



## SIR Foundation Summer Medical Student Internship Program

Institution Name: University of Colorado

Responsible mentoring physician: Premal Trivedi, MD, MS

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

**Note from host site:** Public health experience and knowledge is not required but would likely lead to an enhanced experience.

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

Our lab performs health services research and currently consists of 3 faculty members, 2 statisticians, along with advisors from the Colorado School of Public Health. We have an existing system in place to educate students with little relevant experience and enable them to be productive within a few weeks. In the first demo phase (2 weeks), students with no prior relevant experience start with redoing a simple completed project, allowing for gradual learning from a “template”. We find that learning by doing is most effective with this type of research. In addition, we will provide structured education around the assigned demo project on:

- a. basics of health services research
- b. overview of national datasets: how to and how not to use them
- c. data wrangling/cleaning
- d. development of specific aims from broader scientific questions
- e. performance of comprehensive literature review
- f. basic statistics
- g. basic statistical coding (using SAS and STATA or R)
- h. generating analytical reports.

In the second phase of the internship, the student will be assigned a live project. The expectation will be that they take the project from conception to manuscript development, taking primary responsibility of all steps along the way. They will be closely supervised throughout such that answers are available from our team of experts, if needed. Our statisticians will provide education and oversight on statistical



methodology, coding and generating analytical reports. I will be primarily responsible for all other components detailed above, and in addition:

a. data visualization: generating tables and figures that effectively communicate relevant information

b. data dissemination: generating an abstract, scientific presentation (oral or poster) for a national conference if feasible, and manuscript writing as first author

Brief description of how each element will be taught:

- Concept development and experimental design: For both practice phase and live phase projects, we will start with a relevant clinical question to be answered and work with the student to convert that into specific aims, associated hypothesis and approach/analytical plan. The student will take first crack and I will provide instructive feedback for incremental improvement such that they are able to reach do it all themselves over time.

- Techniques in the basic science lab: N/A

- Data collection, statistics, and meaningful analysis of data: The student will choose the right test to use on each analysis step. Feedback will then be provided by our statisticians on whether the appropriate choice was made and why along with basic applications/limitations of the test involved.

- Constructing a well-written scientific paper: Examples of published papers using similar methodology and approach will be provided to the student in the first week of their internship. We will then do a small “journal club” to discuss merits and weakness of the paper along with an in-depth analysis of dos and don’ts for the various sections of the typical manuscript during the first phase. This training will culminate in the student producing the first draft of a manuscript by the end of their rotation during their own live project analysis in the second phase.

**B. Please provide the details on 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.**

Dr. Trivedi will provide didactic office-based instruction for one hour each week on the topics detailed above, progressing from general overview of health services research to data sources, methodologic focus on how to perform high quality HSR, and ultimately to practical tips on generation of effective oral presentations and manuscripts. The remaining education will be ad hoc while the students work through a dummy project in the first two weeks followed by the live projects through the remainder of the internship. The student will also have structured access to one of two biostatisticians for



an hour each week to answer any project related questions or to speak more generally about basic relevant statistical methodology. The expectations from the student will be to present a 30-minute talk once every week on health services research and statistical concepts. Source material will be pulled for the student from radiology and public health journals. The final test will be a defense of their assigned “live” project to a forum of lab investigators/statisticians focused on all aspects of the educational elements detailed in #4 and creation of a manuscript draft ready for journal submission prior to leaving our institution. The entire internship experience can be made virtual with relative ease given the nature of our research.

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

1. Geographic trends in utilization of dialysis access maintenance interventions by provider specialty and clinical location in the Medicare population
  - The student will examine how role for nephrologists, vascular surgeons and interventional radiologists varies in dialysis access maintenance (relative market shares) according to geographic location of the clinical service using Medicare files
2. Geographic trends in utilization of peripheral vascular interventions by provider specialty and clinical location in the Medicare population
  - The student will examine how role for cardiologists, vascular surgeons and interventional radiologists varies in PAD work (relative market shares) according to geographic location of the clinical service using Medicare files
3. National trends in enteric access procedures by physician specialty and clinical location
  - The student will examine how relative utilization of PEG placement vs. percutaneous gastrostomy insertions has changed over the past two decades, stratified both by clinical location and geographic census location using Medicare files.
4. Quantifying the impact of COVID: national change in volume and types of invasive procedures done by interventional radiologists stratified by census location and clinical setting during the COVID vs. pre-COVID eras.
  - The student will quantitatively compare how utilization of IR procedures changed during the COVID era (each month in 2020) versus the pre-COVID era (2019) using



Medicare PPS files. Additional analysis will quantify overall volume change and change by procedure type during peak COVID infection months for each state and for how long overall and procedure specific volumes were decreased vs. pre-COVID controls (in # of months). Medicare PPS files are produced annually and are typically available in July (i.e., data for CY2015 is usually available in July 2016).