Expanding Use of the ProVent Score

Kyeongman Jeon, M.D., Ph.D.[1,2]

[1]Division of Pulmonary and Critical Care Medicine, Department of Medicine, [2]Department of Critical Care Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Although advances in intensive care have enabled more patients to survive through the acute stage of critical illness, approximately 5%–10% of mechanically ventilated patients experience difficulty in weaning and thus require prolonged mechanical ventilation (PMV), which has been defined as a period of 21 days or more[1]. PMV is associated with a disproportionate use of medical resources resulting in substantial health care costs as well as high mortality after intensive care[2]. A recent meta-analysis of 124 studies from 16 different countries worldwide reporting clinical outcomes in PMV further highlights short- and long-term survival information for patients treated with PMV: approximately 30% of the patients requiring PMV did not survive to hospital discharge and over half of the patients died within 1 year[3].

For these reasons, the Prolonged Mechanical Ventilation Prognostic Model (ProVent score) was developed and validated to predict 1-year mortality of patients requiring PMV, which is derived by assessing 1 point to each of four readily ascertained variables assessed on day 21 of mechanical ventilation[4]: need for dialysis, need for vasopressors, age 50 years or older, and platelet count less than 150×10^9. It has been modified by adding another age group (65 years or older), to which 2 points are assigned, yielding a 6-point score ranging from 0 to 5[5]. These variables are objective and easy to extract so that can be linked within electronic medical records to inform clinical care. This simplicity leads to actual clinical use rather than limited to research application only, to help inform manage-

ment decisions for patients receiving PMV. To date, this tool has been validated in Korean populations with simple clinical data obtained at 14 and 21 days of mechanical ventilation[6-8].

However, the ProVent score is not perfect for assessing prognosis for the individual patient. Based on the clinical characteristics not included in ProVent, there are clearly unique patients who can reasonably expect to be much better or worse than the model predicts[8]. Another current limitation of ProVent is its inability to predict outcomes beyond survival that patients and families deeply care about, such as chronic critical illness and related medical resource utilization.

In this issue of *Tuberculosis and Respiratory Diseases*, Roh et al.[9] present additional research looking for the predicted value of ProVent score in medical expenses as well as intensive care unit and hospital mortalities of patients requiring PMV. In a retrospective cohort design among 305 patients received PMV, the authors found that three components of ProVent model, such as age less than 50 years, platelet count, and need for dialysis, were associated with high medical costs. Further extending their exploration of the model, the authors also found that the ProVent score was significantly associated with short-term outcome during hospitalization, consistent with the previous report[10]. One of the primary weaknesses of the study, as identified by the authors, is that the true total costs of PMV patients would be underestimated because of their common omission of post-discharge care expenses. In addition, other clinical characteristics that are not included in the ProVent could be associated with high medical costs. Nonetheless, the two major findings suggest that the use of ProVent score can be expanded to predict clinical outcomes in patients requiring PMV.

Address for correspondence: Kyeongman Jeon, M.D., Ph.D.
Division of Pulmonary and Critical Care Medicine, Department of Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, 81 Irwon-ro, Gangnam-gu, Seoul 06351, Korea
Phone: 82-2-3410-3429, **Fax:** 82-2-3410-6956
E-mail: kjeon@skku.edu

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

References

1. MacIntyre NR, Epstein SK, Carson S, Scheinhorn D, Christo-

pher K, Muldoon S, et al. Management of patients requiring prolonged mechanical ventilation: report of a NAMDRC consensus conference. Chest 2005;128:3937-54.

2. Unroe M, Kahn JM, Carson SS, Govert JA, Martinu T, Sathy SJ, et al. One-year trajectories of care and resource utilization for recipients of prolonged mechanical ventilation: a cohort study. Ann Intern Med 2010;153:167-75.

3. Damuth E, Mitchell JA, Bartock JL, Roberts BW, Trzeciak S. Long-term survival of critically ill patients treated with prolonged mechanical ventilation: a systematic review and meta-analysis. Lancet Respir Med 2015;3:544-53.

4. Carson SS, Garrett J, Hanson LC, Lanier J, Govert J, Brake MC, et al. A prognostic model for one-year mortality in patients requiring prolonged mechanical ventilation. Crit Care Med 2008;36:2061-9.

5. Carson SS, Kahn JM, Hough CL, Seeley EJ, White DB, Douglas IS, et al. A multicenter mortality prediction model for patients receiving prolonged mechanical ventilation. Crit Care Med 2012;40:1171-6.

6. Kim WY, Jo EJ, Eom JS, Mok J, Kim MH, Kim KU, et al. Valida-

tion of the Prognosis for Prolonged Ventilation (ProVent) score in patients receiving 14days of mechanical ventilation. J Crit Care 2018;44:249-54.

7. Mok JH, Kim YH, Jeong ES, Eom JS, Kim MH, Kim KU, et al. Clinical application of the ProVent score in Korean patients requiring prolonged mechanical ventilation: a 10-year experience in a university-affiliated tertiary hospital. J Crit Care 2016;33:158-62.

8. Park YR, Lee JS, Kim HJ, Hong SB, Lim CM, Koh Y, et al. Modification of the prolonged mechanical ventilation prognostic model score to predict short-term and 1-year mortalities. Respirology 2019;24:179-85.

9. Roh J, Shin MJ, Jeong ES, Lee K. Association between medical costs and the ProVent model in patients requring prolonged mechanical ventilation. Tuberc Respir Dis 2019;82:166-72.

10. Boniatti MM, Giustina AD, Marin LG, Franca J, Dos Santos MC, Vidart J, et al. Mortality in chronically critically ill patients: expanding the use of the ProVent score. J Crit Care 2015;30:1039-42.