Essentia Health Summer Internship program

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Rural pre-medical and medical students gain clinical and research experience in cardiology through a pilot program that offers mentored training.

Through the program, students better understand the importance of research-based evidence and how it impacts clinical medicine—especially in the rural communities from which many of them come.

In the fall of 2018, two medical students from the University of Minnesota Medical School, Duluth Campus, completed the inaugural Essentia Health Summer Research Internship program, which is structured to provide mentoring in clinical research, educational experiences in clinical cardiology, and early exposure to medicine in a large health care facility that primarily services a rural population.

The students’ response was enthusiastic. One student said: “I would suggest this internship to others, especially those interested in cardiology. It provides you with valuable exposure to the specialty, you will learn a ton, you will already have research experience with manuscripts and abstracts, and possibly the most important part is you start to make connections and relationships with people who can be valuable mentors in your future career.”

Students in northern Minnesota and Wisconsin face several barriers to gaining early experience in both clinical medicine and clinical research. On the one hand, institutional risk concerns and regulations regarding patient privacy and access make access to clinical medicine more difficult. Likewise, academic workloads in the first several years of medical school make exposure to clinical medicine more difficult. On the other hand, opportunities for clinical and research training in rural areas are limited because of the paucity of academic medical centers in these areas of the country. In order to fill these gaps, especially in the rural Northland, the Essentia Health Summer Research Internship program (EHSRI) was started for pre-medical and pre-clinical (MS1) medical students.

Minneapolis program was a model

The model for this program was inspired by Timothy Henry, MD, and the Minneapolis Heart Institute Foundation (MHIF) Summer Research Intern Program at Abbott Northwestern Hospital in Minneapolis. Many of their students went on to

**Sample timeline for six-week medical student summer research program.**

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Orientation, project assignments, statistical methodology learned, literature search, clinical experience (cardiac catheterization lab)</th>
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</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Literature search, database construction, clinical experience (echocardiogram)</td>
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<tr>
<td>Week 3</td>
<td>Database modification, manual chart review, clinical experience (exercise stress test)</td>
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<tr>
<td>Week 4</td>
<td>Data analysis, manual chart review, manuscripts preparation</td>
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<tr>
<td>Week 5</td>
<td>Data analysis, manuscripts revised, and presentation preparation, clinical experience (electrophysiology lab)</td>
</tr>
<tr>
<td>Week 6</td>
<td>Oral presentation, exit survey, clinical experience</td>
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A considerable number chose cardiology as their specialty, based on their early exposure to the specialty and mentors. In fact, two of the co-authors of this article completed this internship as undergraduate students. After completing medical school, internal medicine residency and cardiology fellowships, both cardiologists decided they wanted to give back by providing students in their community the same opportunities they were given at a critical time in their development.

After its initial year, EHSRI expanded from two to nine students (five pre-medical and four medical) in the summer of 2019. The program recruited students from rural areas to give them early exposure to specialty practice (cardiology) and rural medicine, as well as a mentored research experience not widely available in rural areas. Students were selected based on academic merit and a personal statement indicating interest and passion for medicine and research. The program was run by volunteer faculty from the Essentia Health Heart and Vascular Center, a tertiary care center serving northern Minnesota and northern Wisconsin, and it provided students the unique opportunity to learn about cardiovascular research while seeing patients in the hospital and clinical setting with various cardiovascular conditions. Weekly attendance at journal club, multidisciplinary heart team meetings and valve conference were encouraged, as well as mandatory attendance at summer intern-specific lectures on various topics, including research study design, quality improvement, cardiac anatomy, electrocardiograms, coronary artery disease and cardiac imaging.

Medical students were paid a stipend for their participation, equivalent to that of other students doing basic science research. Undergraduate students were paid by hour of participation.

**Orientation is critical**

A critical aspect of the summer research program was the initial orientation. Students were supervised in a step-by-step process to satisfy requirements for patient contact and research. Each student was given an orientation guide, which included guidelines on appropriate dress code, guidelines for interactions with physicians and staff, a schedule template, information about their research projects, protected health information and confidentiality requirements and a final presentation guide. Students completed the necessary institutional requirements for patient contact, providing a more complete understanding of clinical etiquette and research best practices than would otherwise be available.

