Thesis Project Portfolio

Ring Device to Induce Hemostasis

(Technical Report)

Preventative Healthcare as a Sustainable Transition

(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

Roan Back

Spring, 2022

Department of Biomedical Engineering

Table of Contents

Sociotechnical Synthesis

The US healthcare system currently operates primarily under a reactive care model, rather than a preventative treatment system. When the US healthcare system originated, preventative practices had yet to be created or widely discovered. However, as the use of preventative services and procedures has become encouraged by scientific findings, the US healthcare system has slowly begun to grow on two fronts: reactionary and preventative services. The following technical and STS theses discuss the growth of each front, and stakeholder influence on the manner and rate of growth.

The technical thesis proposes a device desired by clinicians to induce hemostasis in procedures such as Moh's Micrographic Surgery, a procedure used in reactive care, frequently used to treat forms of skin cancer. This research supports the notion that clinical stakeholders desire greater device design growth for well-established reactive care services. Optimization of reactive care procedures benefits the patients that require the procedures, as it allows for increasingly beneficial patient outcomes. The goal of the research was to allow a clinician to induce hemostasis using a single hand while utilizing an electrosurgical device in the remaining hand. In Moh's Micrographic Surgery, a high percentage of complications, nearly 45%, are due to excessive bleeding events. These events may inhibit optimal surgical performance or outcomes, induce clinical or patient frustration, or increase chances of an undesired healing pattern. By creating hemostasis, clinicians are better able to cauterize desired vessels and inhibit excessive bleeding events.

The STS thesis explores stakeholder involvement in the progression or inhibition of a transition to a preventative care-based healthcare system in the US. The thesis analyzes the existing structure of the US healthcare system and the current reliance on reactive care. It also examines the implementation of particular preventative care services in small scale programs. Due to the initial investment required to implement preventative services or programs, many stakeholders are not eager to drive for a transition to preventative care, as improved individual health is not seen as a benefit to stakeholders that rely on monetary return. With stakeholders acting in their own self-interest to maintain the status-quo, the reality of the regime shifting to a different manner of care is complex. Several questions regarding the moral

responsibility and responsibility of financial investment required for a transition to a preventative care model remain unanswered. The discussion then turns to the framing of the transition as an ideology, as there are many possible responses, without any being more correct than another, to these unanswered questions.

These theses illustrate the dynamic nature of a transition within the healthcare system. While preventative care practices may be beneficial for future health of individuals, the care required by existing patients with ailments must also be acknowledged. The multi-faceted relationship between the progression to preventative care and the responsibility to further develop reactive care treatments for those in immediate need requires additional intensive research. Once this relationship is fully understood, the manner in which the healthcare system should be driven to evolve will become more defined.