Interdisciplinary PhD Healthcare Genetics

During the 2013-13 academic year the Healthcare Genetics (HCG) program continued its successful progression with a total of 21 doctoral students. All of the first three doctoral students have now graduated and have jobs in academia, one is part-time. Three candidates plan to graduate in August. Two of these individuals are nurses and the other is a multidisciplinary student. The multi-disciplinary student has already taken a position as a Director of a laboratory which develops genetics associated assays for disease diagnosis.

The next wave of students have started to plan the schedule for their comprehensive exams with implementation of the research study once the exams are successfully completed. This cohort of approximately eight students includes both multidisciplinary and nursing students. One is an Internal Medicine physician from China (interested in pharmacogenomics), a male advanced practice nurse with a doctorate in clinical nursing (interested in the genetics of pain), two master’s prepared nurses interested in an academic career (one interested in genetics education in practice and the other the genetics of obesity), a student originally from Iran but now a U.S. citizen (interested in breast cancer research), a nurse from India (interested in the epidemiology of Indian-Asian incidence of breast cancer) and two multidisciplinary students with undergraduate degrees in Psychology (already has worked with a mouse model and an educational study for staff working with children) and Biology (interested in working with cell free DNA to answer her research question). All of these students hope to graduate by December, 2015.

The “youngest doctoral students” are all nurses. They have completed their first year of genetics and research courses. As they progress in the program they will be immersed in actual research studies. This change is based on student suggestions by the previous cohorts.

Of the students enrolled in the HCG interdisciplinary doctorate (iPhD) two are internationals, two are males and 12 are from disciplines other than nursing. In addition, two of the students are of minority designation. Four students have completed the master’s level portion of the BS-PhD option designed for nurse educators with one completing as a family nurse practitioner. Three students from outside of South Carolina are taking online program courses to enhance their coursework.

Two students made decisions to change their education trajectory, but plan to return to complete the HCG doctoral. One has started medical school and the other a physician’s assistant program.

Statistics are kept regarding inquiries, accepted versus enrolled students and those continuing in the program. (See the Healthcare Genetics Program Recruitment and Admissions table directly below.) Evaluation and outcome criteria have been established for the HCG program. (See the Healthcare Genetics Program Scholarly Outcomes table below.)
The cytometry is being used to identify markers on cells associated with cancer risk.

To address recruitment needs the Student Services Coordinator and HCG faculty plan to meet with various healthcare institutions, schools with Master’s degrees, especially those with diverse populations of students. The website is undergoing revision to enhance visibility of the interdisciplinary faculty and partnerships available for doctoral student research. The doctoral student handbook was revised to more specifically address needs of students as they move through the program.

The HCG Society was established by HCG students from HEHD. One person from outside the program has joined the group. The students meet with advisors Drs. Jane Deluca and Julie Eggert bi-monthly with an educational program at each meeting. Annually the students plan and implement a seminar. This year the seminar, August 18th, will focus on the topic of “Pharmacogenomics: a key to personalized medicine”. A multidisciplinary group of expert speakers and vendors will be available during the breaks.

Research and the Healthcare Genetics Laboratory

The Healthcare Genetics Laboratory in 105 Edwards Hall has been active under the direction of Research Professor, Dr. Lyn Larcom and Research Scientist Dr. Patilee Tate. Multiple research studies from three teams of researchers have been conducted. Two new pieces of equipment were purchased to provide up-to-date laboratory technology for molecular research. One of the students graduating in August completed her research on the macromolecule zonulin and the possible association with Autism Spectrum Disorders using the PCR machine. The new cell flow cytometry is being used to identify markers on cells associated with cancer risk.

One research study continued to accrue patients to determine the “Effect of Raspberries on Cognitive Decline in Women with Breast Cancer who are Receiving Chemotherapy”. A doctoral student completed the foundational laboratory work on the effect of epigenetics (hypermethylation) of nerve cells treated by chemotherapy and raspberries. The clinical trial continues and focuses on memory changes in two groups of women with a breast cancer diagnosis who have been treated with chemotherapy. One group of women receives standard of care while the second group is provided raspberries. An amendment adds another level of experiments looking at the activity of white blood cells in women with breast cancer. This is a collaborative study with Greenwood Genetics Center and Upstate Oncology Program of the
Bon Secours Saint Francis Hospital.

