Thesis Project Portfolio

Designing a Dashboard to Streamline Pediatric Heart Transplant Decision Making

(Technical Report)

Analyzing Outside Influences Leading to High Donor Organ Discard Rates in Pediatric Heart Transplantation

(STS Research Paper)

An Undergraduate Thesis

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Table of Contents

Sociotechnical Synthesis

Pediatric heart transplantation is an innovative field that has seen significant success in performing surgery on children to replace their failing hearts with new donor hearts, allowing these children to extend their life expectancy well beyond what was originally predicted. However, the industry still suffers from lingering problems, including the fact that the discard rate of donor hearts in the United States is almost 50% despite long waitlists and high waitlist mortality. Together, my technical capstone project and research paper work to highlight and alleviate several of the factors that are causing the cardiologists responsible for conducting donor assessments to reject an unnecessary number of hearts. The capstone project focuses on the technical factors associated with donor assessment, including the presentation of donor heart data that must be reviewed by cardiologists when performing a donor assessment. My research paper builds upon this concept by calling attention to the behavioral aspects of decision-making, with an emphasis on the various outside influences that are increasing pressure on cardiologists and leading to lower acceptance rates.

A major contributing factor to low acceptance rates is the highly variable decision-making process of cardiologists who must determine the suitability of a potential transplant in an extremely short period of time. The current system for displaying donor data, DonorNet, does not present information ideal for decision making under these conditions which has resulted in suboptimal decisions and cardiologists not being confident in their decisions. The goal of my capstone project aimed to adopt a user-centered systems design approach to develop a new DonorNet dashboard to better support the decision-making process for pediatric cardiologists. The design of an improved DonorNet dashboard was based on: (1) a literature review to understand the factors that influence practitioners in their decision making process and identifying post hoc factors that are predictors of transplant success and (2) interviews by my

research team with eight pediatric heart transplant practitioners to understand how end-users make decisions with DonorNet and identify common pain points. Based on this, my team designed a dashboard using the Figma software based on our research findings that addressed identified pain points such as difficulty finding relevant data. In order to gain feedback on our design, we conducted several of the practitioner interviews after an initial wireframe of the dashboard had been developed, which allowed us to incorporate this end-user feedback into the final mockup. The results of the project included a full prototype of the dashboard which displayed all relevant information on patient and donor heart characteristics.

For my research paper, I argued that cardiologists face a complex network of pressures and considerations from outside influences which are leading to the unnecessary discard of donor hearts. To conduct this argument, I first provided an overview of the literature surrounding pediatric heart transplantation, with emphasis on current processes used in heart transplantation, regulatory agencies used for evaluating transplant centers, and the lack of uniform criteria for assessing a donor heart. From there, I analyzed published medical journal articles, news reports, and transcripts from interviews to construct the network of actors involved in pediatric donor assessment and the various influences that these actors have on donor discard rates. Throughout this analysis, I used Latour's Actor Network Theory to find that influences from these actors are playing a large role in the decision-making of cardiologists and ultimately leading to increased discard rates. Finally, I ended my argument with a brief discussion of how regulations and policies need to be changed to ensure cardiologists are making the best decision possible.

By working on both of these projects simultaneously, I was able to gain significant insight into the decision-making process of cardiologists that would not have been possible if they were conducted individually. For example, interviewing cardiologists for my capstone

project provided a broad range of personal experiences regarding the donor assessment process that ended up being used as evidence in the literature review and argument sections of my research paper. Similarly, the dense amount of research that was conducted for my paper provided new details on the difficulties that cardiologists face in trying to interpret donor data and decide which variables are important for determining transplant success. Overall, the combination of the two projects allowed me to gain a perspective on both the technical and behavioral aspects of pediatric donor assessment and the problems associated with each side.