

**Thesis Portfolio**

**Improving the Ergonomics of GI Endoscopes**  
(Technical Report)

**Can Telemedicine work in America?**  
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science  
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## **Sociotechnical Synthesis**

In the rapidly growing field of medicine, innovations in healthcare are no longer limited to the traditional lab-bench and test tubes. Nowadays, the medical devices industry has been projected to sustain an annual growth rate of 5.6% as innovations are driven by leaders like Stryker or Medtronic. Likewise, information and communication technologies (ICTs) are spearheading the widespread telemedicine adoption as evidenced by our country has seen a dramatic increase in research and development, as evidenced by a recent executive order passed by the White House and a recent UN meeting. Therefore, this project aims to advance device development in both telemedicine and the medical devices market.

Colorectal cancer is the 3rd leading cause of cancer-related deaths in the United States, and in the current standard of care, colonoscopy is the only procedure capable of screening for colorectal polyps and cancers. In the United States alone, approximately 19 million colonoscopies are conducted by gastroenterologists every year and serve as the primary diagnostic tool to identify these otherwise undetectable gastrointestinal pathologies. Through a survey of 1,353 respondents, Cohen et al., (2006) found that gastroenterologists in the United States often must perform an average of 22.3 colonoscopies per week. A high frequency of colonoscopies has often led to De Quervain's tenosynovitis of the practitioner's left thumb, amongst other related repetitive strain injuries, which is caused by the repetitive "abduction and extension of the thumb to manipulate the dials" of the endoscope.

Characterization of this injury typically involves a painful inflammation of two tendons that run between the thumb and the wrist: the abductor pollicis longus (APL) and the extensor pollicis brevis (EPB). Therefore, the technical component of this thesis aims to develop an ergonomic solution to mitigate the frequency of repetitive strain injuries (RSI) contributed by endoscope mechanics. Improving the endoscopy ergonomics of the modern scope not only reduces the risk for repetitive strain injuries (RSI), but also offers a solution to improve the quality of life for the physician.

Smart health encompasses a myriad of initiatives and innovations to help interconnect all community members with health-care practitioners as a means of expanding access to health care. In particular, with advancements in telemedicine and remote patient monitoring, physicians have been able to establish meaningful relationships with members of isolated communities. Nowadays, strides in telemedicine and smart health have been developed locally and abroad as a means to ensure healthy living within various communities across the world. For instance, China, amongst other world leaders, has paved the way in establishing ground-breaking technology designed to improve the patient and healthcare provider experiences. However, due to challenges with widespread implementation across America, especially in Charlottesville, the magnitude of the impact of telemedicine has been reduced. Therefore, I plan to characterize how the Charlottesville community has embraced this healthcare platform and what the Charlottesville population considers are the factors influencing people's tendencies to interact with this form of healthcare.