



Anique Ducharme, MD, MSc, FRCP

Professor of Medicine
Université de Montréal
Director Heart Failure Clinic
Institut de cardiologie de Montréal
Montréal (QC), Canada

Reviews:

Development of a Transplantation Risk Index in Patients With Mechanical Circulatory Support: A Decision Support Tool. Johnston LE, Grimm JC, Magruder JT, Shah AS. *JACC Heart Fail.* 2016 Feb 2. pii: S2213-1779(15)00720-9. doi: 10.1016/j.jchf.2015.11.009. [Epub ahead of print]

The decision to continue ongoing MCS support or list for transplantation for an individual patient may be difficult. Few clinical tools are available to aid in this decision-making process in patients already supported with MCS. The aim of this study was specifically to develop a risk index for those patients that accurately predicts 1-year mortality after heart transplantation, using the United Network for Organ Sharing (UNOS) database. 6,036 adults patients who underwent a primary cardiac transplantation between 2000 and 2013 after being bridged with a durable MCS were included. This population was then randomly separated into derivation (80%) and validation (20%) cohorts.

The primary outcome was 1-year mortality; secondary endpoints included 90-day and 3-year mortality as well as overall survival time. Standard UNOS variables and definitions were used. The dataset contained 680 variables, including both donor and recipient data. All plausible variables for predicting 1-year mortality were evaluated using univariate logistic regression in the derivation sample. The multivariate regression model was built in a hierarchical fashion. Of the approximately 50 variables that were screened in univariate logistic regression, 20 were at least modestly associated with 1-year mortality and were candidates for inclusion in the final model. Once the final model was complete, points were assigned to each variable to generate the transplantation risk index in patients with MCS (TRIP-MCS) score.

Recipient variables (9) that strongly predicted 1-year mortality included age, body mass index (BMI), intensive care unit admission, need for preoperative mechanical ventilation, renal and hepatic function, recent infection, and type of support device. Significant donor variables (4) included donor age, sex mismatch with the recipient, ischemic time, and donor glomerular filtration rate (GFR). A 75-point scoring system was created with an average score in the validation cohort was 14.4 ± 7.7 , and scores ranging from 0 to 57. Each 1-point increase predicted an 8.3% increase in the odds of 1-year mortality (odds ratio: 1.08; 95% confidence interval: 1.06 to 1.11). Low (0 to 10), intermediate (11 to 20), and high (>20) risk score cohorts were created, with predicted average 1-year mortalities of 8.6%, 12.8%, and 31%, respectively, in the validation cohort.

To ensure that the model was valid for latest generation ventricular assist device technology, most specifically the HeartMate II (Thoratec, Pleasanton, California), a subset analysis was conducted, examining only patients who underwent transplantation after 2009. In this scenario, the score remained a robust predictor of 1-year mortality in both derivation (OR: 1.08; 95% CI: 1.06 to 1.09) and test (OR: 1.09; 95% CI: 1.05 to 1.13). The score was also broadly generalizable against both 90-day and 3-year mortality.

To better understand the balance between risk incurred from donor and recipient variables, the scores were broke down by risk source to evaluate what percentage of patients could move to a lower risk group given the selection of an alternative organ. In the moderate-risk group, 36% (95% CI: 34% to 38%) of patients in both the derivation and validation (95% CI:32% to 40%) cohorts could move to the low-risk group with a lower risk organ. In the high-risk group, 49% (95% CI: 46% to 52%) and 46% (95% CI: 39% to 53%) of patients in the derivation and validation cohorts, respectively, could move down at least to the moderate group with a different organ, and 1.5% (95% CI: 0.82% to 2.5%) and 1.4% (95% CI: 0.30% to 4.2%), respectively, could potentially move from high-risk to low-risk groups with alternative organ selection.

Conclusion: This is a novel, cross-validated risk index that accurately predicts mortality in MCS patients undergoing cardiac transplantation. The results are consistent with the non-MCS specific IMPACT score, and provides additional information on recipient variables such as BMI, ICU admission and type of devices as well as the donor-recipient interaction. I am looking forward for the availability of an app using this index.

