

## Are Tracheostomized Patients Safe on Regular Hospital Wards?

Tracheostomies are commonly performed in critically ill patients, with approximately 10% of patients receiving tracheostomies during their time in the intensive care unit (ICU).<sup>1-3</sup> Accordingly, much research has centered on the optimal timing of tracheostomy during the ICU course, immediate complications of the procedure, and ICU outcomes such as ventilator weaning and ventilator-associated pneumonia. Less research has focused on outcomes after patients are discharged from the ICU.<sup>4-8</sup> A small but growing body of evidence suggests that the inability to decannulate a patient prior to ICU discharge is associated with worse outcomes, including higher mortality.<sup>8-11</sup>

---

SEE THE ORIGINAL STUDIES  
ON PAGES 1644 AND 1653

---

In this issue of *RESPIRATORY CARE*, Hernández et al<sup>12</sup> report on a prospective observational study of 73 tracheostomized patients without severe neurologic disease, to compare the in-hospital mortality of patients decannulated prior to ICU discharge to those discharged from the ICU with a tracheostomy in place. Hernández et al utilized a decannulation protocol with daily evaluation of respiratory secretion management and risk of aspiration for up to 10 days, and decannulated 35 of the patients before ICU discharge. Those with a tracheostomy tube in place were discharged to wards with a specific tracheostomy-care protocol and skilled nurses. The overall mortality was 19%, with a nonsignificant trend toward higher mortality in the patients who had a tracheostomy in place at ICU discharge: 26% versus 11% in the decannulated patients. Multivariate analysis showed that discharge from the ICU with a tracheostomy, and a body mass index  $> 30 \text{ kg/m}^2$ , were associated with higher ward mortality.

This small study<sup>12</sup> indicates that patients in whom ICU decannulation is not possible have a higher ward mortality rate, and obese patients may be at even greater risk. Notably, other studies have found higher mortality than did Hernández et al in ward patients with tracheostomies, which may be because those studies included patients with severe neurologic disease, whom Hernández et al excluded. Patients with severe neurologic deficit and tracheostomy in place at ICU discharge have worse outcomes.<sup>11,13</sup>

Similarly, also in this issue of *RESPIRATORY CARE*, Gerber et al<sup>14</sup> report a retrospective review of 60 patients who were discharged to the ward with a tracheostomy in place, to determine if outcomes of tracheostomized patients can be predicted with commonly collected clinical data. Of the 60 patients, 15 were readmitted, 6 died outside the ICU, and 12 died during initial ICU stay. Weight was identified as a risk factor for higher mortality in the patients who died or were readmitted to the ICU, compared to the patients who were not readmitted. Unfortunately, we do not know the causes of death in those patients.

Both studies<sup>12,14</sup> show that predicting outcomes of tracheostomized patients remains difficult, and all patients appear to be at risk for adverse outcomes after leaving the ICU. However, 2 groups emerge as potentially higher-risk: patients with neurologic disease, and the obese. Clinicians should have heightened concern about tracheostomized patients with neurologic disease; the poor outcomes found by Gerber et al are consistent with other studies. Additionally, patients with higher body mass index are at greater risk. Several studies have found that obese critically ill patients have no worse outcomes than patients with normal body weight,<sup>15-17</sup> but morbid obesity is associated with 4-fold greater complications in tracheostomized patients.<sup>18</sup> Major complications were mainly due to anatomical issues such as tube obstruction and inability to reestablish an airway.

The studies by Hernández et al<sup>12</sup> and Gerber et al<sup>14</sup> help us to define tracheostomized patients who might be at risk of complications. Three approaches have been identified for improving the safety and care of post-ICU tracheostomized patients.

### Decannulation Protocols

Previously published limited data and expert opinion suggest that all patients should be considered for decannulation once mechanical ventilation is no longer needed, upper-airway obstruction has resolved, airway secretions are controlled, and swallowing is evaluated and adequate.<sup>6,19</sup> Ceriana et al applied a decisional flowchart decannulation algorithm to patients weaned from mechanical ventilation with a tracheostomy in place. With their protocol, 78% of patients were weaned, only 3.5% required reintubation within 3 months, and only 1 reintubation was for an airway-related complication.<sup>13</sup>

