatory lung disease whose intractable coughing as PEEP was withdrawn halted progress toward extubation. In these admittedly rare cases, the cough was successfully suppressed by a lidocaine infusion whose effect was sustained in the days post-extubation by application of a cutaneous lidocaine patch. Nothing else we tried, including potent conventional cough suppressants was effective.

Some would argue with some or all of such experimentally unproven recommendations, either because they may have had somewhat different bedside experiences or adhere without compromise to a scientific standard underpinned by published clinical trials. ("Primum, non nocere.") I can certainly understand such skepticism while respectfully disagreeing with such a rigid approach. Few experiences are quite as stressful—or hazardous—as sustained intubation in the ICU setting. Viewed in this context, the concerned clinician's obligation to ("first, do no harm") takes on a different twist when an inherently noxious treatment (intubation) is unnecessarily applied.

As noted at the start, I consider preparation for weaning but one aspect of a challenging multi-stage process. In future articles I will approach my remaining 'tips and tricks' for the evaluation, tube extraction and post-extubation phases. Fair warning: you might not agree with those either!

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