The Healthcare Genetics Research Professor and Professor Emeritus, Dr. Lyndon Larcom, passed away in late June, 2014. His death brings a great loss to Clemson University; especially the HCG research team. Their goal is to continue and complete the projects he initiated and publish the results as a last testimony to his contributions to the world of Science, especially nutraceuticals and their effect(s) on the biology of cancer.

Instruction

HCG courses continue to utilize Adobe Connect® online format for class. Students access the course from home via computer or mobile technology (or anywhere) and interact synchronously while viewing lectures or making their presentations to classmates and faculty. Break-out sessions are available online where the faculty could move between the groups to facilitate discussions and respond to questions without leaving the virtual classroom. Other internet resources such as You Tube are incorporated to engage a variety of learning style. A whiteboard is available for students or faculty to make notes and develop directions for student to follow during the weekly class time. Some classes have been recorded and available for download to MP3 players, iPODs, iPADs or home computers. Pre-course preparation is completed following a typical syllabus outline with expanded discussion of technological requirements and accessibility instructions. The goal is that all courses in the HCG program will be available with all or a portion of the noted technology so students can be recruited from other states and internationally for this innovative doctoral program.

Innovation and Collaboration

The HCG faculty have been working closely with the Greenwood Genetic Center (GGC), Upstate Oncology Associates with St Francis Health System, Greenville Hospital System (GHS) faculty and staff to collaborate in courses, research, clinics and innovative projects that will offer better health to the people of SC. This academic year two courses (Advances in Healthcare Genetics and Applications of HCG to Medical Genetics) were taught in conjunction with faculty from these institutions.

Angela Wu is working with the research team of Dr. Emil Alexov in the Biophysics department. Ms. Wu has participated in the development of two manuscripts for publication on the topic of proteomics.

Drs. DeLuca and Eggert work in clinics (Metabolic and Inherited Cancer Genetics, respectively) to provide examples of cases that can be reviewed (without identifiers) to facilitate the understanding of genetics in the healthcare setting. An inherited genetics clinic is planned to open through the Sullivan Wellness Center in the Fall. Students will work with the faculty to analyze family history of cancer, learn focused assessment and provide education to families that may help them prevent or access early detection for their loved ones.

Two doctoral students worked with staff at GHS to develop focused educational modules targeting how to incorporate genetics into their specialized areas of patient care, oncology and behavioral pediatrics. Learning was evaluated and shared with the staff. One of the students presented a more detailed discussion of her topic for the monthly hospital-wide Grand Rounds program for the nursing staff.
The HCG faculty traveled with students to national conferences for poster presentations but to meet with them for discussions about conference topics, research and ideas about future directions. The students were also encouraged to network with vendors and the other scientists. This serves to motivate the students and encourage them to incorporate more “scholarship” into their education.

Scholarship

During 2013-14 doctoral students provided peer-reviewed presentations including two national/international podia with poster presentation at the international, national and regional/local levels. One poster on epigenetics was presented at a meeting in Singapore. See the Appendix for a detailed list.

Dr. DeLuca is working with students and some of the GGC staff on a genetic focused research study.

Dr. Eggert was recently funded to implement a research study with GGC faculty, Drs. Chaubey and Friez to develop Next Generation Sequencing targeting specific cancer susceptibility genes. One outcome for the information obtained will be to answer questions regarding breast cancer and leukemia in diverse populations of women in SC. Two doctoral students have been funded as research assistants to help collect data and learn the research process.

### Healthcare Genetics Program Scholarly Outcomes

<table>
<thead>
<tr>
<th>Year</th>
<th>Publication</th>
<th>Posters</th>
<th>Podia</th>
<th>Scholarship</th>
<th>GTA Positions</th>
<th>Grant Funding</th>
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<tr>
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<td>6</td>
<td>6</td>
<td>5</td>
<td>1 (3)</td>
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Please see Appendix for a detailed list.

Two groups of *Creative Inquiry* research projects included direction from doctoral students. Tracy Lowe and Elizabeth Hassen worked with three undergraduate students on a project entitled “GENE: Genetic Essentials in Undergraduate Nursing Education”.

