NEW ACADEMIC PROGRAM – IMPLEMENTATION REQUEST

I. PROGRAM NAME, DESCRIPTION AND CIP CODE

A. PROPOSED PROGRAM NAME AND DEGREE(S) TO BE OFFERED
University of Arizona Genetic Counseling Graduate Program
Master of Science in Genetic Counseling

B. CIP CODE 51.1509 – Genetic Counseling

C. DEPARTMENT/UNIT AND COLLEGE
Managing unit – Center for Applied Genetics and Genomic Medicine
Academic Department – Cellular and Molecular Medicine, University of Arizona College
of Medicine, Tucson

II. PURPOSE AND NATURE OF PROGRAM
The Center for Applied Genetics and Genomic Medicine (TCAG²M), in partnership with
the Department of Cellular and Molecular Medicine (CMM), are proposing to re-
establish the University of Arizona Genetic Counseling Graduate Program leading to a
Master’s degree in Genetic Counseling. The program would be a 2-year (22 month)
Master’s level program. Individual eligibility for professional certification by the ABGC
(American Board of Genetic Counselors) is dependent on successful completion of an
ACGC accredited graduate program and successful completion of the ABGC board exam.

Genetic counseling is a rapidly growing, clinically essential part of 21st century medicine.
The goal of this application is to train future practitioners, particularly to fill a necessary
role in the growth of precision health care within Arizona. Two primary foci of this
program will be the emphasis on individualized genetic and genomic medicine and
recruitment of culturally diverse students into our program. The field of Genetic
Counseling has recognized a significant need to recruit and retain practitioners from
diverse cultural backgrounds. Graduates of this program will gain valuable experience
working with patient populations across ethnic backgrounds and have a unique learning
experience treating patients with diverse ethnic and cultural identities. The ABGC
(American Board of Genetic Counseling) certifies genetic counselors. As of the date of
this survey, ABGC has over 4,000 certified genetic counselors, an increase of 75% over
2006.

There are currently no other graduate programs in Genetic Counseling within the state.
The University of Arizona, Tucson had such a program from 1995 through 2005. During
that time frame, the program received approximately 50 applications annually for 5
student positions. In 2014, the ACGC (Accreditation Council for Genetic Counseling) reported 264 training slots in the U.S, with 3.3 applicants per position.

Within the WICHE (Western Interstate Commission for Higher Education) states, there are 3 programs in California and one each in Utah, Colorado and South Dakota. Of the 34 programs with Full Accreditation, 8 are west of the Mississippi River. This program would be uniquely situated to recruit students from the Western U.S.

The cost of the U of A Genetic Counseling program will be comparable to other public institutions. An analysis of similar institutions found an average annual in-state tuition and fees of approximately $12,000 - $16,000 and $35,000-$40,000 for out-of-state tuition.

With the approval of ABOR (Arizona Board of Regents), we anticipate applying a special program fee of 3,000/semester for resident and non-resident students due to the intense faculty involvement and clinical supervision required. Tuition based on 2016 Annual Graduate program fees, in addition to the special program fee would set resident tuition at approximately $17,400 and non-resident tuition at $37,100.

The cost of clinical practicum training is provided by the use of academic credits. There is no additional charge to students. Clinical training sites provide the supervision in kind. Students are responsible for having reliable transportation to attend clinics in Tucson and Phoenix. Summer clinical placements are available within Arizona. Students may also choose clinical experiences outside of Arizona, which may incur some additional cost.

III. PROGRAM REQUIREMENTS

Program requirements include:

- Successful completion of at least 46 academic credit hours. An additional 16 credit hours will be devoted to a clinical practical application which meets the guidelines of the American Council for Genetic Counseling (ACGC). This leads to a total of 62 credit hours.
- To ensure ACGC board-eligibility, varied clinical rotations will be developed in partnership with several healthcare delivery organizations by the program to guarantee that students achieve a minimum of 50 core cases, each including one role in the required three categories of management, education and counseling.
- Completion of a thesis project prior to graduation is required.

A. CURRENT COURSES AND EXISTING PROGRAMS

All academic coursework will be based on the Practice-Based Competencies for Genetic Counselors developed by the ACGC. Clinical practicum experiences are designed to incorporate these competencies into clinical practice.
These competencies can be found at:

A review of a variety of Genetic Counseling Graduate program curricula was undertaken to assist in the development of this program. Examples of curriculum at other Genetic Counseling Graduate Programs are below.

University of Wisconsin

**Semester I (Fall Semester): 11 credits**

- Pediatrics 677, 1 credit - Medical Genetics (MedGen721)
- Pediatrics 741, 1 credit - Interviewing and Counseling for the Genetic Counselor
- Counseling Psych 620, 1 credit - Theory and Practice in Interviewing (lecture)
- Pediatrics 713, 3 credits (16 hours/week) - Practicum in Genetic Counseling
- Pediatrics 737, 1 credit - Contemporary Professional Issues in Genetic Counseling
- Pediatrics 739, 2 credits - Academic Methodologies and Resources for Genetic Counselors
- Pediatrics 744, 2 credits - Genetic Counseling for Inborn Errors of Metabolism

**Semester II (Spring Semester): 10 Credits * **

- Medical Genetics 562, 2 credits - Human Cytogenetics and Molecular Diagnostics
- Pediatrics 646, 2 credits - Cancer Risk Assessment and Counseling
- Pediatrics 714, 3 credits (16 hours/week) - Practicum in Genetic Counseling
- Pediatrics 737, 1 credit - Contemporary Professional Issues in Genetic Counseling
- Pediatrics 742, 1 credit - Clinical Embryology and Prenatal Diagnosis
- Pediatrics 745, 1 credit - Genetic Counseling Research Seminar
- Elective - 1 to 2 credits *

