



## **SIR Foundation Summer Medical Student Internship Program**

Institution Name: **Children's National Medical Center / GW University in Washington, DC.**

Responsible mentoring physician: **Karun Sharma, MD, PhD, FSIR**

Length of proposed curriculum: The internship should be **8 weeks and at least 40 hours per week.**

A. Please provide a brief description of how each of the following curriculum elements will be demonstrated/taught through your program. Provide details of the instructional setting and methodology (laboratory, classroom), description of any educational resources (PowerPoint presentations, textbooks, selected readings), and assessment techniques (question and answer sessions, tests) to be used in the process of instruction:

### **Interventional Radiology Medical Student Internship Curriculum**

1. Textbook: Both will be provided  
**Research Text: Designing Clinical Research, 4<sup>th</sup> Ed. – Hulley et al**  
**Clinical Text: Pediatric Interventional Radiology – Temple et al**
2. Required Readings:  
**Three recently published manuscripts from CNMC group on clinical use of MR-compatible robots in Interventional Radiology procedures**  
  
**Three recently published manuscripts from CNMC group on clinical use of MR-HIFU ablation and histotripsy in Pediatric IR and Pediatric Oncology**
3. Mandatory Lectures:  
**Weekly Bioengineering group research meeting**  
**Weekly MR-HIFU group research meeting**  
**Monthly – PEP (Proposal Enhancement Program) lectures**  
**M,W,F Resident Didactic Lectures – Pediatric IR Radiology**



4. Weekly Schedule:  
**7A-5P M-F, No weekend duties**

5. Educational Resources:

**A computer with internet and intranet access with online educational resources. A desk workspace and wet bench space in bioengineering lab. Team mentoring from 3 biomedical engineering faculty and 3 IR faculty.**

Mandatory elements:

1. Concept development – distillation of a clinical question into elemental components:  
The student will begin with a 1 week orientation to the SZI Bioengineering labs for MR-robotics and MR-HIFU. During this orientation, he/she will complete the requisite online education on research design and animal research. This week will also allow participation in weekly research group meetings that will help involve the student with ongoing clinical research projects and identify an “independent” clinical question that he/she can take on with supervision. The student will also participate in the clinical IR service daily beginning with morning rounds and didactic lectures. We will aim to have a 50/50 split between clinical and research time – based on individual interests. It is best if the student’s individual interests and discussed a month or so prior to beginning the internship so that experience can be tailored to this.
2. Experimental design and statistics, including proof of concept, steps in validation of new technique:  
For the MR-Robotics work, the student will focus mainly on ongoing device design efforts with our engineering team. This will focus on experimental design and proof of concept.  
For the MR-HIFU ablation work, the student will work on an established animal model of neuroblastoma. This will focus on validation of a new technique of image-guided tissue histotripsy – mechanical disruption.
3. Techniques in the basic science lab:  
The student will be exposed to basic animal research techniques including online education and hands on work with animal surgery and image guided ablation.
4. Data collection, statistics, and meaningful analysis of data:  
The student will be closely supervised during data collection and analysis. He/she will also receive on-line education on basic statistical analysis.



5. Constructing a well-written scientific paper:

The student will write and submit an abstract for the SIR meeting and also be supervised on manuscript preparation by Drs. Karun Sharma and Kevin Cleary. The goal will be to submit a short peer reviewed manuscript with the student as first author.

Suggested/optional elements:

1. Clinical trials design and regulatory approval/obstacles/legal considerations – **The student will complete a minimum of 4 hours of online education pertaining to Clinical trial design and FDA approval for devices, including statistical design.**
2. Design and conduct of animal research and observation of animal research - **The student will complete a minimum of 4 hours of online education for animal research**

B. Please provide a brief outline of available research topics, one of which the student will select for completion as part of the program. Projects should be of a scope appropriate for completion within the limited time frame provided.

1. **MR-guided robotics for musculoskeletal interventions (arthrography, bone biopsy, and nerve injections).**
2. **MR-HIFU ablation of Pediatric tumors (osteoid osteoma, desmoid tumors, and sarcoma).**
3. **Post MR-HIFU ablation imaging follow-up and analysis. Segmentation and Changes in tumor volume.**

The student will be asked to make an oral presentation at the Medical Student Brunch at the SIR Annual Scientific Meeting in 2023.