

Key Determinants of Successful Weaning in Subacute Ventilator/Respiratory Care Centers

by Gene Gantt, RRT

Advances in life-prolonging interventions over the last 30 years have led to a rapidly growing subgroup of patients who are medically stable but have not successfully weaned from the ventilator and require prolonged mechanical ventilation (PMV). These patients have specific needs that differ from those of patients needing acute intensive care. The National Association for Medical Direction of Respiratory Care defined PMV as mechanical ventilation for at least six hours per day for more than 21 days.¹ The number of patients requiring PMV is predicted to grow to 605,898 cases by the year 2020.² According to published studies, 50–67% of these ventilated patients can be liberated from mechanical ventilation utilizing a structured weaning approach and clinicians skilled in the use of therapist-driven protocols.³ Successful ventilator liberation is defined as at least seven days (one week) of ventilator independence.¹ The plight of these patients is very difficult as there are limited, often fragmented, post-acute resources for continued care.⁴

In recent years, the focus of inpatient care for patients requiring PMV has shifted from acute care hospitals to ventilator programs at long-term acute care hospitals (LTACHs) and subacute skilled nursing facilities (SNFs), where the cost of an extended stay is lower. LTACHs have an average length of stay of 28–30 days. Subacute units in SNFs have a much longer length of stay. Some SNFs provide 24/7 respiratory therapy and care to PMV patients, including weaning, while others do not. There is a rapidly growing trend in the United States to increase the scope and quality of subacute SNF facilities to provide continued weaning for the growing PMV population.

Key determinants

Mechanical ventilation can be abruptly discontinued in 75% of patients whose underlying cause of respiratory failure has either improved or resolved.⁵ Many weaning criteria have been presented and tested over the years; however, an evaluation of these criteria revealed that nearly 18% of all patients who were weaned successfully had previously failed the weaning criteria. Since there are no foolproof predictors of weanability measures (e.g., minute volume), maximum inspiratory pressure, tidal volume, rapid shallow breathing, and CROP Index should serve as tools to complement the patient assessment and build a weaning plan of care.⁶

The basic key determinants of readiness to wean remain constant from the ICU to the subacute arena. These include resolution of the underlying disease process that necessitated ventilation: PEEP < 5 cm H₂O, FiO₂ < 0.5, afebrile, cardiovascular stability with heart rate < 140 beats per minute, absence of myocardial ischemia, no need for vasopressors, and hemoglobin > 8 grams per deciliter (gm/dl).⁷

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Other determinants

Once these basic criteria for eligibility to wean are met, attention must be paid to a wide variety of other determinants that are commonly associated with failure to wean. Central respiratory drive, respiratory muscle strength, and load applied to the muscles are all major considerations, as are comorbidities, nutrition, physiological factors, infections, wounds, and environment. In the subacute arena, clinicians are challenged to find

ways to correct multiple issues in order to improve clinical status.

Psychological factors are due to multiple failed weaning attempts and are an important obstacle to weaning in the subacute environment and are often overlooked. Patients admitted to long-term care facilities have often been ventilated for a month or more prior to admission, and many have already been told they will live the rest of their lives on the ventilator. Depression and stress negatively impact ventilator weaning and survival. Jubran et al recently reported that of 336 patients admitted to long-term care, 142 (42%) were diagnosed with depressive disorders. The rate of weaning failure was higher in patients with depressive disorders than in those without such disorders (61% vs. 33%), as was mortality (24% vs. 10%).⁸ Care must be taken to approach the treatment of depression in these cases without excessive use of psychotropic drugs, which decrease respiratory drive. Alternately, in practice, subjective benefits have been realized by gaining the patient's trust, paying close attention to speech therapy, enabling the patient to speak using a speaking valve, and promoting personal hygiene. Patients who have been on PMV are also often afraid of losing this ventilator support. Because these psychological barriers can be significant, clinicians must provide careful, frequent communication and reassurance for the patient and family throughout the weaning process, as well as providing activities to relieve the depressive state.⁹

Metabolic factors, such as inadequate nutrition and electrolyte imbalances, are important considerations as they influence muscle strength and respiratory pattern. Patients who have chronic CO₂ retention from COPD compensated by bicarbonate retention are sometimes hyperventilated during mechanical ventilation, causing excessive bicarbonate that may interfere with weaning. A caloric regimen that is appropriate for the patient avoiding hypermetabolism and increased minute ventilation should be in place. It is important to maintain body weight and assess daily caloric intake.¹⁰

Analgesics and sedatives for sleep must be used very sparingly in the subacute environment. The PMV patient is sensitive to the pharmacology of these agents, and weaning can be significantly affected. Attention should be paid to day-night routines and adequate "natural" sleep time allowed.

While noninvasive ventilation, synchronized intermittent mandatory ventilation, pressure support, and T-piece trials several times daily are the methods most commonly used for weaning, the best weaning method should be chosen on an individual basis according to each patient and their individual needs.¹¹

The RT determinant

Finally, the respiratory therapist plays a crucial role as a determinant to the weaning success. In a major evi-

dence and technology report prepared for the Agency for Healthcare Research and Quality by the McMaster University Evidence-based Practice Center, differences in clinicians' intuitive threshold for reduction or discontinuation of ventilatory support were cited as having a greater impact on failure to wean than do weaning modes. When clinicians set a high threshold, many patients who could tolerate weaning remained on mechanical support longer than necessary.¹¹

The incidence of prolonged mechanical ventilation in the United States is projected to grow to more than 600,000 cases by the year 2020. Approximately half of those cases will be referred to subacute SNF ventilator facilities. However, multiple studies have shown that over 50% of the cases can be liberated from the ventilator at this level of care. Clinicians must prepare using a variety of clinical knowledge bases to adequately maximize the efforts of ventilator weaning in the subacute arena. A holistic multidisciplinary approach to the discontinuation of mechanical ventilation is the key to patient success in ventilator liberation. ■

EDITOR'S NOTE

Gene Gantt is scheduled to present a symposium on long-term care, "Trends in Alternate Site and Home Ventilation," during the AARC International Respiratory Congress in Las Vegas, NV, Dec. 6-9.

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