**Summer Session**

- Mayo Clinic Internship (1 week)
- Second-year rotations begin

**Semester III (Fall Semester): 12 Credits**

- Medical Genetics 731, 3 credits - Clinical Genetics
- Medical Genetics 737, 1 credit - Contemporary Professional Issues in Genetic Counseling
- Medical Genetics 813, 4 credits (20 hours/week) - Advanced Practicum in Genetic Counseling
- Medical Genetics 708, 1 credit - Genetic Counseling Research

**Semester IV (Spring Semester): 8 Credits * **
### Medical Genetics 737, 1 credit - Contemporary Professional Issues in Genetic Counseling

### Medical Genetics 814, 4 or 5 credits (20-24 hours/week) - Advanced Practicum in Genetic Counseling

### Medical Genetics 708, 2 credits - Genetic Counseling Research

Elective - 1 to 4 credits *

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**University of Texas at Houston**

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<td>Medical Genetics Course</td>
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# Augustana-Sanford Genetic Counseling Graduate Program

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<th>Course Number</th>
<th>Course Title</th>
<th>Name of Instructor Or Organizer &amp; Institution</th>
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<td>GENC 610</td>
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<td>Casey Trainor &amp; Asst PD SF</td>
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<td>GENC 630</td>
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<td>Diversity in Genetic Counseling</td>
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## B. NEW COURSES NEEDED

### Proposed Genetic Counseling Graduate Program Curriculum

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<td><em>CMM 5XX</em> Modern Genetics: Molecules to Populations</td>
<td>Restifo</td>
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<td><em>CMM 6XXa</em> Medical Genetics</td>
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<td>CMM 525a Human Histology</td>
<td>Amerongen</td>
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<td><em>CMM 596X</em> Genetics Seminar</td>
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<td><em>CMM 594</em> Clinical Practicum</td>
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<td><em>CMM 6XXb</em> Medical Genetics</td>
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<td><em>CMM 5XX</em> Cancer Genetics</td>
<td>Laukaitis</td>
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<td>CPH 576A Biostatistics in Public Health</td>
<td>CPH/Roe</td>
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<td><em>CMM 695X</em> Genetic Counseling Colloquium</td>
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<td>OBG 585 - Embryology, Teratology, Birth Defects</td>
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<td>CPH 535 Multicultural Health Beliefs</td>
<td>CPH/Sabo</td>
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<td><em>CMM 695D</em> – Human Genetic Disease Colloquium</td>
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<td>CMM 595H – Problems in the Biology of Complex Diseases</td>
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CMM 5XX Modern Genetics: From Molecules to Populations
Course director: Linda Restifo; 3 units

Unit 1: rapid review of molecular biology
1.1. DNA replication and its control
1.2. Meiotic recombination
1.3. Transcription and its regulation
1.4. Translation and its regulation
1.5. Protein trafficking
1.6. Protein folding and 3D structure
1.7. Non-coding RNAs
1.8. Genome architecture
1.9. Epigenetic modification of DNA

Unit 2: basics of mutation
2.1. Genetic variation and its evolutionary implications
2.2. Phylogenetic relationships
2.3. Genotype-phenotype relationships (penetrance, expressivity, pleiotropy, genetic heterogeneity)
2.4. Classification of mutations based on molecular structure
2.5. Classification of mutations based on function

Unit 3: overview of transformative, enabling genetic technologies
3.1. Gene cloning and expression of recombinant gene products
3.2. DNA sequencing
3.3. Linkage mapping
3.4. Transgenic organisms
3.5. Specialized hybridization technologies (e.g., FISH, nucleic acid microarrays)
3.6. GWAS
3.7. RNA interference
3.8. Immunogenetic technology from hybridomas to ChIP-seq
3.9. ENCODE project
3.10. Induced pluripotent stem cells

Unit 4: compelling biological questions studied with exemplary organisms
Comment: "exemplary" is used to include model organisms, emerging models, or non-model organisms
4.1. Cell cycle control and oncogenesis
4.2. Development: cellular differentiation and tissue morphogenesis
4.3. Nervous system function
4.4. Microbiome-host interactions--Inter-genome interactions (e.g., virus-host; microbiome-host)
4.5. Function of mitochondria and other organelles (lysosomes, peroxisomes)
4.6. Circadian rhythms
4.7. Prion biology
4.8. Human evolution and migration

Unit 5: sociological issues
5.1. ELSI of human genetics
5.2. GMO controversies in agriculture
5.3. Economic issues: research funding; academia-industry relationships
CMM 6XXXa Medical Genetics (infancy through adolescence)
CMM 6XXXb Medical Genetics (reproductive years through aging)
Course director: E. Hoyme, 3 units in each of two semesters

This continuation course explores genetic disorders across the lifespan

Examples of individual lectures already available include:
- Patterns of Inheritance I (AD, AR, XLR, XLD and mitochondrial)
- Patterns of Inheritance II (Cytogenetics)
- Too Short or Too Tall: A Genetics Approach to Short Stature and Overgrowth
- A Genetics Approach to Autism Spectrum Disorders
- A Genetics Approach to Hearing Loss
- Ethical Challenges in Genomic Medicine
- Diving into the Gene Pool: Genetics, Genomics and Primary Care Medical Practice
- Down Syndrome: Clinical Evaluation and Management
- Genetic Unknowns (both malformation syndromes and common metabolic conditions)
- Tuberous Sclerosis Complex
- A Day in the Life of a Pediatric Geneticist
- Common Microdeletion Syndromes

Additional topics to be developed:
- Preconceptional and prenatal medicine
- Cardiovascular genetics
- Neurogenetics
- Personalized genomic medicine
- Pharmacogenomics
- Psychiatric genetics
- Population and quantitative genetics