The research experience required students to read the study protocol and complete a thorough literature search, including downloading and becoming familiar with a reference manager, prior to starting data analysis or drafting a manuscript. During orientation, the students were given two half-day research lectures on study design and basic statistical analysis. Research staff at the Essentia Institute of Rural Health (EIRH) volunteered to guide students in data analysis and understanding data. Students were required to meet with the EIRH informatics team to learn how clinical Electronic Medical Record (EMR) data are stored in large databases, how to communicate effectively with non-clinical informaticists on merging datasets, and how to best extract data from the EMR.

All research projects were Institutional Review Board approved, investigator-initiated projects and focused on cardiovascular disease disparities seen in rural areas. The student research experience included literature review, retrospective chart review, updating and analyzing heart and vascular registries, data analysis and manuscript development. One cardiologist was responsible for ongoing project progress, bi-monthly student check-ins, reviewing the weekly intern reflection journals and providing general medicine and cardiology-specific career expertise, information and advice. Regarding mentoring, one student wrote, “My meeting with Dr. [X] was the most enjoyable aspect of the week because it was a good break from the day-to-day routine of chart review and got me thinking more in the future about my career and it was fun planning and getting excited about my options ahead.”

**Students record experiences**

Students completed a weekly reflection journal to record challenges and successes, as well as reflections on the skills and knowledge they acquired each week. While describing the challenges and successes, one student wrote, “I learned this week that the methods section of papers is a crucial marker for whether the paper should be read. This has enabled me to better understand what variables and methods have been used in previous studies.” Another wrote, “Through lots of trial and error, questions and answers, I’ve been able to create a somewhat comprehensive document that acts like a table of contents or glossary for all the variables I need to collect. This process of getting a standardized method written out for a procedure such as a chart review is valuable for further research to ensure a sound and reproducible scientific investigation.”

There were opportunities for education in the echocardiography lab and exercise stress laboratory, as well as the cardiac catheterization and electrophysiology laboratories. Regarding exposure to clinical medicine, one student wrote, “As I continue to learn about cardiology, I become stronger in the field. In studying for my
MCAT, any question about cardiology I immediately know because of what I have learned from this research experience so far, not to mention a few topics within the psychology/social sciences and physics/math portions that have to do with research and the ethics behind research.” Students also participated in a full-day simulation catheterization lab experience, where they experienced the hands-on deployment of cardiac stents, toured the manufacturing facilities where stents and other cardiac devices are assembled and participated in an in-depth learning experience reviewing imaging of the heart at a large device company in Maple Grove.

At the end of the summer, each student was required to give a 15-minute presentation, including a summary of the background, methods and preliminary results of their project, and then a highlight of clinical experiences, including lessons learned. The presentation concluded with time for heart and vascular, clinical trial and research staff to discuss findings and ask questions. The presentation allowed students to gain formal experience presenting and interacting with clinical and research staff, as is often expected in clinical medicine, and demonstrated how research informs clinical practice.

The program is a long-term investment for the communities in the Northland where the results will be seen years from now, when today’s interns complete their medical training. In the short term, the number of peer-reviewed abstracts, manuscripts, presentations and knowledge acquisition of cardiology concepts and clinical research will continue to be evaluated.

Medical students are eager to engage in clinical and research activities. Opportunities to do mentored clinical research are limited, given the heavy burden of coursework and limited free time during medical school. The summer provides an ideal opportunity for a program that involves active clinical experience and research experience for eager pre-medical and medical students. Programs such as this are important to provide the rural medical community with practitioners who are better trained in research, understand study design, basic statistical analyses, and evidenced-based medicine. MM

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Acknowledgements
Funding for the EHSRI was made possible by the Essentia Health Duluth Clinic Foundation. The authors wish to thank Christine Leone, Kaitlyn Rikkola, Brianna Lemke, Ryan Theil and Paula Termuhlen, MD, for their assistance with making the program possible and Wilson Ginete, MD; Kalkidan Bishu, MD; Richard Mullvain; Anne Meyer; Ross Blood; Paul Hitz; and Nick Cameron for providing data and mentoring.

For more information, go to https://www.essentiahealth.org/education-research/essentia-health-summer-research-intern-program/