

Outcomes and Utilization of Extracorporeal Membrane Oxygenation as Bridge-to-Transplantation Following the 2018 Adult Heart Allocation Policy

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Background

- The Organ Procurement and Transplantation Network implemented drastic changes to the existing adult heart allocation policy on **October 18, 2018**.
- Prior to this change, heart transplant candidates had been categorized into three broadly-defined tiers, with the majority falling under the highest priority status.
- The new policy was aimed at prioritizing the most urgent patients with emphasis on the duration and type of mechanical circulatory support (MCS) being used.
- Under the new policy, stable and dischargeable patients with left ventricular assist devices (LVADs) received a decrease in urgency, while those on extracorporeal membrane oxygenation (ECMO) and intra-aortic balloon pumps (IABP) were prioritized in status.
- Little is known regarding the characteristics and outcomes of the large influx of patients now being bridged with ECMO in the new allocation scheme.
- Purpose:** The present study characterized changes in waitlist and post-transplant outcomes of ECMO patients being bridged to transplantation following the 2018 OPTN policy change.
- Hypothesis:** ECMO patients would experience improved survival both on the waitlist and following transplantation due to prioritization.

Methods

- Patient cohort: Adult (≥ 18 years) patients on ECMO at the time of transplant
 - Era 1:** 2 years prior to new policy (*October 18, 2018*)
 - Era 2:** 2 years following rule change
 - Primary endpoint:** Survival at 1 year following transplantation
 - Secondary outcomes included 30-day mortality following transplantation, waitlist death or deterioration and waitlist duration
- Statistical Analyses
- Baseline Characteristics:** Mann-Whitney-U and Chi-square tests
 - Continuous and categorical variables, respectively
 - Waitlist outcomes:** Competing risk regressions
 - Post-transplant outcomes:** Kaplan-Meier Survival Estimates and Cox-PH analysis

Results

Table 1. Baseline characteristics of ECMO patients bridged to heart transplantation

Variable	Era 1 n = 50	Era 2 n = 289	p-value
Proportion of all Heart Recipients	1.2%	6.1%	< 0.001
<i>Recipient Characteristics</i>			
Age, y	49 (31 - 61)	50 (34 - 60)	0.67
Female	42.0%	26.0%	0.02
Non-White race	22.0%	35.6%	0.06
BMI	27.3 (23.0 - 32.8)	26.7 (23.7 - 30.5)	0.50
Days on waitlist, median (IQR)	11 (5 - 39)	5 (2 - 13)	< 0.01

Figure 1. Violin plot of **waitlist times** for those bridged to transplantation in Era 1 (left) vs Era 2 (right).

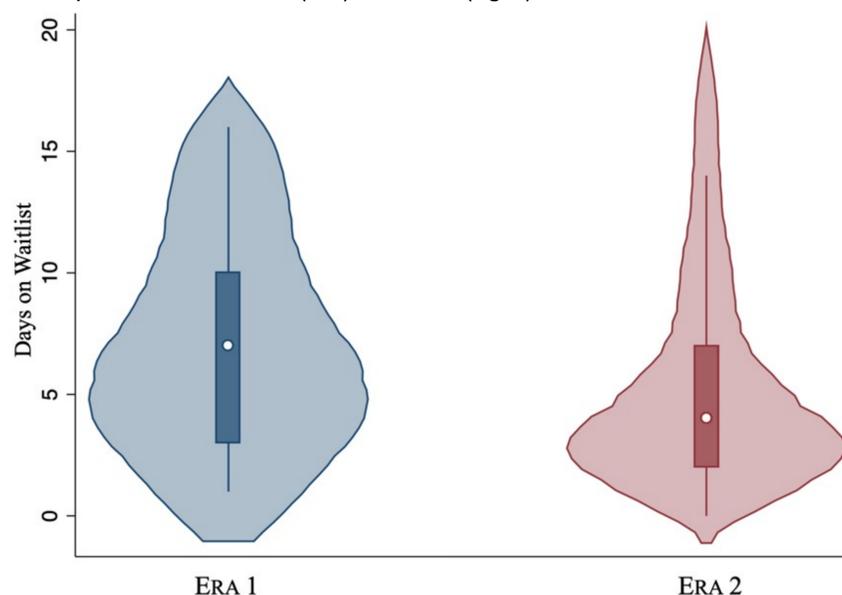
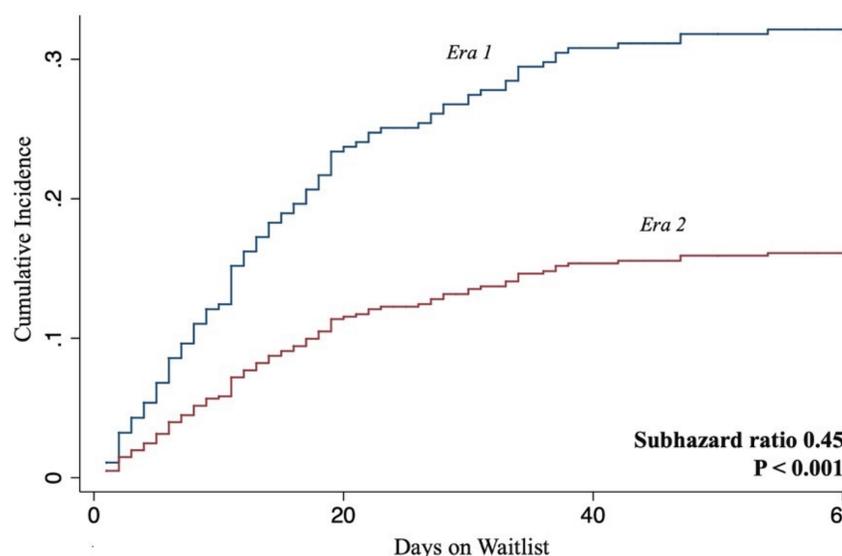


