Thesis Project Portfolio

Modular Walker Handles for a Motorized Posterior Walker

(Technical Report)

How Inequity Was Introduced into The Organ Transplant List

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Introduction

My STS project focuses on the history of inequity in the organ transplant list, while my technical project contributes to the improvement of a technology that could reduce inequity among a disadvantaged community. The STS research topic attempts to understand how inequity has persisted in the organ transplant despite decades of exposure and attempted treatment, while the technical topic is a capstone project aiming to help reduce the negative effects that cerebral palsy patients experience from using walkers that don't fulfil their specialized needs.

Technical Report

Cerebral Palsy (CP) is the most common motor disability in childhood, and posterior walkers are prescribed to approximately 25% of children diagnosed with CP. As a result, over 41,000 school-aged children in the United States use a posterior walker every day. The Motion Analysis and Motor Performance Lab at UVA is working to develop a motorized posterior walker that will minimize energy expenditure and fatigue for users. To do this, a traditional posterior walker and an experimental motorized walker must both be fitted with sensitive, 6-axis force transducers to quantify the forces applied to the walker handles during use. However, these force transducers are prohibitively expensive, so the lab does not have enough to outfit both walkers, only having access to one pair of transducers for one set of handles. Our technical project was to improve the walker handles in a way that would allow the motion lab to interchange the handles quickly and efficiently between walker designs, facilitating improved data collection during clinical trials with cerebral palsy patients. To do this, we designed handles that utilized a button-and-spring locking mechanism to latch and unlatch the handles from the

walker, rather than the original lock which used a hex screw and an Allen wrench to secure the handle to the walker. We 3-D printed and prototyped several iterations of mechanisms before landing on our final design, and used finite element analysis to verify that our modifications wouldn't reduce the structural stability of the handles or impact the accuracy of the force transducers. This change from the screw-and-wrench mechanism to a button-locking mechanism significantly reduces the time required to change the handles between walkers during trials and reduces the amount of people required for this process from three to one.

STS Project

My STS research project focuses on how inequity was first introduced into the organ transplant list and why it continues to exist today, despite continued efforts to eradicate it. Utilizing the Social Construction of Technology (SCOT) framework, I perform a policy analysis and a historical analysis on legal texts, studies, and reports on the organ transplant list from the 1980's till now. Through these analyses, I uncover the existence of closure mechanisms to equity in the foundational legislature and organizational structure of the organ transplant list, such as restrictions to Organ Procurement Organizations (OPOs) in the National Organ Transplant Act (NOTA). I highlight an unwillingness to compromise towards a socially constructed view of equitable organ transplantation between the United Network for Organ Sharing (UNOS) and the member organizations of the Organ Procurement and Transplantation Network (OPTN) in the Final Rule. This resulted in the passing of legislature that much of the public and medical community was strongly opposed to and fought against, delaying implementation of the final rule for years. I also talk about recent studies on the effects of the final rule indicate that this legislation had little or no effect on improving disparities in waiting times, mortality, and donor organ quality. To address why inequity persists, I discuss the lack of enforcement, particularly of

OPOs. I point out the obvious conflicts of interest in the enforcement of regulations by the OPTN on their members and call attention to the redefining of equity by UNOS in their Strategic Plans. This redefining of equity without quantifiable, measurable metrics of success prevents any way to assess the effectiveness of regulations to combat inequity.

Conclusion

Working on both of these projects simultaneously gave me an improved understanding of the processes involved in the development of a new technology and an appreciation for the difficulty in creating equitable work. When my group had trouble compromising on ideas or had hindrances to effective communication with our advisor, it made me much more aware of the difficulty that UNOS experiences when attempting to facilitate collaboration and compromise across the 398 member organizations of the OPTN. Additionally, the less-than-ideal implementation of our first prototypes gave me an increased appreciation for the necessity for continued development. This revelation led me to pay more attention to the stabilization of inequity through a lack of continued development in the organ transplant list that I would not have identified otherwise.