

**Designing a Scrub Cap to Meet Clinical Needs in a Sterile Environment**  
(Technical Report)

**Using Care Ethics to Examine the Retracted Article by Andrew Wakefield, et al.:  
Ileal-lymphoid-nodular hyperplasia, non-specific colitis,  
and pervasive developmental disorder in children**  
(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

Rebecca Byrd

May 8, 2020

## **Table of Contents**

Socio-technical Synthesis

Designing a Scrub Cap to Meet Clinical Needs in a Sterile Environment

Using Care Ethics to Examine the Retracted Article by Andrew Wakefield, et al.: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

Prospectus

## **Socio-technical Synthesis: The Public Perception of Scientific Research and Healthcare**

My technical work and my STS research are primarily connected through the idea of researching how public perceptions influence what scientific research is prioritized and how the publication of this research influences society. My technical project focuses on how implementing sustainable practices in the healthcare industry can be beneficial to healthcare professionals, as well as the hospital itself, by developing a more sustainable, comfortable, and more effective reusable scrub cap. My STS research focused on the ethics of scientific research publication and the effects it has on the public. While my technical project and my STS research paper are focused on two different areas of the healthcare industry, the theme of public perception in the scientific community is consistent across both projects.

My technical work involves redesigning the currently used disposable scrub caps used in hospitals to be more comfortable for healthcare workers while better meeting clinical needs in a sterile environment. My partner and I interviewed healthcare professionals to determine which features the users did and did not like about the current design. Using this feedback, we designed a reusable scrub cap that added features to aid identification in operating rooms and improve the overall comfort of the cap. Additionally, we worked to design a scrub cap that could be used and adjusted for people with different head shapes and sizes and different hair lengths and volumes, as this was seen as one of the most prominent issues with the currently available designs. Overall, the goal of our innovative scrub cap design is to improve the comfort and functionality of the cap for the healthcare professionals while simultaneously helping hospitals cut costs and reduce the amount of waste they produce.

My STS research also explores the protection and prevention aspects of the healthcare industry, but instead focuses on the anti-vaccination movement that has resurged in the past two

decades. Beauchamp's *Principles of Healthcare Ethics* are employed to examine the ethics of publishing Andrew Wakefield's retracted article "Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children" (1998). My claim is that, through the lens of care ethics, Andrew Wakefield violated the duty of care that he owes to the general public by publishing data from a scientifically flawed experiment. My paper explores this article and how the publication of scientific research is something that should be carefully and thoughtfully done. The goal of my research was to start a debate about the duty of care that healthcare professionals and scientific researchers have to accurately inform society.

Concurrently working on these projects allowed me to better understand the public perception of scientific and medical research. My technical project gave me a better understanding of hospital workflow and how products are interpreted and used in various departments. This context helped me better understand the public perception of scientific research. Likewise, my STS research paper helped me understand the cycle of the influence of public interest on what topics scientists research and how these research findings are interpreted by the public. This increased my motivation to help create a more sustainable scrub cap option for healthcare workers as we move towards a more environmentally-conscious society. In summary, simultaneously working on both my technical project and my STS research paper gave me the opportunity to explore the healthcare industry from a diverse set of viewpoints that proved to be very valuable information for both my technical project and my STS research paper.