CMM 525a Human Histology: An Introduction to Pathology (existing course)
Course Director: H. Amerongen, 3 units

This course will focus on the normal functional histology of the tissues and organs of the human body. The course includes basic cell biology of the cells, tissues, and organs, and emphasis will be given to integrating function with structure at all levels. Pathology will be used to help illuminate normal structure and function. Modes of instruction will include lecture, discussion, and computer-based laboratory. Graduate-level requirements include: Choose two diseases that interest you and that have histopathological manifestations (many diseases do), and for each one, generate a clinical case and prepare a description of (1) the normal histology of the area(s) involved and (2) the histological changes (pathology) associated with the disease. The core of these reports will be well chosen, accurately labeled illustrations (at appropriate magnifications) comparing normal and diseased tissue. Faculty will be happy to help you in selection of materials for this exercise and directing you to useful resources, etc.
CMM 910 Genetic Counseling Research/Master’s Thesis
Course director: Linda Restifo, total 7 units

Genetic Counseling Research will be offered in all four semesters. The goal of this course is to guide students through the development and implementation of a research project, culminating in a publishable thesis. Students learn essential elements of research including critical assessment of genetic/medical literature, application of research methodology, the challenges of collaborative research, and logistics of clinical research, including human subjects protection and IRB approval. As students progress through the four-semester course, topics such as proposal writing, data collection and analysis, design of figures and tables, and identification of suitable target publications will be covered. Oral presentation skills will also be emphasized. Ethical issues will be addressed within each topic.

First semester (1 unit)
- Identify research topic and advisory committee (advisor and 2 faculty members)
- Bibliography and literature matrix

Second and third semesters (2 units each)
- Proposal with a full literature review/background and significance section
- Meet regularly with committee chair, and other members, as needed
- Develop research tools, conduct research
- Collect and analyze data

Fourth semester (2 units each)
- Complete data analysis
- Draft and edit manuscript, submit and present to Committee
- Present thesis research as slide presentation in CMM 596 Genetics Seminar

CMM 5XX Introduction to Genetic Counseling
Course director, Dee Quinn; 2 units

The goal of this course will be to develop beginning professional competencies by:
- Obtaining and interpreting family histories, medical terminology and medical records
- Use and analysis of genetics literature
- Medical documentation
- Contracting and establishing rapport
- Interviewing and active listening techniques
- Facilitating decision making via informed consent
- Patient/subject privacy issues (e.g. HIPAA)
- Theories of counseling
- Structure and purpose of genetics-related professional organizations
- Genetic Counseling Code of Ethics

Required activities:
- Attend one genetic disorder support group meeting; one home visit coordinated by Pilot Parents
- Attend Arizona Genetic Advisory Committee meeting
- Complete 5 clinical family histories
- Group project on medical terminology
- Development of letter writing skills
- Independent reading (one book and 10 articles) with summaries
- Psychosocial issues in genetic counseling project: 5-10 page paper focused on a particular topic, incorporating concepts from theories of counseling, with a 20 minute Power Point presentation
CMM 596X Genetics Seminar (Genetic and Genomic Grand Rounds/Case Conference/ Journal Club)
Course directors: Christina Laukaitis, Hussam Al-Kateb, Dee Quinn, 1 unit

This course introduces trainees to current topics in clinical genetics and genomics research through a monthly seminar series, monthly journal club and bimonthly case conferences. Each month, a local or outside speaker will present a one-hour seminar (Genetics & Genomics Grand Rounds). Two weeks prior to this, the students will read, present and critique an article authored by the speaker in order to understand the seminar and to ask probing questions of the speaker. Each student will be expected to lead the discussion of one article per semester, and other students will be expected to have read the article and to participate in the discussion. Students will be encouraged to interact with the speaker during dinners and lunches prior to or after the seminar. On the alternating two weeks per month, trainees and clinical faculty will gather to discuss interesting, perplexing, or illustrative genetics cases from their clinical practices and archives. Each student will be expected to present one case per semester, describing the patient, drawing a pedigree, and explaining the team’s rationale for their testing strategy. They will be expected to read and summarize relevant literature as a part of this discussion. The course directors will monitor attendance, assign/distribute journal articles, and evaluate the quality of journal and case presentations.

CMM 594 Clinical Practicum
Course director, Assistant Program Director

Throughout the 22-month program, students will be placed in genetics clinics in Tucson and Phoenix. The requirement of student paid travel is consistent with other genetic counseling graduate programs. In the first year, placements will begin with observational experiences and lead to counseling of non-complex issues. The second year will be more focused, both in terms of student involvement in counseling but also that clinics will be specific such as cardiac, neuromuscular, connective tissue disorders.

A list of genetic counselors in Arizona who have agreed to train these students is included in the Appendix. We have already begun to explore affiliation agreements with potential clinical training sites, many of which are already in place through the University of Arizona College of Medicine.

CMM 5XX Cancer Genetics and Precision Oncology
Course director: Christina Laukaitis, 2 units

Concern about hereditary cancer risk is a major cause for referral to a genetic professional and identifying a hereditary cancer syndrome opens many cancer prevention options. In addition, testing of tumors for treatment-changing somatic mutations is becoming commonplace, and geneticists are often asked to assist in arranging or interpreting these test results. This 3-hour course will present important ideas in cancer genetics and precision health, preparing students to identify patients with a family history consistent with a hereditary cancer syndrome and to understand and interpret the results of somatic tumor testing. The course will cover three major topics: 1) Hereditary cancer syndromes; 2) Tumor genomics; and 3) ethical, legal and social implications of hereditary cancer risk. The educational format will include lectures by experts in the field, reading and presentation of current peer-reviewed literature by students in the class, and report preparation based on standardized patient cases.
**CPH 576A Biostatistics in Public Health (existing course)**
Course Director, D. Roe, 3 units

This course introduces biostatistical methods and applications, and will cover descriptive statistics, probability theory, and a wide variety of inferential statistical techniques that can be used to make practical conclusions about empirical data. Students will also be learning to use a statistical software package (STATA).

