Decisions, Decisions, Decisions...The Challenges Between Two Different Organ Allocation Systems"

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It's 3 o'clock in the morning and the pager has begun to scream with a very familiar number. I wipe the sleep from my eyes, trying hard not wake up anyone else, and I'm finally able to log into Donornet (after only the 3rd attempt). Another sad story, school aged child versus gun shot wound. The offer is for a potential recipient who is 5th on the list. It's far away so the ischemic time will be long. The down time was long before the child was resuscitated. The sodium is elevated. The taking care of the donor haven't started vasopressin yet. The troponin is rising. The ejection fraction was low at the start and has gotten better but still not normal on two inotropes. It will be big for the recipient but probably (maybe) will fit. Wait, everyone has turned it down and your recipient is up next! It's easy to turn this down and wait for a better one. Or do you roll up your sleeves and make the call to the surgeon knowing that it will require some conversation and convincing? Your recipient is in hospital on milrinone stable but not perfect either. It is not perfect. Donor organs are never perfect.

The above is a common scenario many have faced before. These are challenging decisions. Having had the opportunity to work as a transplant cardiologist in both Canada and the United States (US) has provided some interesting perspectives on decision making. Justin Godown and colleagues published a multi-centre survey looking at donor acceptance practices across sites from 17 countries. We learned that there is little uniformity in practices with regards to donor to recipient weight ratio (DRWR), the acceptable donor age, and cardiac function. Centers outside of the US tend to be more willing to take hearts from donors who are older, a higher threshold for DRWR, and lower ejection fraction.[1] The driving factor for most of these decisions is organ availability. The more offers you get for your potential recipient allows the program to be more selective. Donor organs come very infrequently in Canada. It's a big country with a population the size of California. So when an offer comes, the knee jerk reaction is to accept it and then deal with the flaws afterwards. Function is depressed? Rossano et al showed that, although infrequent (<15%), donor hearts with depressed ventricular function had no difference in graft survival.[2] But how low is too low? Though data supports the decision to accept it, are decision makers for accepting donor organs comfortable with that decision? Perhaps there are subsets in such a group that would do worse than other. We just do not know who those may be. What about the organ that is far away? We tend to set limits on how far we will travel to retrieve an organ aiming for that ideal ischemic time. Is an ischemic time greater than 4 hours acceptable? Many parts of the USA are very close to high density populous regions and derive a geographical benefit from donor offers such that ischemic times over 4 hours are rare occurrences. But anything can happen (If you haven't seen "Planes, Trains & Automobiles", you should). However, there are parts of the world where a longer ischemic time is unavoidable. Dani and colleagues showed that in donor hearts with an ejection fraction greater than 65% and an ischemic time between 4 to 6 hours had similar outcomes to those < 4 hours. However the data has been mixed on this topic with some reports showing poorer post-transplant hemodynamics with prolonged ischemic times.[3] But perhaps prolonged ischemic time will be a problem of the past. Multiple centers are exploring the use of ex vivo perfusion for pediatric heart transplants and already there is a growing experience for ex vivo in adult sized adolescents using the commercially available systems.[4]

The conundrum of deciding if a heart will fit in a recipient is ongoing. Traditional measures of using donor to recipient weight ratios are, for a lack of better way of saying it, "old school". Yet, it is still the most widely employed method and quickest way to determine fit. Where the threshold of comfort exits will vary i.e. to accept an organ that is double the size or not. What about two and a half times? three times larger? these thresholds are arbitrary and with limited data on outcomes. Perhaps graft function won't be impaired but the associated complications of donor to recipient vessel mismatch may result in additional procedures and comorbidities that are still understudied in pediatric heart transplantation. More novel ways to determine the best "fit" involve both echocardiography and computed tomography (CT) virtual fit testing. Szugye and colleagues published the experience of using total cardiac volumes instead of weight for donor selection which allowed for increasing the potential size of the donor organ that could be transplanted without associated complications.[5] Adding this approach to the toolbox for decision making may broaden the donor pool available for centers that have long waitlist times and limited donor organ availability.

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Back to the 3 am donor offer. I will try to be self-reflective on this aspect and thus impart my personal opinion. Others may manage these scenarios differently. With depressed ventricular function and multiple inotropes, rising troponin, and a long ischemic time it would be more than likely that I would turn this offer down in Donornet and try to go back to sleep. Unless the potential recipient was on ECMO or actively deteriorating, it would pose more than the usual amount of risk for a relatively stable recipient who has the hope to wait a little longer for a more appropriate donor organ. However, having now moved to the other side of the 49th Parallel, it would be unclear as to how many more weeks, or possibly even months, before another suitable donor offer would present itself. This would require a phone call to the organ procurement organization (OPO) and discuss the need to contact the donor institution and the team taking care of the patient. A more active hand may be needed in donor management to adjust the fluid management and inotrope strategy, repeat an echocardiogram with the changes, and perhaps waiting an additional 24-48 hours to allow for further improvement and a down trend in the troponin. Additional conversations may also be had with other team members about the suitable "fit" with respect to the size and additional images that are needed. This will often take up hours of work. However, if successful, it can result in turning a marginal organ into a better one. Truth be told, it doesn't always turn out successful and there will be some near misses and "dry runs" from this approach too.

The general problems of donor availability are the same pretty much around the world. It often is a matter of how many standard deviations from the mean that impact access to suitable donor hearts. Some institutions will routinely have to transplant with patients supported with longer wait times, have longer ischemic times, and greater thresholds for donor sizes. This is where innovation in pediatric heart transplantation helps everyone - such as improvement in VAD support, ex vivo perfusion, and novel imaging that can provide further accuracy for donor suitability. These advances help all of us across the board no matter where we practice and should drive better outcomes for all. Now I will try to go back to sleep.

1. Godown, J., et al., Variability in donor selection among pediatric heart transplant providers: Results from an international survey. Pediatr Transplant, 2019. 23(5): p. e13417.

2. Rossano, J.W., et al., Pediatric heart transplantation from donors with depressed ventricular function: an analysis of the United Network of Organ Sharing Database. Circ Heart Fail, 2013. 6(6): p. 1223-9.

3. Dani, A., et al., Effect of ischemic time on pediatric heart transplantation outcomes: is it the same for all allografts? Pediatr Transplant, 2022. 26(4): p. e14259.

4. Andersen, N.D., et al., A report of the first pediatric heart transplant following donation after circulatory death in the United States using ex-vivo perfusion. The Journal of Heart and Lung Transplantation, 2022.

5. Szugye, N.A., et al., Evidence supporting total cardiac volumes instead of weight for transplant size-matching. J Heart Lung Transplant, 2021. 40(12): p. 1495-1497.