

Thesis Portfolio

Development of Hepatic Vasculature Models for Preoperative Planning
(Technical Report)

Analysis of Racial Disparities in the Treatment of Liver Cancer in the U.S.
(STS Research Report)

An Undergraduate Thesis Portfolio

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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

My technical work and STS research share a common goal of improving the quality of care and outcomes for patients affected by liver cancer. The technical work explores a specific procedure used to treat liver cancer while the STS research explores liver cancer treatments in general. My technical research focuses on developing a 3D model of the liver vessels to be used as a medical education tool and preoperative planning tool for arterial embolization. My STS research focuses on the social and political work performed by the medical technology of liver cancer treatments.

My technical work explores the research side of medical training technology through the design and development of a 3D model of liver vessels. The project investigates different manufacturing methods with 3D resin printing as the main focus. Previous work with anatomical 3D modeling has been mostly solid silicone approximations of arterial anatomy and only involves modeling large or medium-sized vessels. The project aims to expand the use of 3D-printed organ models as medical teaching tools used in clinical settings. Most of the time, when medical residents perform arterial embolization for the first time, it is done on a real-life patient. The goal is to create a hollow model that uses materials that mimic the physiologic characteristics of tissue so that the model can be utilized as a preoperative training tool for residents to practice guiding a catheter through a complex vascular network.

My STS research examines the racial disparities observed in the treatment of liver cancer. In a study using data from the National Cancer Institute, it was found that racial minority patients were less likely to receive guideline-recommended treatment or treatment at all even though minority patients are disproportionately affected by liver cancer. The study as well as other scholars argue that these racial disparities are most likely attributed to demographic factors such

as race, income, and insurance status. However, I argue that they fail to consider internal factors that lay the foundation of the healthcare system which contribute to biases seen in liver cancer treatments. My research aims to bridge the gap in understanding why these disparities exist, which in turn can help us work towards a more equitable healthcare system.

Working on both of these projects has given me a deeper understanding of the importance of the quality of patient care and how technology plays a significant role in this. Technical and social research on medical technology is crucial in the medical field as it helps us push boundaries to improve patient care and outcomes.