Decannulation protocols, tracheostomy-care protocols, and weaning protocols can improve outcomes, but a majority of institutions have no such protocols, so there is wide variability in knowledge about and management of patients with tracheostomies,<sup>4,6</sup> which may negatively impact care. Protocols have benefitted other aspects of critical care and would probably benefit tracheostomy management and decannulation.<sup>4</sup>

### Respiratory Step-Down Units

If a patient fails ICU decannulation, it may be beneficial to discharge the patient to a respiratory step-down unit instead of a regular floor. At many institutions these step-down units specialize in ventilator weaning and managing patients with tracheostomies.<sup>20,21</sup> A step-down unit has a higher nurse-to-patient ratio than a regular ward, and is staffed by clinicians with respiratory care expertise.<sup>8</sup>

A respiratory step-down unit provides a highly monitored environment for continuing aggressive respiratory management. An international survey found that clinicians in weaning and acute-care units are more likely to recommend decannulation than are those in long-term-care facilities.<sup>6</sup> A step-down unit may be an ideal site to implement a decannulation protocol in patients not able to be decannulated during their ICU course.<sup>13</sup>

### Tracheostomy Teams

Not all hospitals have the resources for a dedicated respiratory unit, and these units may not have the capacity to admit all tracheostomized patients. As an alternative or addition to a dedicated unit, tracheostomized patients can be followed closely by a tracheostomy team, which includes one or more respiratory therapists with a special interest in tracheostomized patients, nurses, and physicians, especially those with ear, nose, and throat or ICU training.<sup>22,23</sup> Some tracheostomy teams begin following the patient immediately after the tracheostomy, even if the patient is in the ICU. This provides continuity of care, and the tracheostomy team can assist the ICU team with the decannulation protocol.<sup>23</sup>

The benefits of a tracheostomy team include specialists seeing the patient every day, ensuring good tracheostomy position, cleaning, proper sizing, assisting with tracheostomy changing, providing immediate intervention in cases of tube dislodgement or blockage, and teaching ward nurses and physicians about tracheostomies.<sup>22,23</sup>

A tracheostomy team may allow for safer discharge of patients with tracheostomies to the general wards. In a case-control study, a specialist-led tracheostomy team that began following patients in the ICU significantly increased pre-ICU-discharge decannulation, from 14% to 34%, and there were significantly fewer complications in patients

discharged to the wards with a tracheostomy in place when they were followed by the tracheostomy team.<sup>23</sup>

In Australia, an intensivist-led tracheostomy team improved the hospital's decannulation rate by 20% per year, and shortened stay among patients discharged from the ICU with a tracheostomy in place.<sup>22</sup>

Once a tracheostomized patient is liberated from the ventilator, efforts should be made to decannulate, because patients discharged with tracheostomies in place have a higher risk of morbidity and mortality. Decannulation protocols are probably helpful, although they are not yet common. Among patients discharged from the ICU with a tracheostomy in place, the highest-risk patients are probably those with severe neurologic disease and obesity. All patients should be considered for discharge to a respiratory care unit if such a unit is available. Alternatively, tracheostomized patients should be followed by a dedicated multidisciplinary tracheostomy team that continues to evaluate for decannulation, provides continuity of tracheostomy care, and manages emergency airway situations.

**Susan R Wilcox MD**

**Ulrich H Schmidt MD PhD**

Department of Anesthesia and Critical Care  
Massachusetts General Hospital  
Boston, Massachusetts

### REFERENCES

1. Fischler L, Erhart S, Kleger GR, Frutiger A. Prevalence of tracheostomy in ICU patients: a nation-wide survey in Switzerland. *Intensive Care Med* 2000;26(10):1428-1433.
2. Apezteguia C, Rios F, Pezzola D. Tracheostomy in patients with respiratory failure receiving mechanical ventilation: how, when, and for whom? In: Esteban A, Anzueto A, Cook DJ, editors. Evidence-based management of patients with respiratory failure. Berlin: Springer; 2004:121-134.
3. Cox CE, Carson SS, Holmes GM, Howard A, Carey TS. Increase in tracheostomy for prolonged mechanical ventilation in North Carolina, 1993-2002. *Critical Care Med* 2004;32(11):2219-2226.
4. Veelo DP, Schultz MJ, Phoa KY, Dongelmans DA, Binnekade JM, Spronk PE. Management of tracheostomy: a survey of Dutch intensive care units. *Respir Care* 2008;53(12):1709-1715.
5. Heffner JE. Tracheostomy decannulation: marathons and finish lines. (editorial) *Crit Care* 2008;12(2):128.
6. Stelfox HT, Crimi C, Berra L, Noto A, Schmidt U, Bigatello LM, Hess D. Determinants of tracheostomy decannulation: an international survey. *Crit Care* 2008;12(1):R26.
7. Frutos-Vivar F, Esteban A, Apezteguia C, Anzueto A, Nightingale P, Gonzalez M, et al; International Mechanical Ventilation Study Group. Outcome of mechanically ventilated patients who require a tracheostomy. *Crit Care Med* 2005;33(2):290-298.
8. Engoren M, Arslanian-Engoren C, Fenn-Buderer N. Hospital and long-term outcome after tracheostomy for respiratory failure. *Chest* 2004;125(1):220-227.
9. Clec'h C, Alberti C, Vincent F, Garrouste-Orgeas M, de Lassence A, Toledano D, et al. Tracheostomy does not improve the outcome of patients requiring prolonged mechanical ventilation: a propensity analysis. *Crit Care Med* 2007;35(1):132-138.

