

Designing a Wearable Air Filtration System to Block Coronavirus Transmission
(Technical Report)

A Virtue Ethics Analysis of Dr. Jack Kevorkian and his Role in Physician-Assisted Suicide
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Biomedical Engineering

By

Kelly Waring

May 1, 2021

Kelly Waring
April 29, 2021
STS 4600-013

Socio-Technical Synthesis

My technical project and STS research both address aspects of developing technologies in the medical field to improve the lives and wellbeing of patients. Using my technical project from Capstone and my STS research, I was able to further analyze the different technical and ethical factors that play a role in designing and implementing technologies in the real world. In what follows, I plan to summarize my technical project and STS research, as well as reflect on the value of having worked on both projects simultaneously.

With the continuous rise of COVID-19 cases and a large number of deaths, the COVID-19 pandemic still affects many people across the world. To limit the spread of the virus and significantly reduce the number of cases, an innovative device that effectively blocks virus particles from entering the body is needed. The technical solution my group and I developed to address this issue was we designed a novel wearable air filtration system that provides superior filtration and comfortability. The current face masks out today that are used to help reduce the spread of COVID-19 have many limitations. The two main limitations include poor particle filtration and the lack of comfortability. Many current designs lack a tight seal to the face and the constant covering of the mouth and nose makes them very uncomfortable to wear. In order to overcome these limitations, we were able to develop a wearable air filtration system that provides superior filtration through the use of a HEPA filter and maximum comfortability by implementing a baseball cap, cooling fans, and a face shield into our design. Our device will not only lower COVID-19 cases, but it will also provide a more comfortable fit that will increase the user compliance in wearing face masks and coverings.

For my STS research, I took a deeper look into the ethics behind physician-assisted suicide in the medical field. I analyzed what ethical factors played a role in Dr. Jack Kevorkian's medical practices of physician-assisted suicide by using the ethical framework, virtue ethics, to determine the morality of Kevorkian's character. Many scholars have explored the ethics behind physician-assisted suicide with most opposing this practice or lacking the ability to draw a perfect ethical solution. However, these views failed to consider using virtue ethics to evaluate Kevorkian's true moral character. By using virtue ethics, I was able to judge the morality of his actions regarding physician-assisted suicide. More specifically, I demonstrated that Kevorkian's actions were morally acceptable because he exemplified one of the five focal medical virtues of compassion in three areas. These included compassion for the suffering patient, compassion for the patient's family, and compassion for society as a whole.

By working on my technical and STS projects simultaneously, it has provided me so much value and has allowed me to further think outside of the box as an engineer. My technical project has allowed me to fully understand the process of designing and building a new technology. My STS research has helped me consider the different ethical implications in regards to certain practices in the medical field. When I first started my technical project last semester, I had minimal knowledge on all the different ethical frameworks. Because of this, at the beginning of the design process, I never thought about the ethical implications that could play a role in developing a device to block COVID-19 transmission. I only looked at the technical factors. However, as I learned more frameworks in STS 4600, I was able to use this new knowledge and apply it in the technical design process. Now, I am able to identify and understand all the different ethical factors that contribute to designing new technologies.

Table of Contents

Socio-technical Synthesis

Designing a Wearable Air Filtration System to Block Coronavirus Transmission

A Virtue Ethics Analysis of Dr. Jack Kevorkian and his Role in Physician-Assisted Suicide

Prospectus