**CMM 695 Genetic Counseling Colloquium**
Course director, D. Quinn, 2 units
Spring of first year and fall of second year

This course will consist of two semesters and include all students from both graduating years. Topics will include:

**Advanced Counseling Skills**
- Psychosocial assessment
- Family dynamics
- Grief and bereavement
- Crisis intervention
- Cultural sensitivity and competence

**Advanced Genetic Counseling skills**
- Case management
- Risk calculation and communication
- Informed decision-making
- Assessment and provision of resources
- Test results interpretation and disclosure

**Health care systems**
- Health and social policy
- Service delivery models
- Financial/reimbursement issues

**Genetics in the community**
- Genetic discrimination and related legislation
- Disability awareness
- Advocacy
- Community, regional, and national resources
- Genetics as a component of public health services
- Identification of the genetics educational needs of clients, patients, community, and lay groups, students, and health and human service professionals

**Required activities:**
Develop, deliver and evaluate an educational tool for a specific group (one in each semester)
- Additional activities TBD
OB 585 Introduction to Birth Defects: Embryology, Teratology and Genetics (existing course)
Course director: Dee Quinn, 3 units

This course is designed to help clinicians understand normal and abnormal fetal development and will focus on clinical approaches to prevent, diagnose and manage birth defects. The course will be taught by genetic professionals and will focus on a range of subjects covering general concepts of genetics, embryology, teratology and dysmorphology. Risk assessment and communication methods, as well as ethical, cultural and legal aspects of genetic counseling will be discussed. Teaching methodologies will include didactic lectures (including guest lecturers), case studies and outside readings. Grades will be based on 3 exams and a 5-10 page paper on a specific birth defect.

CPH 535 Multicultural Health Beliefs (existing course)
Course director: S. Sabo, 3 units

Designed to provide sensitivity by health promotion professionals to the varying multicultural health beliefs and needs of our society. Special emphasis on ethnic characteristics of minority populations in Arizona with recommendations for programming strategies.

CMM 5XX Genetic Diagnosis and Lab Testing
Course Director: Valerie Schaibley, 1 units

Diagnostic tools in genetics have been rapidly evolving since the publishing of the Human Genome in 2003. This course will delve into current genetic diagnostic methodologies and discuss future applications, developments, and challenges in the genetic diagnostic field. Topics covered in this course will include fundamental principles of cytogenetics, chromosome abnormalities, microarray, biochemical tests, newborn screening, and variant interpretation and reporting. In addition, the course will explore new molecular assays, including whole genome and exome sequencing, bioinformatic analysis of DNA sequence data, and regulatory oversight of new DNA-based tests, and examine the ways in which these technological advances are shifting the practice of genetics and genomic medicine. The course will also instruct students on systematic use of lab testing in the diagnostic process for genetic conditions. Classes will include lectures by experts in the field, reading and presentation of current peer-reviewed literature, and report preparation based on variant interpretation and a diagnostic analysis for a specific genetic condition.

CMM 596D Human Genetic Disease Colloquium (existing course)
Course director: Linda L. Restifo, 3 units

Every year, the course covers four disorders in depth, each representing a different type of genetic causation, from simple Mendelian on the one hand to complex disorders with high heritability and environmental triggers on the other. Topics vary each year. Clinical presentation, natural history, differential diagnosis, pathophysiology, genetic mechanisms, biochemical features, and therapeutic advances will be considered. Readings from the primary biomedical literature, didactic lectures, and student presentations provide the basis for class discussion.
CMM 595H – Problems in the Biology of Complex Diseases (existing course)
Course Director: D. Vercelli, 2 units

Complex diseases (CDs: e.g., asthma, allergy, COPD, obesity, inflammatory bowel disease, hypertension, coronary artery disease, diabetes, rheumatoid arthritis, multiple sclerosis, schizophrenia) are the next major challenge in human biology because they are at the same time unique, common and difficult to decipher. The complexity of CDs lies in their pathogenesis, in which a constellation of environmental and genetic factors interact in intricate ways to alter biological thresholds and response patterns, modifying disease susceptibility. Since both genes and environmental exposures contribute to CDs, the biological pathways involved in CD pathogenesis depend on the genetic background of a given population and the specific environment to which that population is exposed. Hence, asthma, obesity and hypertension in Arizona may not be the same as asthma, obesity and hypertension in Iceland.

CMM 5XX Ethical, Legal and Social Issues in Genetics
Course Director: TBD, 2 units

This course is being developed in conjunction with colleagues in the Colleges of Law, Science, Social and Behavioral Studies, and the Eller School of Business. Topics will focus on the bioethical, legal, and social challenges present in the field of genetics. Students will explore bioethical concerns being faced by the genetics community, and how those are shifting with advances in technology. We will look at current legislation protecting patient’s genetics rights, including the Genetic Information Nondiscrimination Act (GINA) and HIPPA, and potential gaps in legal structures to protect genetic rights. Finally, our students will learn how different societies perceive genetics, and ways in which clinicians and researchers can work within those societal frameworks while respecting diverse cultural beliefs.