10. Fernandez R, Bacelar N, Hernandez G, Tubau I, Baigorri F, Gili G, Artigas A. Ward mortality in patients discharged from the ICU with tracheostomy may depend on patient's vulnerability. *Intensive Care Med* 2008;34(10):1878-1882.
11. Mpe MJ, Mphahele BV. In-hospital outcome of patients discharged from the ICU with tracheostomies. *S Afr Med J* 2005;95(3):184-1846.
12. Hernández Martínez G, Fernandez R, Sánchez Casado M, Cuenca R, Lopez-Reina P, Zamora S, Luzon E. Tracheostomy tube in place at intensive care unit discharge is associated with increased ward mortality. *Respir Care* 2009;54(12):1644-1652.
13. Ceriana P, Carlucci A, Navalesi P, Rampulla C, Delmastro M, Piaggi G, et al. Weaning from tracheostomy in long-term mechanically ventilated patients: feasibility of a decisional flowchart and clinical outcome. *Intensive Care Med* 2003;29(5):845-848.
14. Gerber DR, Chaaya A, Schorr CA, Markley D, Abouzgheib W. Can outcomes of intensive care unit patients undergoing tracheostomy be predicted? *Respir Care* 2009;54(12):1653-1657.
15. Aldawood A, Arabi Y, Dabbagh O. Association of obesity with increased mortality in the critically ill patient. *Anaesth Intensive Care* 2006;34(5):629-633.
16. Peake SL, Moran JL, Ghelani DR, Lloyd AJ, Walker MJ. The effect of obesity on 12-month survival following admission to intensive care: a prospective study. *Crit Care Med* 2006;34(12):2929-2939.
17. Ray DE, Matchett SC, Baker K, Wasser T, Young MJ. The effect of body mass index on patient outcomes in a medical ICU. *Chest* 2005; 127(6):2125-2131.
18. El Solh AA, Jaafar W. A comparative study of the complications of surgical tracheostomy in morbidly obese critically ill patients. *Crit Care* 2007;11(1):R3.
19. Christopher KL. Tracheostomy decannulation. *Respir Care* 2005; 50(4):538-541.
20. Bigatello LM, Stelfox HT, Berra L, Schmidt U, Gettings EM. Outcome of patients undergoing prolonged mechanical ventilation after critical illness. *Crit Care Med* 2007;35(11):2491-2497.
21. Confalonieri M, Gorini M, Ambrosino N, Mollica C, Corrado A; Scientific Group on Respiratory Intensive Care of the Italian Association of Hospital Pneumologists. Respiratory intensive care units in Italy: a national census and prospective cohort study. *Thorax*. 2001;56(5):373-378.
22. Tobin AE, Santamaria JD. An intensivist-led tracheostomy review team is associated with shorter decannulation time and length of stay: a prospective cohort study. *Crit Care* 2008;12(2):R48.
23. Norwood MG, Spiers P, Bailiss J, Sayers RD. Evaluation of the role of a specialist tracheostomy service: from critical care to outreach and beyond. *Postgrad Med J* 2004;80(946):478-480.

---

The authors have disclosed no conflicts of interest.

Correspondence: Susan R Wilcox MD, Department of Anesthesia and Critical Care, Massachusetts General Hospital, 55 Fruit Street, Boston MA 02111. E-mail: swilcox1@partners.org.