Transplantation and Mechanical Circulatory Support in Congenital Heart Disease: A Scientific Statement From the American Heart Association Circulation. Heather J. Ross, Yuk Law, Wendy M. Book, Craig S. Broberg, Luke Burchill, Frank Cecchin, Jonathan M. Chen, Diego Delgado, Konstantinos Dimopoulos, Melanie D. Everitt, Michael Gatzoulis, Louise Harris, Daphne T. Hsu, Jeffrey T. Kuvin, Cindy M. Martin, Anne M. Murphy, Gautam Singh, Thomas L. Spray, and Karen K. Stout. on behalf of the American Heart Association Adults With Congenital Heart Disease Committee of the Council on Clinical Cardiology and Council on Cardiovascular Disease in the Young, the Council on Cardiovascular Radiology and Intervention, and the Council on Functional Genomics and Translational Biology. 2016;133:802-820

Adults patients with Congenital Heart Disease (CHD) presents additional challenges to the cardiac transplantation team both in terms of evaluation for listing and outcomes compared with patients with acquired HF. Further, the actual allocation systems used throughout the world do may not be optimal for patients with CHD. Therefore, the Thoracic Organ Transplantation Committee recently proposed modifications to the adult heart allocation system to better stratify the most medically urgent heart transplant candidates, reflecting the increased use of mechanical circulatory support devices (MCSD) and prevalence of MCSD complications, and addressed geographic disparities in access to donors among heart transplant candidates.

(<https://optn.transplant.hrsa.gov/governance/public-comment/adult-heart-allocation-changes-2016/>)

Nevertheless, many CHD patients require complex vascular reconstruction at the time of transplantation; the presence of pulmonary hypertension, liver disease and sensitization are also obstacles to timely transplantation. Consequently, CHD remains a risk factor during the waiting period and after transplantation, with a poorer survival early after transplantation, but this early risk is offset by a survival paradox, in which the early mortality is counterbalanced by better long-term survival. Therefore, although the management of the CHD patient with end-stage HF must include the option of transplantation, its indication and timing are very different from that for acquired HF. Further, although overall use of MCS before transplantation has increased dramatically over the last decade, it has not done so in adults CHD patients. Many small reports have published the feasibility for those patients after arterial switch procedures, but with additional complexity for inflow cannula placement, including the performance of RV trabeculations muscular resection, whereas for those with a Fontan physiology, total cardiac replacement strategy might be a better option.

Two important considerations warrant discussion regarding CHD and MCS. One is the need for assessment of full cardiac morphology (including location of great vessels, shunts, and collateral vessels, assessed before MCS). The other is that for those patients who are not candidates for left ventricular support, assessment for total heart replacement strategies is important. Unfortunately, there is no multi-institutional MCS single-ventricle registry available to help better defines selection criteria for MCS and the authors call for further studies in that field.

Mechanical circulatory support and simultaneous heart-kidney transplantation: An outcome analysis. Sandip K. Zalawadiya, Mark Wigger, Thomas DiSalvo, Nicholas Haglund, Simon Maltais, JoAnn Lindenfeld. JHLT February 2016 Volume 35, Issue 2, p203–212.

Tricuspid Valve Annular Dilation as a Predictor of Right Ventricular Failure After Implantation of a Left Ventricular Assist Device (pages 110–116). Livia Goldraich, Hiroyuki Kawajiri, Farid Foroutan, Juarez Braga, Phyllis Billia, Jimmy Misurka, William E. Stansfield, Terrence Yau, Heather J. Ross and Vivek Rao. Journal of Cardiac Surgery. Article first published online: 8 JAN 2016 | DOI: 10.1111/jocs.12685

Left Ventricular Assist Device and Bariatric Surgery: A Bridge to Heart Transplant by Weight and Waiting Time Reduction (pages 120–122). Eric I. Jeng, Juan M. Aranda Jr., Mustafa Ahmed and Charles T. Klodell. J Cardiac Surgery Article first published online: 8 JAN 2016 | DOI: 10.1111/jocs.1268

Short-term mechanical circulatory support with the Impella 5.0 device for cardiogenic shock at La Pitié-Salpêtrière. Mastroianni C, Bouabdallaoui N, Leprince P, Lebreton G. Eur Heart J Acute Cardiovasc Care. 2016 Feb 12. pii: 2048872616633877. [Epub ahead of print]

Modern Outcomes of Mechanical Circulatory Support as a Bridge to Pediatric Heart Transplantation. Wehman B, Stafford KA, Bittle GJ, Kon ZN, Evans CF, Rajagopal K, Pietris N, Kaushal S, Griffith BP. *Ann Thorac Surg.* 2016 Feb 22. pii: S0003-4975(15)01988-8. doi: 10.1016/j.athoracsur.2015.12.003. [Epub ahead of print]