CMM 6XX Contemporary Professional Issues in Genetic Counseling
Course Director, Dee Quinn, 2 units
Spring of second year

Topics to be covered:
- Emerging fields of practice
- Clinical supervision
- Genetic counselors as scholarly professionals
- Professional development, including research opportunities
- Development of self-assessment tools
- Stress management and self-care
- Genetics in the press and media training
- Genomics and business
- Development of CV
- ABGC Board Preparation

Required activities:
- Develop a CV
- Write a press release
- Prepare for and take “mock” board exam
- Additional activities TBD
Given the concentrated and focused nature of this program, several courses will be developed to address specific student needs. In each academic semester, continuation courses in research/thesis development, as well as issues within the profession of genetic counseling will be offered. Additional courses under development include two semesters of Medical Genetics, Clinical Cancer Genetics, Genetic Diagnosis and Lab Testing and Ethical, Legal and Social Issues in Genetics. We anticipate that several of these courses will be of broad interest to numerous students in a variety of professional programs.

We currently have in place a monthly Genetic and Genomic Grand Rounds. Drs. Laukaitis, Al-Kateb, as well as Dee Quinn in consultation with U of A leadership are planning to incorporate a case conference and journal club for genetic counseling students to create a weekly, one credit Genetics Seminar course, as listed above.

Activities required to institute new courses are in process, with plans to hire a 0.5 FTE Program Coordinator to assist with these activities. In addition, the program plans to begin advertising for an 0.4 FTE Associate Program Director in January of 2017.

C. REQUIREMENTS FOR ACCREDITATION

All Genetic Counseling Graduate programs must obtain accreditation from the ACGC (American Council for Genetic Counseling).

A minimum of three months before submitting an Accreditation Application for New Programs, the prospective program must submit a Letter of Intent and a non-refundable fee of $500 to the ACGC Executive Office.

Standards for accreditation are available at: http://www.gceducation.org/Pages/Standards.aspx.

New Program Accreditation is awarded to programs that meet the standards noted above and submit an accreditation application (http://gceducation.org/Documents/ACGC%20Accreditation%20Manual%209%202016%20final.pdf)

Following approval from the University of Arizona Graduate College and ABOR, we will submit a New Program application to the ACGC. This application will map specific program and student outcomes with professional metrics.

ACGC requires the following leadership for program compliance. Required program leadership positions include the Program Director (or Co-Directors) and the Medical Director. The leadership for the proposed U of A Genetic Counseling program will include
a 0.1FTE Medical Director (Dr. Gene Hoyme), 0.65 FTE Program Director (Dee Quinn) and an 0.4 Associate Director (TBD), totaling 1.15 FTE.

ACGC criteria:

- There should be a minimum ratio of paid FTE Program Leadership per total student enrollment (full or part time):
  - ≤10 students: 1.0 FTE
  - 11-15 students: 1.0 -1.25 FTE
  - 16-20 students: 1.25-1.5 FTE
  - 21-25 students: 1.5-1.75 FTE
  - ≥26 students: 1.75-2.0 FTE

New programs must complete a self-study and undergo a site visit within one year of graduating its second class. Full Accreditation is achieved through completion of this self-study and site visit. If approved, accreditation is conferred for a period of up to six years. With programs undergoing a re-accreditation review (at the conclusion of a six-year Full Accreditation period), the Accreditation Committee may elect to grant program re-accreditation for a period of up to eight years.

The former University of Arizona Genetic Counseling Graduate Program received New Program Status in 1995 and Full Accreditation in 2000. The program received an average of fifty applications annually for 5 student positions. The program graduated 32 students, of which 24 are board certified. One student withdrew from the program and 2 did not take exam. The Program Director, Dee Quinn, has participated in 3 accreditation site visits of established programs for the ACGC and is therefore quite familiar with the accreditation process.

The academic home for the previous program was the Genetics Graduate Interdisciplinary Program (GGDIP). During an academic program review in the early 2000’s, the GGDIP determined that the mission and goals of the Genetic Counseling program were substantially different than those of the GGDIP, and a recommendation was made that the program be moved to the College of Medicine. The change occurred in 2003. Simultaneously, an ABGC program accreditation site visit held in 2004 identified “serious concerns about the financial stability and institutional support for the program”. Program strengths included commitment of program directors, clinical supervision and experience (including significant exposure to diverse populations) affordability of program and academic performance of students. At that time, it was determined that the required institutional support was not available, and the program was closed.

Development of the UAHS Center for Applied Genetic and Genomic Medicine (TCAG²M) provided the impetus for the re-establishment of the Genetic Counseling Graduate program. Identification of the program’s academic home included exploring previous and new partnerships. The “best fit” was determined to be a collaboration of the UAHS TCAG²M and the Department of Cellular and Molecular Medicine.
Among the previously identified strengths, several of the faculty (including the Program Director and Medical Director), clinical practicum supervisors and some coursework will continue to be a part of the proposed new program. Importantly, now under the auspices of the University of Arizona Health Sciences (UAHS), the program enjoys significant institutional support and financial stability. Given the transformative changes taking place at UAHS in the area of precision medicine, and point-of-care genomic medicine services, this is an ideal time to launch a graduate program in Genetic Counseling.

D. CAMPUS AND LOCATION OFFERING
All academic courses will be offered through the University of Arizona, Tucson. Clinical rotations will occur throughout Arizona, although primarily in the larger cities of Phoenix and Tucson.

IV. STUDENT LEARNING OUTCOMES AND ASSESSMENT

A. STUDENT OUTCOMES
Students will be prepared to:
- Work as a member of a genetic/genomic health care team
- Interpret family and medical histories to assess the likelihood of disease occurrence or recurrence.
- Provide patient counseling to promote informed personal and medical choices, as well as adaptation to the risk or condition.
- Educate clients, clinicians and the public about genetic conditions, inheritance, testing, management, prevention, resources and research on inherited conditions.

