Effect of ECMO Duration on Post-Transplant Survival and Treated Rejection

Joshua Bott, Setara Nusratty, Kyle Torres

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Background

- ECMO, which stands for Extracorporeal Membrane Oxygenation, is a medical device that provides life support by externally oxygenating the blood and removing carbon dioxide from the body
- After transplant, patients may experience adverse health outcomes such as organ rejection or death/graft failure
- It is not known if duration of being on a device is associated with worse health outcomes prior to transplantation

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Background (con.)

- Sensitization, the development of antibodies in the immune system against foreign antigens, can occur if you are on an MCS (mechanical circulatory support) device such as ECMO
- Sensitization has been shown to lead to worse post-transplantation outcomes
- It is unknown if the degree of sensitization is dependent on duration of ECMO prior to transplantation
- We are interested in duration as the covariate of interest

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Data

- Data is collected from an observational cohort study collected through the United Network for Organ Sharing (UNOS)
- We utilized a subset of the UNOS data focusing on one ventricular support device, ECMO

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- Objective: Determine if duration of ECMO support is associated with worse one-year post-transplant outcomes:
  1. Treated for rejection within 1 year
  2. Rejection-free mortality within 1 year
  3. Death/Graft failure within 1 year (i.e., graft failure-free survival).

Methods

- Multinomial regression was used to model ECMO duration on the following three outcomes:
    1. Alive and not treated for rejection
    2. Treated for rejection
    3. Rejection-free death within one year
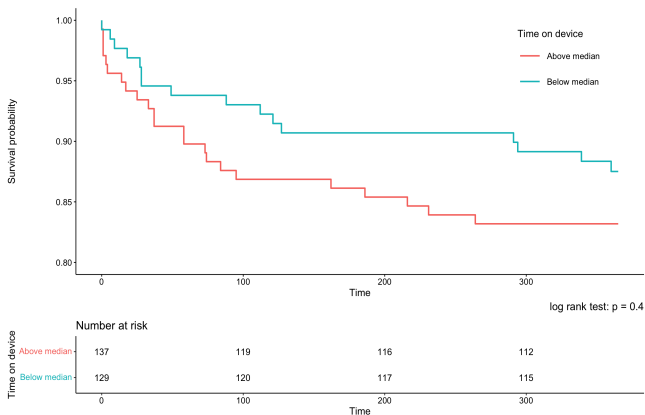- Cox's regression was used to model ECMO duration on one-year graft failure-free survival

Results

Table 1: Characteristics of ECMO Duration Subset Stratified by Median

Variable	Level	Stratified by Time on Device	
		Above (137)	Below (130)
Age (mean (SD))		48.44 (15.51)	45.88 (14.99)
Gender (%)	F	36 (26.3)	35 (26.9)
	M	101 (73.7)	95 (73.1)
Ethnicity (%)	White	92 (67.2)	72 (55.4)
	Non-white	45 (32.8)	58 (44.6)
BMI (mean (SD))		27.78 (5.03)	26.45 (4.85)
Pre-transplant dialysis since listing (%)	N	105 (76.6)	119 (91.5)
	Y	32 (23.4)	11 (8.5)
Patient bilirubin level at transplant (mean (SD))		1.96 (2.68)	2.08 (3.56)
IV Drug therapy (%)	N	82 (59.9)	112 (86.2)
	Y	55 (40.1)	18 (13.8)
Presence of ischemic cardiomyopathy (%)	N	102 (74.5)	97 (74.6)
	Y	35 (25.5)	33 (25.4)
Outcome (%)	Alive	99 (72.3)	92 (70.8)
	Dead	23 (16.8)	15 (11.5)
	Treated	15 (10.9)	23 (17.7)

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Figure 1: K-M Curve for ECMO Duration Subset Stratified by Median

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Figure 2: Adjusted and Unadjusted Multinomial Model Results

Model	Outcome	OR
Unadjusted	Treated (p = 0.07)	0.922
Adjusted	Treated (p = 0.84)	0.913
Unadjusted	Died (p = 0.42)	1.021
Adjusted	Died (p = 0.06)	1.006

OR (95% CI)
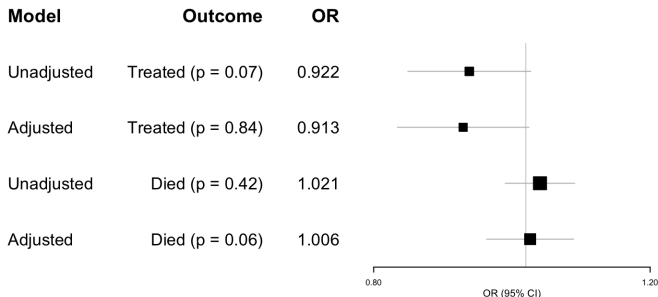
*Multinomial and Cox Proportional Hazards regression analyses were adjusted for gender, age, ethnicity, patient bilirubin level at transplant, pre-transplant dialysis since listing, presence of ischemic cardiomyopathy, and IV Drug therapy two weeks prior to transplant. The multinomial regression analysis compares the treated for rejection and died and not treated for rejection groups with the baseline of being alive and not treated for rejection

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Figure 3: Adjusted and Unadjusted Cox PH Results

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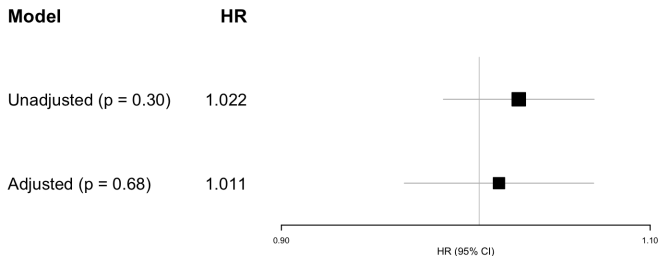
Discussion

- No association between duration on the device and survival
- Future analysis should focus on a bigger subset of data containing multiple ventricular support devices
- We should further examine confounding variables, specifically creatinine levels and pre-transplant dialysis since listing
  - Recode these as three variables: creatinine levels at pre-dialysis, post dialysis, and the subset of patients not on dialysis