Figure 2. Competing risks regressions for **waitlist death or deterioration** among all patients listed with ECMO.



Results

Figure 3: Adjusted hazard of **mortality at 1-year following transplantation** among those bridged with ECMO (red) vs not bridged with ECMO (blue). Era 1 shown on left panel and Era 2 shown on right.

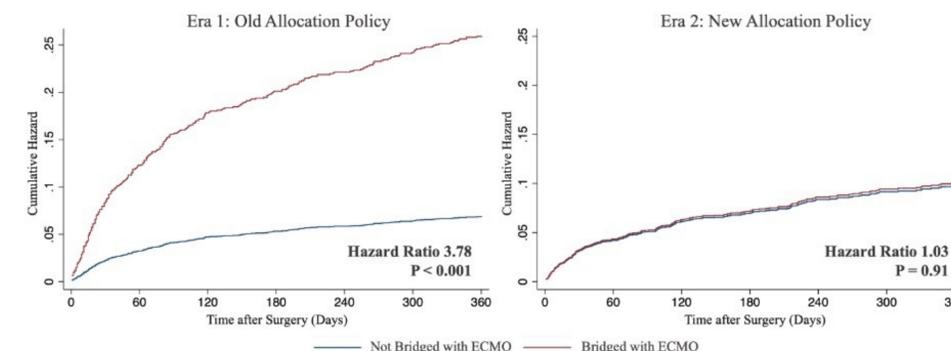


Table 2. Risk prediction model of 30-day mortality in patients bridged with ECMO

Recipient Variable	Hazard Ratio	95% CI	p-value
Age, per 1 y	1.06	1.00 - 1.12	0.05
Female	0.30	0.03 - 3.05	0.31
Body mass index, per 1 kg/m²	1.30	1.09 - 1.54	< 0.01
Ventilator use at transplant	8.45	2.13 - 33.55	< 0.01
Prior cardiac surgery	7.03	1.67 - 29.68	< 0.01
Dialysis	0.14	0.02 - 1.38	0.09
Cerebrovascular disease	2.65	0.33 - 21.5	0.36
Functional status, per 1 u*	1.02	0.71 - 1.45	0.93
Serum creatinine, per 1 mg/dL	2.37	0.93 - 6.03	0.07
Systolic PA pressure, per 1 mmHg	1.04	0.99 - 1.86	0.13
Cardiac output, per 1 L/min	1.32	0.94 - 1.86	0.11

Conclusion

- Patients bridged with ECMO in the new Era have **similar acuity** compared to prior to the rule change
- Compared to Era 1, ECMO patients in Era 2 spend **less time on the waitlist**
- Use of ECMO is no longer associated with worse post-transplant mortality, suggesting time to transplant may be a key indicator of successful outcomes
- Increasing BMI, ventilator status, and prior cardiac surgery are among factors strongly associated with increased 30-day mortality in the ECMO cohort.
 - These findings may aid in candidate selection and prioritization as the role of ECMO in heart transplantation continues to grow
- Main takeaway:** Patients bridged with ECMO are benefitting from the new allocation policy. These findings suggest ECMO may be most effective as a bridging strategy when patients are transplanted **in a timely manner**