B. STUDENT ASSESSMENT

Student accomplishments in course work will be evaluated by numerical grades or pass/fail. Remediation will be provided for students who do not achieve satisfactory progress. Student progress will be evaluated biannually by program faculty with referrals to appropriate student resources within the University. All students must maintain a 3.0 GPA and meet the program’s academic progress criteria toward degree completion. Graduate students who have less than a cumulative 3.0 grade-point-average (GPA) will be placed on academic probation. Students on probation are required to meet with their major advisor, discuss the steps necessary to remediate the problems that led to probation, and devise a written action plan to be submitted to the Graduate College. Students whose cumulative GPA remains below 3.0 for two consecutive semesters will be dismissed from the program.
All academic courses will be evaluated using the Teacher-Course Evaluation system (TCE).

All clinical supervisors will be required to assess student clinical skills (in conjunction with the student) in writing at the mid-point and end of their rotation. These evaluations will follow the NSGC practice-based competencies and be used to assist the student in identifying their strengths and areas of improvement. Clinical rotations will include prenatal, pediatric, adult and cancer genetic counseling, as well as exposure to a variety of specialty clinics, laboratories, non-profit organizations, and genetic and genomic testing companies. All evaluations will become part of the student’s record. We anticipate that students will assess and have significant clinical involvement with 125-175 patients over the course of the program in order to achieve the 50 core genetic counseling cases required to sit for the ABGC exam.

Each student will be required to develop a thesis project. Projects will be supervised by an advisor and a committee of 2 faculty members. Students are required to plan, conduct, write, and present an original research project. This individualized scholarly work may consist of a case series, a case study and literature review, a clinical or laboratory research project, or a clinical application. Each student will complete their graduate training with a formal oral presentation and a paper of publishable quality. Instruction in research design will begin in the first semester and continue throughout the duration of the program.

**Overall program evaluation**

Additional information that will be used to evaluate program effectiveness:

- ABGC board exam scores of program graduates
- Annual surveys to alumni and current employees of program graduates
- Annual program administration personnel evaluation
- Evaluation of individual courses – program leadership will review
- Student and faculty evaluations of clinical experience, including site evaluation by program leadership
- Advisory Board (details below)
- Annual faculty and clinical supervisor retreat
- Accredited New Programs must complete a self-study and undergo a site visit within one year of graduating it’s second class to obtain Full Accreditation

**Proposed Advisory Board for U of A Genetic Counseling Graduate Program**

As part of the program evaluation, we will develop an Advisory Board comprising local, regional and national members. As the program evolves, the Board will assist the program administration with expert advice on programmatic development and the needs of Arizona and the region. We anticipate their input into evaluating the overall
program, academic and clinical rotation assessments, providing suggestions for potential funding opportunities and a vision for the program as it moves forward.

Goal: Elicit academic, research, industry and consumer input to advise the program on instructional content

Objectives:
1. Develop collaboration between the program and the community at large
2. Assist in development of program evaluations and suggestions for improvement
3. Review curriculum every 3 years to determine compliance with ACGC competencies
4. Assist the program in setting future priorities

Membership
1. Will be composed of 6-8 members from varied professional backgrounds (instructional, research, alumni, consumers, community)
2. At least one member of the Board must be external to the program
3. Meetings will occur biannually, either in person or by teleconference
4. Terms will begin Aug. 1st and shall last for 3 years

V. STATE’S NEED FOR THE PROGRAM

Careers in Genetic Counseling are expanding in relation to the current and future clinical utility of genetics in the medical setting. This includes areas such as obstetrics, pediatrics, cancer, cardiology, public health and pharmacogenomics. Career opportunities in industry (such as in pharmacogenomics, genetic laboratory testing, precision medicine, and health policy) are rapidly expanding, and the need for Genetic Counselors will continue to grow as the application of genetic technology to human health expands within the private sector.

Within the state of Arizona, there is a significant need to increase the pool of applicants for employment. Two websites each currently list 8 open positions for genetic counselors in Arizona.

http://www.indeed.com/q-Genetic-Counselor-l-Arizona-jobs.html

A. IS THERE SUFFICIENT STUDENT DEMAND FOR THE PROGRAM?

The following assessment of growth in the field of genetic counseling has been provided by the Bureau of Labor Statistics.
Employment of genetic counselors is projected to grow 29 percent from 2014 to 2024, much faster than the average for all occupations. Ongoing technological innovations, including lab tests and developments in genomics, are giving counselors the opportunities to conduct more types of analyses. Cancer genomics, for example, can determine a patient’s risk for specific types of cancer. The number and types of tests that genetic counselors can administer and evaluate has increased over the past few years. Similarly, many types of genetic tests are covered by health insurance providers.

A summary from the journal *Science* states: Major research efforts that aim to broaden our understanding of how genetic variations may cause rare inherited disorders and cancer or interact with environmental and lifestyle factors to influence more common, complex diseases, such as the *100,000 Genomes Project* in the United Kingdom and the *Precision Medicine Initiative* in the United States, are underway. Meanwhile, DNA analysis technologies are becoming ever more affordable, with companies offering an increasing number of genetic sequencing and testing services, sometimes directly to consumers. In this evolving landscape, the demand for professionals who can make sense of genetic information and help translate it into clinical practice while navigating the psychological, ethical, and legal pitfalls is likely to grow.

According to the *2016 NSGC Professional Status Survey (PSS)*, of genetic counselors in the United States and Canada, genetic counseling positions are also becoming available in many different medical areas and work environments. “Genetic counselors can work in multiple specialty areas, including prenatal, cardiovascular disease, cancer, metabolic disease, neurology, pediatrics, infertility, pharmacogenetics, genomic medicine, and others,” and although genetic counselors have traditionally worked in clinical settings, today they are also finding work in commercial diagnostic laboratories and, to a lesser extent, in nonprofit organizations and government agencies. Genetic counselors’ possible roles are also growing to include new applications and responsibilities. “These
include working in administration, research, public and professional education, web content development, public health, laboratory support, public policy, and consulting,” the PSS report says.

