

Thesis Project Portfolio

Designing a Dashboard to Streamline Pediatric Heart Transplant Decision Making
(Technical Report)

Exploration of Pediatric Cardiologist Decision-Making in the United States and Canada
(STS Research Paper)

An Undergraduate Thesis

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Angela Wan

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Department of Engineering Systems and Environment

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Heart transplantation is the standard of care for a child with end-stage heart failure or heart defects from birth that have not improved with medication or other surgeries. Although pediatric heart transplantation is a successful alternative for patients to survive, 20% of children on the waitlist die before receiving a transplant in the United States (Singh et al., 2021).

Optimizing the use of organs remains a pressing issue in the United States as almost half of all donor hearts are discarded (Khan et al., 2016). For my technical project, my team and I were tasked to redesign the patient dashboard to give pediatric cardiologists more confidence and ease in their decision to accept or reject a heart. After being given a more in-depth overview of the heart utilization problem for my Capstone project, I learned that even after being deemed unacceptable by multiple programs in the United States, many hearts are sent to Canada and used in successful transplants. Due to the lack of standardized criteria for pediatric heart acceptance across programs, I was curious as to why Canadian transplant programs decided hearts that the United States had rejected so many times were safe for use. Because Canada's organ usage leads to higher waitlist survival and decreases the number of hearts that go to waste, I decided to investigate the two countries' health systems to see why differences in decision-making procedures exist and how both could improve in the future.

The current patient dashboard given to pediatric cardiologists uses small font, little to no color, and a deluge of information organized in an unclear hierarchy. To access valuable patient information and files, users must scroll and parse through messy and complicated donor data spread between large areas of blank space to find what they need. With the short amount of time given to pediatric cardiologists to make such high-stakes decisions, the patient data should be shown as intuitively as possible. My technical project aims to design a new dashboard to better

assist cardiologists in making donor acceptance decisions. The dashboard displays patient and donor information more efficiently as well as incorporates metrics and indicators to help cardiologists interpret the most important transplant factors more quickly. This improved decision-making will ideally result in a higher overall survival rate for children in need of a heart transplant and a lower rate of discarded donors. After conducting interviews with eight pediatric cardiologists and a comprehensive literature review to understand how to optimally display information, we created a high-fidelity prototype of the interface that we presented to the representatives of the United Network of Organ Sharing (UNOS), the primary organ procurement organization in the United States.

With waitlists increasing globally for pediatric heart transplants, researchers around the world are looking for ways to optimize the current process and save more lives. Due to Canada's proximity, many of the hearts US hospitals reject are offered to Canadian pediatric cardiologists, who have performed successful surgeries with them (Khan et al., 2016). My STS research aims to see why the pediatric heart acceptance process differs between Canada and the United States and how each healthcare system leads to these distinctions. Similarly to my technical project, I used literature review and interviews to guide my research but focused more on learning about Canada's system and how it differed. I was able to analyze how public versus private healthcare systems as well as the presence of organ procurement organizations influenced how each country's system approached their decision-making with potential hearts.

It was very insightful to do these two projects at the same time, especially since they are so closely related. My technical project helped me understand the decision-making system in the United States at a much deeper level than I would have with a literature review alone, as we had to really understand the biggest issues with the current system to improve it. The background

research and client meetings I had to do for the technical project also prompted my interest in the topic of my STS paper and gave context to a more niche topic I could explore. My STS research helped me to see my technical project in a bigger context and see how the American system fits in a larger global view; I was able to learn a lot about how much variation there is in the decision-making process and how complex it is to make lasting systemic changes due to a country's health politics and culture. This exploration also helped me to reflect on the importance of my capstone project as donor heart usage is a prevalent issue no matter the system.

References

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- Singh, N., Raees, M., & Zafar, F. (2019, October). Donor considerations in pediatric heart transplantation. *TP Translational Pediatrics*, 8(4), Article PMC6825970.