

Evaluating the Impact of Respiratory Therapist-Led Protocols on Ventilator Liberation Success Rates in a Tertiary Hospital Setting

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Abstract

This study aimed to assess the impact of weaning protocols led by respiratory therapists (RTs) on ventilator liberation success rates in a tertiary hospital ICU. Using a retrospective cohort design, we examined 150 adult patients who had been on mechanical ventilation for over 48 hours. The results showed that RT-led protocols achieved a ventilator liberation success rate of 83.3%, with patients averaging 7.3 days on mechanical ventilation and a reintubation rate of only 6.7%. Additionally, the incidence of complications like ventilator-associated pneumonia (VAP) was lower compared to standard care. These findings suggest that RT-led protocols can enhance patient outcomes and optimize ICU resource use. Future research in varied hospital settings is encouraged to further validate these results.

Keywords: Respiratory therapist-led weaning, ventilator liberation, ICU, mechanical ventilation, extubation success, ventilator-associated pneumonia.

Introduction

Mechanical ventilation is a critical intervention for patients who cannot breathe adequately on their own. However, keeping patients on ventilators for too long can lead to complications like ventilator-associated pneumonia (VAP), weakened respiratory muscles, and increased risk of death (Esteban et al., 2004). Getting patients off the ventilator at the right time is therefore vital to support recovery and avoid these risks.

Weaning, the process of gradually reducing ventilator support, can be challenging. Studies suggest that about 20-25% of patients struggle with weaning (Boles et al., 2007). Various weaning strategies, involving teams of doctors, nurses, and RTs, have been developed to improve outcomes. Among these, RT-led protocols have shown promise in enhancing patient outcomes (Stoller et al., 1998).

Respiratory therapists are highly trained in respiratory care, making them well-equipped to assess patient readiness for ventilator weaning and make informed adjustments. Evidence shows that RT-led weaning can lead to shorter ventilation times and better results compared to physician-led or non-standardized weaning methods (Ely et al., 1996). Empowering RTs to lead this process could potentially lead to better patient outcomes, reduced ICU stays, and lower healthcare costs.

Despite promising data, more evidence is needed to understand the impact of RT-led weaning in different hospitals. This study aims to explore how effective RT-led weaning protocols are in terms of ventilator liberation, weaning success rates, length of ventilation, and the need for reintubation in critically ill patients.

Literature Review

Weaning from a ventilator is a critical part of recovery for patients who have been on mechanical ventilation. Effective weaning is crucial for preventing complications such as VAP, muscle wasting, and even higher death rates (Esteban et al., 2004). Over the years, different approaches have been developed, including standardized weaning protocols led by doctors, RTs, or multidisciplinary teams.

RT-led weaning protocols have attracted attention because they utilize the specialized training of respiratory therapists. RTs are highly trained to determine when a patient is ready to wean and to make adjustments to ventilator settings accordingly (Stoller et al., 1998). Studies by Stoller and colleagues found that allowing RTs to lead the weaning process reduced the time patients spent on mechanical ventilation, leading to more efficient use of ICU resources.

Further research by Ely et al. (1996) showed that standardized weaning protocols, regardless of whether led by a doctor or an RT, led to better outcomes than no protocol at all. However, involving RTs seemed to ensure quicker adjustments, which helped improve patient outcomes. Similarly, Burns et al. (2013) found that protocols led by RTs or nurses often led to shorter ICU stays and fewer ventilator-related complications.

Despite these benefits, barriers such as inconsistent practices across hospitals and insufficient collaboration among healthcare professionals have limited the widespread use of RT-led protocols (Blackwood et al., 2014). A key takeaway from the literature is that good communication and teamwork between doctors, nurses, and RTs are crucial for successful weaning (Boles et al., 2007).

In summary, existing research indicates that RT-led weaning protocols can lead to improved outcomes, shorter ICU stays, and fewer complications. However, there is a need for further studies to confirm these benefits across different hospitals and patient populations. This study aims to contribute to this understanding by evaluating the effectiveness of RT-led weaning protocols in a tertiary hospital.

Methodology

This study took place in the ICU of a tertiary hospital, focusing on the impact of RT-led weaning protocols on ventilator liberation success rates. Using a retrospective cohort design, we reviewed patient records from January to December 2023. We included adult patients (18 years or older) who required ventilation for more than 48 hours and were candidates for weaning.

Setting and Participants

The study was conducted in a 20-bed ICU. Patients included were adults who had been on a ventilator for over 48 hours and were stable enough to be considered for weaning. We excluded patients with terminal illnesses or those receiving palliative care. In total, 150 patients met the criteria.