The following data and slides are courtesy of Ian Wallace, MS, CGC, Pullman Regional Hospital, Washington, presented at the Association of Genetic Counselor Program Directors meeting, 9/17/14. This data represents a compilation of population statistics in relation to the availability of genetic counselors.

In the slides below, the Tucson metropolitan area (including all of Pima County) is noted as having well over 900,000 residents per Genetic Counselor. This greatly exceeds the national average and is a significant negative factor affecting the ability of our state to provide sufficient, reliable health information, surveillance and management of genetic disorders. The goal of the program is to raise the number of practicing Genetic Counselors in Arizona, with a particular attention to providing culturally competent care within our state. This survey also highlights the shortage of programs in the western states (notably within WICHE) and identified Arizona as the state with both the highest need and the necessary academic resources.
The 10 states highlighted are projected to have a 52% increase in population by 2030 (compared to 2000). The rest of the U.S. is projected to have a 25% increase in population by 2030.

**Current programs and projected need for new programs (highlighted states have highest need)**
1. What is the anticipated student enrollment for this program?

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Majors</td>
<td>5</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

2. What is the local, regional and national need for this program?

Since the closure of the previous program in 2005, the previous and now current Director of the program met with 10-15 undergraduate students annually to discuss their interest in the field of genetic counseling. Most indicated their preference to remain at the U of A for their graduate education. Of the 28 genetic counselors currently employed in Arizona, 7 are graduates from our previous program and at least 7 are Arizona residents who attended programs outside of Arizona and returned for employment.

The Association of Genetic Counseling Program Directors (AGCPD) estimated that in 2015, there were 2-3 positions for each graduating student and report that almost all of their students were employed prior to graduation.

3. Beginning with the first year in which degrees will be awarded, what is the anticipated number of degrees that will be awarded each year for the first five years? (Please utilize the following tabular format).

<table>
<thead>
<tr>
<th>1st Year</th>
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<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Degrees</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

IV. APPROPRIATENESS FOR THE UNIVERSITY

The University of Arizona’s “Never Settle Strategic Plan” states the mission is “to improve the prospects and enrich the lives of the people of Arizona and the world through education, research, creative expression, and community and business partnerships.”
The Strategic Plan states:

**Engaging**
To graduate students prepared to lead productive lives and confidently pursue their passions, we provide cutting-edge teaching and real-world opportunities.

**Innovating**
To stimulate creative inquiry that will solve grand challenges, we team up across disciplines, attract new resources, and constantly think in new ways.

**Partnering**
To help Arizona thrive, we establish local and global entrepreneurial partnerships, launch new technology, and scale operations that enrich the quality of life.

**Synergy**
To achieve our ambitious goals, we align across disciplines, leverage efficiencies, and seek new resources, which frees us to think beyond traditional boundaries.

The strategic plan for the College of Medicine – Tucson is closely tied to the plans of the “Never Settle” plan of the University.

As the science of genetics and genomics is increasingly incorporated into clinical medicine, it is anticipated that this program can serve as a hub for the advancement of clinical and translational medicine, by providing a clinical genetics education component. Both the academic home department of Cellular and Molecular Medicine and the support of the Center for Applied Genetics and Genomic Medicine will encourage student and faculty interactions that will significantly move collaborations in translational medicine forward. Furthermore, the emphasis on precision medicine within this program will be aided by the University of Arizona Health Sciences commitment to advancing precision medicine within the state of Arizona, providing graduates with experience in this rapidly growing field.

Collaborative efforts in genetics education would provide synergy for potential new certificate, undergraduate, graduate and post-graduate programs in the bio-medical fields to be explored. In conjunction with Dr. Al-Kateb, Dr. Archut Battachayyrya and Dr. Laukaitis, we are exploring areas of common educational opportunities within the Molecular Genetics Pathology Fellowship. Consideration of re-instituting a Clinical Genetics fellowship is also being pursued. Other collaborations will be explored within the University system, including but not limited to the Arizona Institute for Clinical and Translational Science (AZICATS), the UA Center for Population Science and Discovery, the UA Center for Innovation in Brain Science, the Arizona Hispanic Center of Excellence, and the BIOS Institute. Several individual courses proposed by this program would be of interest to a variety of students in health, research and educational fields. We plan to cross-list several classes in a variety of programs such as those offered by the Genetics GIDP, and throughout UAHS College of Pharmacy, College of Nursing and College of Medicine.
This program proposes to address these objectives by providing an interdisciplinary academic and real-world approach to training certified genetic counselors who can lead the University and the state of Arizona to improved health outcomes. As we strive for excellence in this program, we anticipate that our graduates will also engage in national and international efforts to improve public and professional understanding of the use genetic technologies in global health initiatives.

V. EXISTING PROGRAMS WITHIN THE ARIZONA UNIVERSITY SYSTEM

A. ARIZONA UNIVERSITY SYSTEM

There are no programs with the same CIP code definition currently offered in the Arizona University System.

