DESIGN OF A PROTOTYPE SURGICAL LEAD VEST SUPPORT SYSTEM TO PREVENT RADIATION EXPOSURE AND ORTHOPEDIC INJURY

Overview
Penn State Hershey Medical Center is one of the leading hospitals committed to advancing medical knowledge through research and improving the quality of life. Our group seeks to collaborate with vascular surgeon, Dr. Rachael Snow, to create a support structure that offsets the weight of lead vests worn during surgeries. This project has the potential to prevent orthopedic injuries, extend careers, and improve the efficiency of procedures.

Objectives
I. Design and build a device to support a medical lead vest during surgery, which successfully prevents the doctor from radiation exposure and can offload the weight of the apron.
II. Evaluate the impact of all the entities possibly affected by the use of this product including surgeons, hospitals, and patients. Additionally, study the medical device development process and FDA to determine the next steps to release this product on the market.

Approach
- Held weekly conference calls with the sponsor and took a trip to Hershey Medical Center to determine the design criteria, feasibility, and collect background information
- Conducted interviews with surgeons at Doylestown Hospital to brainstorm design features
- Researched medical procedures, patents, material viability, and FDA device development process
- Generated and selected concepts based on prior research and discussion with sponsor
- Performed several calculations, including stress, fatigue, buckling, toppling, and friction, and determined appropriate dimensions for the prototype
- Created SolidWorks and COMSOL models and performed FEA calculations
- Constructed initial and final prototypes, received feedback from sponsor and made modifications accordingly
- Compiled results in a final report document and project poster

Outcomes
- This solution can be used in the operating room to effectively defer the lead vest weight off of the user
- The ball and socket joint of the device permits torso movement from side-to-side and front-to-back, thus not inhibiting user mobility
- The adjustability of the telescoping spinal bar allows for users with heights ranging from 6’2” to 6’7” to use the device comfortably
- The medical grade casters permit quick and unhindered walking while using the device
- The simplistic design requires a small range of materials and can be easily manufactured in high volumes at a low price