Designing a Reusable Scrub Cap to Meet Clinical Needs in a Sterile Environment
(Technical Paper)

A Duty Ethics Analysis of the Use of Reprocessed Medical Devices by Physicians
(STS Research Paper)

A Proposed Paradigm Shift in the Relationship Between Climate Change and Healthcare in the United States
(STS Prospectus)

A Thesis Portfolio Submitted to the
Faculty of the School of Engineering and Applied Sciences
University of Virginia • Charlottesville, Virginia
In Fulfillment of the Requirements of the Degree
Bachelor of Science, School of Engineering

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Fall 2019

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Socio-Technical Synthesis: Sustainability and Health Care

As concerns about climate change grow, institutions around the world are looking for ways to reduce their carbon footprint and become more environmentally friendly. The healthcare industry is no exception to this sustainable revolution, and many hospitals across the United States have started their own sustainability programs. As a result, many healthcare professionals have scrutinized the prevalence of single-use, disposable devices in hospitals due to the enormous amount of waste these products produce. The challenge posed by single-use devices prompted both my technical work and STS research. In my technical work, I aimed to design a reusable scrub cap that could replace the traditional, disposable scrub caps currently used in the University of Virginia (UVA) Health System, while in my STS research I aimed to explore the ethics of reprocessed single-use medical devices in order to provide insight into how physicians can approach the ethical challenges posed by sustainability efforts in healthcare. By tackling these subjects, I hoped to contribute to the growing literature surrounding healthcare and sustainability.

The goal of my technical work was to design a reusable scrub cap that appeals to a diverse audience and addresses issues posed by the current design. Currently, the UVA Health System provides their employees with reusable, launderable scrubs, but uses disposable scrub caps to cover employee's hair in sterile environments. Furthermore, the fit of these scrub caps are impractical for many healthcare workers, especially those with longer hair, and the uniformity of the caps can impede personnel identification in sterile environments. Consequently, my capstone team designed a reusable scrub cap that can be laundered within the hospital facility and can accommodate diverse hair types. We added features that would allow

healthcare workers to place a badge on their cap in order to aid with identification of staff in environments such as operating rooms. The design also incorporated pockets for inserting radiation protection pads into the cap. By redesigning the scrub cap, we hoped to contribute towards efforts to minimize waste in hospitals and make scrub caps more reflective of the diverse array of users found in the healthcare industry.

Unlike my capstone project, my STS research explored the reuse of devices labelled as "single-use", as opposed to devices that are manufactured with the intention of being reused. My research used a duty ethics framework and the American Medical Association's (AMA) Nine Principles of Medical Ethics to explore the ethical considerations behind physician use of reprocessed single-use medical devices. I claimed that the use of these devices is ethical through the lens of duty ethics, and that the framework used to evaluate this technology can be repeated to analyze similar sustainability and cost-saving initiatives. By doing this, I hoped to demonstrate that such initiatives in hospitals could be ethical despite potential risks to patients.

These two projects complemented each other well and allowed me to gain a deep understanding of disposable medical device use in hospitals. My STS research allowed me to delve into single-use devices in the United States on a systemic level, and the pros and cons these devices pose to hospitals and healthcare professionals. Subsequently, my capstone project allowed me to investigate a specific disposable medical device and reflect on the considerations that must be taken into account in order to design a reusable alternative. Thus, these two projects informed each other heavily, and increased my motivation to find answers to the challenging issue of single-use medical devices.