

REDESIGNING THE MEDICAL EXAMINATION TABLE

EVALUATING PRENATAL CARE FOR PATIENTS WITH PHYSICAL DISABILITIES

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By

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SOCIOTECHNICAL SYNTHESIS

While legislation such as the Americans with Disabilities Acts has made strides towards accommodating the needs of people with disabilities, this demographic is still excluded from receiving the same standard of healthcare as their able-bodied counterparts. The medical examination table is an example of a medical device that may exclude patients with disabilities from receiving adequate medical care; due to its traditionally fixed height and narrow width, many patients with mobility limitations may find the medical examination table difficult to use. The technical topic addresses this inaccessibility through the redesign of the medical examination table, in hopes of making this mainstream medical device more accommodating towards patients with disabilities. In prenatal care specifically, women with physical disabilities are in need of a redesigned medical examination table so that they may have access to prenatal screenings typically performed using this device; however, redesigning the medical examination table will not solve all of the persistent issues that women with physical disabilities encounter when seeking prenatal care. The science, technology, and society (STS) topic, tightly coupled with the technical topic, provides a framework with which to examine the complex network of prenatal care and identifies avenues for reform in this field.

The technical project consisted of redesigning the medical examination table through an iterative design process to create a table that accommodates various mobility-limited demographics. An analysis of existing medical examination tables through literature and recommendations from the technical advisor, Dr. Masahiro Morikawa, M.D. at UVA Family Health, allowed the capstone team to develop multiple proposed functions and objectives, such as height-adjustability, increased width, and decreased overall bulkiness of the table. From these

objectives, preliminary two-dimensional figures for the redesigned table were made and narrowed down to a final design at the end of the Fall semester.

In the Spring semester, this two-dimensional design was transferred to Autodesk Fusion CAD, where a three-dimensional virtual rendering of the medical examination table with functioning joints was developed. To validate the integrity and stability of this model, the team used finite element analysis and free body diagrams to simulate real-world forces the table would experience. A materials analysis was also performed, in which existing medical examination tables were researched to determine which materials the redesigned medical examination table should be built out of if it were to be developed for commercial use. If eventually used in clinical settings, this medical device has the potential to revolutionize the standard of doctor-patient interaction for various patient demographics, and ideally improve health outcomes.

The STS topic examines how biases against women with physical disabilities influence the standard of prenatal care received by this demographic, and subsequently posits multiple opportunities for reform. Proof of these biases was unearthed through research of gender and disability-based biases that have been prevalent throughout history. Next, published interviews with prenatal care practitioners and patients with physical disabilities were used to uncover unmet needs in the existing prenatal care network. To visualize the complexity of this issue, Law and Callon's 1988 Actor Network Theory was used as a framework with which to uncover various actors that influence this realm of healthcare, which led to the identification of various actors who have the potential to ignite change in this network.

Overwhelmingly, this research indicated the complexity of the prenatal care network, and highlighted how the prevalent biases that women with physical disabilities face trickle down into prenatal care. While opportunities for reform were exclusively explored from the perspective of

legislation, medical school curriculums, and engineering school curriculums, these recommendations are not meant to limit the scope of the analysis in the STS paper. The findings of this research are designed to inspire those who may wish to examine this complicated network either through the current lens or differently, in hopes that prenatal care may one day support and encourage all patients who wish to become mothers.

Patients with physical disabilities are faced with a myriad of issues that non-disabled patients may not face, and every effort should be made to eliminate these complications to equitably provide the best standard of care for all patients. The technical and STS topics as described are just one attempt at changing the landscape of healthcare for patients with physical disabilities over time, but the work does not stop here. Without actionable change across various fields of medicine and medical devices, patients with physical disabilities will continue to receive subpar care, further compounding the bias that to be disabled is to be disadvantaged.

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PROSPECTUS

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