



SIR Foundation Summer Medical Student Internship Program

Proposal:

Institution Name: Emory University School of Medicine

Responsible mentoring physician: John T. Moon, MD & Zachary Bercu, MD, BIMIT Lab

Length of proposed curriculum: 8 weeks, 40 hours/week.

A. Please provide a brief description of how each of the following curriculum elements will be demonstrated/taught through your program.

1. Concept Development.

Our division of Interventional Radiology at Emory University SOM hosts the Biodesign and Innovation of Minimally Invasive Technologies (BIMIT) Lab. Our lab incorporates biodesign principles into developing each clinical pain point into a viable healthcare solution with both bench-top and clinical research to support its implementation.

We will work with students to go through the biodesign steps in working through pain points we provide them through both existing and new projects.

Current grant-funded projects include:

- Bio flow: Development of an Anti-Occlusion Drainage Catheter
- Fully Integrated Nano-Membrane Sensors in Arteriovenous Endografts for Continuous and Wireless Monitoring of Hemodialysis Access Health.
- Biosensor Central Venous Catheters for Common Laboratory Values to Reduce Blood Draws in Critically Ill Patients.

2. Experimental design, statistics, proof of concept, and steps in validating new techniques.

Both above grant-funded studies incorporate elements of experimental design, statistics, proof of concept prototyping, and validation of the technologies in both benchtop and in vivo models.

3. Techniques in basic science lab

Both projects incorporate basic lab techniques, which students will be able to engage in. These lab techniques will be overseen by our collaborators at the Global Center for Medical Innovation and the Georgia Institute of Technology.

4. Data collection, statistics, and meaningful analysis of data



Students will be provided data to organize and analyze through statistical means. Our lab statistician will oversee their rationale and execution of a statistical analysis. The lab as a whole will discuss the student analysis of findings to refine for presentation.

5. Given the heavy device focus of both of these projects, students will be introduced to the regulatory considerations in developing a research protocol as well as be exposed to, plan, and help carry about both benchtop and animal research."

Mandatory elements:

Each of the following represent over-arching projects within the BIMIT lab. Under each major project, there are smaller projects which we anticipate completion on by time of internship completion.

- 1) Bio flow: Development of an Anti-Occlusion Drainage Catheter
 - Physical Characterization of Anti-Occlusion Mechanism
 - Factors Contributing to Early Exchange Frequency & Associated Healthcare Expenditures.
- 2) Fully Integrated Nano-Membrane Sensors in Arteriovenous Endografts for Continuous and Wireless Monitoring of Hemodialysis Access Health.
 - Impact of time to intervention on arteriovenous graft or arteriovenous fistula failure.
 - Cost-benefit analysis to early intervention in treating thrombotic AVGs and AVFs.
- 3) Biosensor Central Venous Catheters for Common Laboratory Values to Reduce Blood Draws in Critically Ill Patients.
 - Evaluation of most common laboratory values for treatment of critically ill patients.
 - Cost-benefit analysis of Biosensor Central Venous Catheters as compared to conventional blood draws to obtain laboratory levels."

B. Please provide a brief outline of available research topics, one of which the student will select for completion as part of the program.

The student(s) will be placed with an office in the Emory Research Building where they will carry out most of their day-to-day research. Student(s) will also work at Georgia Tech in our collaborator lab to learn hands-on techniques in conducting research in the medical device field. They will also have the opportunity to work with the Global Center for Medical Innovation to test components of the anti-occlusion drainage catheter in both benchtop and animal settings.



We will utilize Playbook of IR and Stanford Biodesign Principles to guide our discussion of clinical projects with a Biodesign filter.

Students will be expected to complete bi-weekly presentations, which will be used to assess their progress.