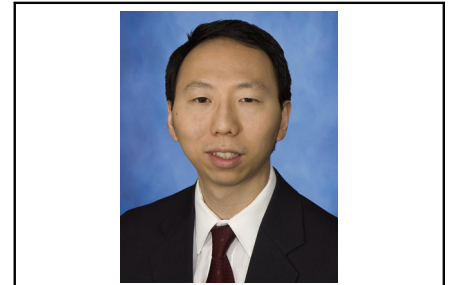


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Commentary: Survival of the fittest: Survival improved in patients on mechanical ventilation pretransplant, but frailty still matters

Jules Lin, MD, FACS, FCCP



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CENTRAL MESSAGE

While survival has improved in patients on mechanical ventilation pre-lung transplant, assessing frailty is critical, as these patients continue to have worse survival than nonventilated patients.

In this issue of the *Journal*, Hamilton and colleagues¹ report that survival has improved in patients requiring mechanical ventilation pre-lung transplant, analyzing data from the Organ Procurement and Transplantation Network registry from 2005 to 2018. While the authors should be commended on their analysis of the available data, there are limitations with loss of important granular details in the Organ Procurement and Transplantation Network database. For example, data on intraoperative cardiopulmonary bypass, 6-minute walk distance, and duration of mechanical ventilation were not available. However, the results are important, with an increasing number of patients on the waitlist and recent changes in lung allocation with broader sharing resulting in sicker patients being transplanted.

The authors focus on preoperative mechanical ventilation and excluded patients on extracorporeal membrane oxygenation (ECMO). However, Hayanga and colleagues found that ECMO has actually overtaken mechanical ventilation as a bridge to transplant since 2014 and was approximately 6% versus 2.5% of lung transplants in 2016.² With ECMO becoming more common, especially in patients likely to become debilitated on mechanical ventilation, it is possible that the sickest patients in the more recent cohort were bridged using ECMO instead of mechanical ventilation and were excluded from the cohort, leading to better survival in the remaining patients on mechanical ventilation. However, the authors performed a sensitivity analysis that

included patients on ECMO and found no significant differences in survival.

There have also been important changes in the lung allocation score during the study period including the 2015 modifications adding total bilirubin that could increase the lung allocation score of candidates with pulmonary vascular disease. More recent changes in lung allocation with broader sharing have also resulted in sicker patients being transplanted earlier, which could change the patients included in the modern cohort. The authors attempted to control for changes in patient characteristics, selection, and post-transplant care over time through propensity-matching, although important data are missing, including cardiopulmonary bypass and duration of mechanical ventilation.

While improvements in the perioperative care of patients requiring mechanical ventilation pretransplant have improved survival over the past decade, these complicated patients continue to have worse outcomes than ambulatory, nonventilated patients coming from home. With increasing duration on mechanical ventilation, patients become increasingly debilitated, and determining whether ventilated, bedbound patients remain transplant candidates can be difficult. Frailty and decreased functional status (6-minute walk distance) have been associated with worse survival after lung transplant.^{3,4} Recent efforts have encouraged early tracheostomy, physical therapy, and ambulation while

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on the mechanical ventilator. There have also been series evaluating ambulatory ECMO, allowing patients to be extubated and to participate in physical therapy to avoid deconditioning.⁵ In the current study, data on the duration of mechanical ventilation were not available, making it more difficult to determine the degree of deconditioning in the 2 cohorts.

Frailty matters, and assessing and preventing deconditioning in ventilated patients is critical, as these patients continue to have worse survival than nonventilated patients following transplant. While survival has improved in patients on mechanical ventilation pre-lung transplant, it continues to be survival of the fittest.

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Commentary: Rage against the machine (ventilator that is)

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Although mechanical ventilation (MV) support pre-lung transplant remains a relative contraindication to lung transplantation, recipient bridging strategies including MV and veno-venous extracorporeal membrane oxygenation (ECMO) continue to expand.¹⁻³ In the current issue of the *Journal*, Hamilton and colleagues⁴ analyze the outcomes of 21,375 patients following lung transplantation with a focus on patients requiring preoperative mechanical ventilation. The authors performed a retrospective analysis of data from the Organ Procurement and Transplantation Network registry from the United Network for Organ Sharing. Objectives posed in the study included the change in outcomes for MV recipients over time; recipient baseline characteristics associated with 30-day mortality; and MV

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CENTRAL MESSAGE

Despite improvements in recipient survival following lung transplant with pretransplant mechanical ventilation, the quest for better bridging strategies continues.

recipient outcomes compared with non-mechanically ventilated recipients (NMV). Recipients were categorized into 2 separate eras, an early era (462 recipients transplanted 2005-2011) and a modern era (424 recipients transplanted 2011-2018). Using propensity matching, the authors demonstrate a significant reduction of death (hazard function) in the modern-era MV recipients at specified time points (30-day and 4 and 14 months). A notable 72% lower hazard of death at 30 days was observed in the modern-era MV recipients compared with the early era. Long-term