

Thesis Project Portfolio

**How wearable sensing can be used to monitor patient recovery
following ACL reconstruction**

(Technical Report)

Exploring Competing Visions of a Personalized Healthcare Experience

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The transition towards a more individualized healthcare experience has been accompanied by medical triumph in addition to controversy. From early genome mapping to present day big data movements, what we deem as “mainstream” healthcare practices is constantly evolving. New technologies and breakthrough discoveries have allowed actors to expand beyond the typical scope of broad distinctions and dive into more specialized methods of classifying individuals in what we call the practice of precision medicine. The following STS research discusses personalized medicine from two perspectives including the potential positives as well as the drawbacks. The technical research couples with the STS research by narrowing in on a singular sector of precision medicine: wearable technology for therapeutics.

The technical research studies how wearable sensors can be used to detect alternate movement patterns in post-ACL reconstruction patients in an effort to prevent reinjury. The goal of this research is to provide initial exploration of the ability of these sensors to assess patient health in hopes that they can potentially be leveraged to continuously monitor physical activity and can be worn over an extended period of time in unrestricted environments. Ultimately, we wanted to develop and study a more ubiquitous and individualized rehabilitation experience for patients. Our findings provided initial insight to different features that would provide the most valuable data for determining patient health. The project was limited by numerous factors, so future research should work to mitigate these limitations to deliver more substantial results.

The STS thesis explores the development of precision medicine in both a positive and negative light. Precision medicine offers countless benefits including the ability to target specific genetic mutations, predict the likelihood of individuals to develop certain diseases, use factors beyond genomics such as phenotype, and individualize healthcare through the use of big data.

Ultimately, precision medicine offers a glimmering hope as an answer to countless diseases and disorders. However, it does hold much controversy when put in practice including legal, social, and ethical issues. In order for precision medicine to be successful and widely accepted, these concerns should be mitigated before full integration. The sociotechnical imaginary requires coordination between a large network of end-users, researchers and scientists, academia, caregivers, technology, and socioeconomic players that must all work collaboratively and efficiently to shape the future of medicine.

Overall, the STS and technical research explore a new emergent path of medicine that requires coordination and cooperation among a vast network of actors. Precision medicine itself is very broad with wearable technology only being a small portion, but it has the ability to completely transform all sectors of healthcare if it is properly integrated into a full system.