

**LOW PROFILE DYNAMIC WRIST ORTHOSIS DEVICE FOR PEDIATRIC
PATIENTS WITH WRIST MOTOR IMPAIRMENTS**

IS HEALTH INSURANCE A BARRIER TO RECEIVING MEDICAL TREATMENT?

An Undergraduate Thesis Portfolio
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By

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SOCIOTECHNICAL SYNTHESIS

Insurance to assist in providing vital, life-sustaining healthcare has almost become unattainable for the typical American family. There are not enough affordable choices for families to afford the healthcare that they need. Children affected by motor impairments have weak wrist extensor muscles which requires an orthotic device for strengthening. To help patients gain access to these devices, they first need to be created with the correct design criteria for dynamic strengthening of these wrist muscles. Based on an individual's insurance company, a patient is at a disadvantage for accessibility to devices. In order to establish where the barriers begin, the impact of insurance companies needs to be assessed. The technical and Science, Technology, and Society research are tightly coupled through the ability of insurance companies to regulate accessibility to devices such as orthoses, as well as the insurance companies acting as a barrier to treatment for patients within many healthcare fields.

The goal of the technical project was to provide an orthotic device for pediatric patients with motor impairments such as cerebral palsy, muscular dystrophy and hemiplegia. There are currently many devices on the market that work to statically hold the wrist but they do not work to improve wrist strength. The main goal of the capstone team's device was to create a low profile and dynamic wrist orthosis which would allow for dynamic strengthening of the weak wrist extensor muscles in these patients. To create these devices, the capstone team laid out specific design criteria needed for the device to be used for patient use. Three design materials were chosen for design criteria implementation: piano wire, thermoplastic, and coil springs.

Multiple iterations of the thermoplastic design were completed allowing for mechanical testing which established a point of failure for the device. One iteration was completed for the piano wire design and only a partial iteration of the coil spring design due to unforeseen

complications. An IRB approved survey was sent to occupational therapists to gain insight on how the three designs maintained the original design criteria laid out at the beginning of the technical project. The survey showed that occupational therapists felt all of the devices are better than what they currently use in their practice. Based on the technical work and the survey from the occupational therapists, the thermoplastic device proved most successful for pediatric patients with motor impairments.

The goal of the Science, Technology, and Society research was to assess the main research question, Is Health Insurance a Barrier to Receiving Medical Treatment? There are barriers produced by insurance companies based on various factors such as cost, device approval processes, and quality of healthcare. An Actor Network Theory framework worked to analyze the potential barriers that patients face created by insurance companies. Journal articles were used to evaluate the state of the current healthcare system.

Addressing the cost barrier of insurance companies was done through looking at the socioeconomic status of individuals. The device approval process begins with the Food and Drug Administration as the approvers but the barrier forms when the insurance companies step in as the regulatory agency. The quality of healthcare is contingent upon an individual's insurance plan, making the quality inconsistent from one patient to the next. A solution to the barriers created above is allowing Medicare for All to intervene in place of all insurance companies, providing more individuals with the access to healthcare that they need.

The capstone team was able to design, test, and evaluate a much-improved pediatric wrist orthosis device to aid in the dynamic strengthening of the patients' wrist extensor muscles. The Science, Technology, and Society research provides a clear solution to the insurance barrier preventing the average American family access to affordable insurance. An improvement of the

healthcare system, as well as improving orthotic devices, will provide many families with an affordable option to the vital devices needed to improve everyday life.

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PROSPECTUS

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