Intervention

The RT-led weaning protocol involved daily evaluations by RTs to determine readiness for weaning, gradually reducing ventilator support, and coordinating with doctors and nurses. RTs also led spontaneous breathing trials and adjusted ventilator settings based on how patients responded.

Data Collection

Data were gathered from electronic health records, focusing on patient demographics, ventilation duration, weaning success or failure, ICU length of stay, and reintubation rates. Successful weaning was defined as staying off the ventilator for at least 48 hours post-extubation without needing to be reintubated.

Outcome Measures

The primary outcome was ventilator liberation success, defined as successful extubation without needing reintubation within 48 hours. Secondary outcomes included ventilation duration, ICU stay length, and the incidence of reintubation. We also tracked complications like VAP to gauge the safety of the weaning protocol.

Data Analysis

We used descriptive statistics to summarize patient characteristics. Continuous variables were expressed as means, while categorical variables were reported as percentages. We analyzed outcomes using t-tests and chi-square tests where applicable, and a multivariate logistic regression model was used to account for potential confounders.

Ethical Considerations

This study was approved by the ethics committee. Given its retrospective design, informed consent was waived. Patient confidentiality was maintained through anonymization of data.

Findings

The study included 150 patients eligible for weaning. Results are summarized below.

Table 1. Patient Demographics and Baseline Characteristics

Characteristic	RT-Led Protocol Group (n = 150)
Age (mean \pm SD)	62.5 \pm 14.2 years
Gender (Male/Female)	85 (56.7%) / 65 (43.3%)
Common Comorbidities	COPD: 40 (26.7%), Diabetes: 55 (36.7%), Hypertension: 75 (50%)

Table 2. Primary and Secondary Outcomes

Outcome Measure	RT-Led Protocol Group (n = 150)
Ventilator Liberation Success Rate	125 (83.3%)
Duration of Mechanical Ventilation	7.3 \pm 3.5 days
Length of ICU Stay	10.2 \pm 4.6 days
Reintubation Rate (within 48 hours)	10 (6.7%)

Table 3. Complications Related to Mechanical Ventilation

Complication	RT-Led Protocol Group (n = 150)
Ventilator-Associated Pneumonia (VAP)	15 (10.0%)
Muscle Atrophy	20 (13.3%)

The findings show that RT-led weaning protocols achieved a high success rate of 83.3% for ventilator liberation, with patients requiring an average of 7.3 days of mechanical ventilation. The reintubation rate was low at 6.7%, and the incidence of VAP was 10.0%. Compared to traditional physician-led or non-standardized weaning practices, these results suggest that RT-led protocols can improve weaning outcomes and reduce the risk of complications.

Discussion

Our results suggest that respiratory therapist-led weaning protocols significantly enhance the success rates for ventilator liberation in critically ill patients. The observed success rate of 83.3% aligns with findings from previous studies that highlight the advantages of RT-led protocols in improving patient outcomes (Stoller et al., 1998; Burns et al., 2013). Leveraging the expertise of RTs to make timely ventilator adjustments appears to have played a key role in these favorable outcomes.

The average duration of mechanical ventilation in our study was 7.3 days, which is shorter compared to other studies using physician-directed or non-standardized weaning approaches (Ely et al., 1996). Reducing the time spent on a ventilator is crucial, as longer ventilation is linked to higher risks of VAP, muscle wasting, and other complications. Our study's reintubation rate of 6.7% also indicates that patients were well-prepared for extubation, minimizing the need for reintubation.

The rate of complications, such as VAP (10.0%) and muscle atrophy (13.3%), was within the lower range reported in similar studies. This suggests that timely weaning with RT involvement helps prevent the risks associated with prolonged ventilation. The daily assessments performed by RTs allowed for prompt extubation, reducing the likelihood of such complications.

Our findings emphasize the importance of multidisciplinary collaboration in the weaning process. The success of the RT-led protocol depended heavily on the teamwork among RTs, physicians, and nurses. This aligns with previous research that underscores the need for standardized protocols and collaboration to ensure consistent, high-quality patient care during weaning (Boles et al., 2007).

While our findings are promising, there are limitations to consider. This study's retrospective design may introduce bias, as we relied on existing patient records. Additionally, the study was conducted in a single hospital, which may limit the generalizability of the results. Future studies should consider prospective, multicenter designs to validate these findings in a wider range of settings.

In conclusion, RT-led weaning protocols were associated with higher ventilator liberation success rates, shorter mechanical ventilation durations, and fewer complications. These results support the broader adoption of RT-led protocols, especially when combined with strong multidisciplinary collaboration, to improve patient outcomes and optimize ICU resource use.

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