

Thesis Project Portfolio

Visually-Assisted Split Tip Catheter for Accurate Positioning and Surfactant Administration for Premature Neonates

(Technical Report)

The Social Construction of the Opioid Epidemic

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

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My technical project and my STS research are linked through exploring different systems in healthcare and policies that impact the most vulnerable patients. In healthcare, there is an obligation for engineers to understand the needs, risks, and policies associated with the systems they are creating for their patients, which is the principal idea in both projects. My technical work focuses on designing a new catheter for surfactant administration to premature infants to prevent worsening cases of respiratory distress syndrome (RSD), while my research project explores the responsibilities of different social groups in creating the opioid epidemic by failing to protect patients. My technical and STS projects approach understanding the responsibility of different systems in medicine to provide intentional care for their patients from opposite perspectives. Both projects share the idea that engineers and designers are responsible for different design choices and protective measures to ensure their technology is safe for patient use and understood by the medical community.

My technical work was to design a catheter with a split-tip capability and integrated visual assistance for surfactant administration to premature infants that are suffering from RSD. Currently, surfactant administration in the delivery room is time-consuming and risky. The new design is based on the single-lumen catheter currently used while including a split-tip to reach both bronchioles and a clip for a fiberscope to visualize equal administration of surfactant to each lung with a shorter insertion and validation time. The design choices for this project were intentionally chosen to suit both the patients and the clinicians using the technology to prevent worsening cases of RSD, therefore considering the obligations we have to create systems that comprehensively serve the patient.

My STS research also explores the obligations of different social groups involved in the creation, marketing, and selling of synthetic opioids, specifically OxyContin. My research focuses on different dynamics of these social groups and how they influenced each other to cause the opioid epidemic through the lens of the Social Construction of Technology framework. My claim is that different dynamics within the pharmaceutical industry and medical community led to the opioid epidemic where misleading marketing and overprescription was permitted by different social groups to create a public health crisis. My paper explores how this idea can guide different engineering design choices and policy decisions surrounding the marketing and selling of medicine. The goal of my research is to initiate dialogue surrounding regulation of marketing in the healthcare industry that prioritizes responsibility of proper care and profit for the company without disadvantaging patients.

Exploring these projects concurrently has increased their significance and value. My technical project has provided me with an increased understanding of the engineering design process in healthcare and different regulations that must be considered when creating a medical device, which has helped me provide context for my STS research. My STS research has helped me understand the negative consequences that occur when design choices and considerations are neglected within the promotional process for a medical technology, which increased my dedication to designing a catheter that satisfied the needs of patients and clinicians. Working on both of these projects throughout the past year has allowed me to learn about the obligations that surround working in healthcare and how different economic, social, and environmental factors play a role in both projects.