

## **Thesis Project Portfolio**

### **Expanding Armrest Module for Electric Bariatric Chair**

(Technical Report)

### **Underutilized: An Actor Network Theory Analysis of Bariatric Surgery in the 21<sup>st</sup> Century**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2025

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## **Sociotechnical Synthesis**

### **(Executive Summary)**

#### **Level II**

Bariatric care refers to a variety of procedures aimed at helping patients with obesity manage their weight. With obesity levels at all time highs in America, the importance of bariatric care cannot be understated. Obesity and its related health conditions are among the leading causes of death in America. In my STS research I investigate the causes behind the severe underutilization of bariatric surgery procedures as treatment for severe obesity. My technical project helps to address some of the problems with providing bariatric surgery by proposing design changes to an existing bariatric chair so that the armrests can expand to accommodate larger patients.

My technical project began with the intention of ordering a bariatric chair and designing an attachment that could be easily integrated into the existing design to expand and contract the width of the armrests. The armrest expansion was necessary due to larger patients not fitting comfortably in the existing chairs. If they did attempt to use the chair, they were prone to getting bruises, skin ulcers, or other injuries that were causing complications before and after surgery. A refurbished Shuttle A bariatric chair from Agiliti was purchased so that we could begin designing. A major roadblock that we ran into immediately was that major components of the armrests were welded to the frame of the chair. This made it impossible to implement a design without cutting through the metal and risking ruining the chair. As a result, the scope of our project shifted to completing the major design elements so that a future capstone group could implement our design. We created a computer-aided design (CAD) model of the chair and researched potential methods to move the armrests. We also researched potential materials to

build the module out of. As shown in the CAD drawing, we decided to use a gear system to expand the armrests due to its superior strength, durability, and reliability (will add drawing when it is finalized). We hope that a future group is able to implement our design or iterate off of it to create a finished product.

I did not know anything about bariatric surgery before I took on my technical project. During my research about the significance of my technical project I discovered that it is a severely underutilized treatment with only 1% of eligible patients receiving the treatment. In my STS research, I investigate the underlying causes of the limited use of bariatric surgery by examining the various groups and organizations involved in providing it. I originally thought that the main cause was limited access to the surgery but through my research, I discovered that many patients simply do not want the surgery. By examining peer reviewed articles and research papers, I recommend changes to the current system that would encourage more people to get bariatric surgery.

Before undertaking my STS research, I had not considered the reasons that my technical project was even necessary. Why could medical equipment companies not simply make wider chairs? In STS 4500 we learned about and did case studies on the social construction of technology. This framework emphasizes that social factors and human actions drive the development of technology. It helped me realize that the reason most chairs did not surpass a certain width is because they were designed to fit through a standard door frame. It helped me appreciate our duty as engineers to consider every possible factor when creating our designs. The social elements discussed in the development of my STS project helped me be more mindful when designing my technical project and helped me consider more elements beyond the technical realm.