These five individuals measured nursing student knowledge (undergraduate and graduate) with a published tool and reviewed course materials to determine the genetic content for each specific course. The group submitted an abstract which was accepted for presentation at the (April 3, 2014) *National Council on Undergraduate Research Conference*, Lexington, KY. More than 4,000 abstracts were submitted and only 400 were
accepted for presentation at the undergraduate conference. They are finalizing their manuscript for publication

Rebecca Garcia worked with one undergraduate student on a qualitative social media project. They used Radian5 software to assist in identifying specific symptom phrases to determine if these could be associated with quantitative laboratory results. There was so much data, Angela Wu, another doctoral student assisted in reviewing the threads of information. They plan to publish these results by the end of the summer.

The HEHD 2013-14 Outstanding Doctoral Student was jointly awarded to Rebecca Garcia and Heide Temples. Both PhD candidates for August graduation.

Elizabeth Hassen and Tracy Lowe were awarded with the Sigma Theta Tau Rising Star. The purpose of this award is to recognize future leaders in nursing. Elizabeth was also awarded a 2014 Doctoral Scholarship by the Oncology Nursing Society Foundation. This scholarship is for doctoral students who are interested in and committed to oncology nursing to continue their education by pursuing a research doctoral degree (PhD or DNSc) or clinical doctoral degree (DNP).

Meredith Purgason and Elizabeth Hassen received recognition from Jonas Nurse Leader Scholars to support educational development as potential new nursing faculty and to learn to stimulate models for joint faculty appointments between schools of nursing and clinical affiliates. The grants, made through institutional awards, also prepare doctoral candidates to help students address the needs of future patients – from dealing with co-morbidities and chronic illnesses to providing culturally competent care.

Scott E. Moore was named a Fellow with the Geriatric Nursing Leadership Academy (GNLA) Cohort IV. Funded by the Hearst Foundations and Hill-Rom, Inc., the GNLA is the premier leadership development opportunity for nurses with a dedication to work with elders in order to improve their health outcomes. The GNLA Fellowship offers grantees a stimulating, intense and professional life-changing experience. The purpose of the academy is to prepare emerging nurse leaders, through individualized leadership development, to lead and motivate multi-professional teams in order to improve health care quality for older adults and
Mr. Moore’s focus is on elder decision-making in the ever changing world of genomics in medicine.

Mr. Moore was also recognized by the National Hartford Centers of Gerontological Nursing Excellence (NHCGNE), located at The Gerontological Society of America, as one of four 2014-2016 national Patricia G. Archbold Scholars. This program assists in the support of doctoral training and strives to launch careers in academic gerontological nursing. In addition, Mr. Moore continues as the 2013-1017 the Betty Cecil Family scholarship recipient for incorporating genetics into the advancement of healthcare for older adults.

Doctoral graduates in Healthcare Genetics for 2013-2014 include Drs. Steck, Farrell, Garcia & Temples.

Submitted by Dr. Julie Eggert, PhD, GNP, Professor and Coordinator of Doctoral Program

FOR THE APPENDIX:


Jenks, A., & Chismark, E. (Submitted for Publication). Implementing genetics into primary care through the Patient Protection and Affordable Care act. Policy, Politics, & Nursing Practice.

Nurses. ONS Publishing. Pending Fall, 2014.


Wu, B., Eggert, J., & Alexov, E. [Accepted]. Molecular mechanisms underlying pathogenic missense mutations. eLS

Podium Presentation:
Lowe, T. Epigenetics and Disease (Sep 17, 2013) 20th Annual Perinatal Partnership-North Carolina, South Carolina Perinatal Association, Concord, NC.


Mele, C. (April 20, 2013.) Pharmacogenomics in Pediatrics. National Associations for Pediatric Nurse Practitioners (NAPNAP), Orlando, Fla. (The Conference Presentation was selected for NAPNAP CEU ONLINE WEBINAR 2013-14)


Poster Presentation:


DeLuca, J. Emotional Responses of Parents to Abnormal Newborn Screen Results and Evaluative Processes" (February 12-14, 2014). Southern Nursing Research Society Annual Conference, San Antonio, TX.


Hassen, E., Lowe, T., & Eggert, J. ACTG: Assessment of Curricula in Teaching Genetics (Nov. 16-17 2013) Sigma Theta Tau International Biennial Conference, Indianapolis, IN


Moore, S.E. (April 8, 2013) Exploring mHealth as a New Route to Bridging the Nursing Theory-Practice Gap” Clemson GRADS: Graduate Research and Discovery Symposium, Clemson University Graduate School—2013, April