VI. EXPECTED FACULTY AND RESOURCE REQUIREMENTS

A. FACULTY

1. Current Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Highest degree</th>
<th>Primary Dept.</th>
<th>Program leadership</th>
<th># Theses and Dissertations</th>
<th>Level of involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Eugene Hoyme</td>
<td>Professor</td>
<td>MD, FACMG</td>
<td>Pediatrics/TCAG2M*</td>
<td>Medical Director</td>
<td>Total 10</td>
<td>10%</td>
</tr>
<tr>
<td>Dee Quinn</td>
<td>Instructor</td>
<td>MS, CGC**</td>
<td>OB/GYN/TCAG2M*</td>
<td>Program Director</td>
<td>12 Master’s</td>
<td>65%</td>
</tr>
<tr>
<td>Linda Restifo</td>
<td>Professor</td>
<td>MD, PhD</td>
<td>Neurology/ CMM***</td>
<td>Research Director</td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>Christina Laukaitis</td>
<td>Assistant</td>
<td>MD, PhD, FACP, FACMG</td>
<td>Medicine/TCAG2M*</td>
<td>Course Coordinator</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>Hussam Al-Kateb</td>
<td>Associate</td>
<td>MSc, PhD, FACMG</td>
<td>Pathology/TCAG2M*</td>
<td>Course Coordinator</td>
<td>-</td>
<td>2%</td>
</tr>
<tr>
<td>Carol Gregorio</td>
<td>Professor</td>
<td>PhD</td>
<td>CMM***</td>
<td>Chair, CMM***</td>
<td>3 Master’s; 6 PhD’s</td>
<td>2%</td>
</tr>
<tr>
<td>Ken Ramos</td>
<td>Professor</td>
<td>MD, PhD</td>
<td>Medicine/TCAG2M*</td>
<td>Director, TCAG2M*</td>
<td>Total 25</td>
<td>2%</td>
</tr>
<tr>
<td>Valerie Schaibley</td>
<td>Administrator</td>
<td>PhD</td>
<td>TCAG2M*</td>
<td>Course Coordinator</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>Leslie Benson</td>
<td>Instructor</td>
<td>MS, CGC**</td>
<td>OB/GYN/TCAG2M*</td>
<td>Class instructor</td>
<td>-</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

*TCAG2M – The Center for Applied Genetics and Genomic Medicine
**CGC – Certified Genetic Counselor
***Department of Cellular and Molecular Medicine
There are approximately 28 certified Genetic Counselors throughout Arizona, who would be appropriate clinical supervisors for the student’s practicum placements. Dr. Hoyme and Dee Quinn will pursue memoranda of understanding (MOU’s) for clinical training between the supervisor’s home institution and the University of Arizona. A list of Arizona Genetic Counselors who are available for clinical supervision is provided in the Appendix.

2. Additional Faculty

Faculty from the University and in particular from within Health Sciences will be invited to provide individual lectures in their areas of expertise. Clinical Genetics professionals (Geneticists and Genetic Counselors) within Arizona have indicated their excitement for participating in teaching specific aspects of the program. In addition, lecturers in the genetic components of cardiology, neurology, cancer, pediatrics and reproductive health will be engaged in the program curriculum. Local expertise will be sought for individual lectures in many areas such as social, legal, ethical and cultural concepts; public health education; research and translational medicine; as well as professional competencies and standards.

Assistant Program Director position recruitment will begin in Jan. 2017.

3. Current Student and Faculty FTEs

Cellular and Molecular Medicine Department:
  Faculty: 33
  Students: 16 PhD; 42 Master’s

4. Projected Student and Faculty FTEs

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>63</td>
<td>68</td>
</tr>
<tr>
<td>Faculty</td>
<td>35</td>
<td>36</td>
</tr>
</tbody>
</table>

These numbers include the projected students in the Genetic Counseling Graduate program.

B. LIBRARY

1. Acquisitions Needed
   None

C. PHYSICAL FACILITIES AND EQUIPMENT

1. Existing Physical Facilities
Within the Department of Cellular and Molecular Medicine (CMM), a student area has been identified which will be equipped with 3 student work stations, each with a phone and computer. A HIPAA-compliant office will be available for contacts with clients in the Department of OB/GYN. An office for the Program Coordinator will be identified, encouraging collaboration between all department graduate, doctoral and post-doctoral students.

2. Additional Facilities Required or Anticipated

D. OTHER SUPPORT

1. Other Support Currently Available
   Program Coordinator (0.5 FTE) to be hired within next several months

2. Other Support Needed, Next Three Years
   None currently

VII. FINANCING

A. SUPPORTING FUNDS FROM OUTSIDE SOURCES
   Genetic Counseling Graduate Programs are not currently eligible for traditional federal education programs. Lobbyists for the National Society of Genetic Counselors (NSGC) have made significant progress toward the recognition of this fairly new profession, with the anticipated outcome of direct program funding.

   With the assistance of the Advisory Board, we will explore other avenues of funding for activities such as scholarships and lecture series.

B. BUDGET PROJECTIONS FORM
   Budget included in appendix

VIII. OTHER RELEVANT INFORMATION

IX. REQUIRED SIGNATURES:

TCAG^3 M Administrator:
   Kenneth Ramos, Associate Vice President, Precision Health Sciences; Professor, Medicine; Interim Dean, College of Medicine-Phoenix Campus

Administrator's Signature: ___________________________ Date: 3/18/16
Department Chair:
Carol Gregorio, Department Head, Cellular and Molecular Medicine; Vice Dean, Tilnovation and Development; Co-Director, Sarver Heart Center; Director, Molecular Cardiovascular Research Program; Professor, Cellular and Molecular Medicine; Professor, Molecular and Cellular Biology; Professor, B105 Institute; Professor, Biomedical Engineering GDP

Department Chair’s Signature: _____________________________
Date: 07/15/2016

Dean’s Signature: _____________________________
Date: 07/25/2016

Charles Cairns, Dean, College of Medicine, Assistant Vice President, Clinical Research and Trials, Professor, Emergency Medicine

All programs that will be offered through distance learning must include the following signature:

Joel Hauff, Associate Vice President of Student Affairs & Enrollment Management, Academic Initiatives and Student Success

Signature: _____________________________ Date:

All programs that will be offered fully online must include the following signature:

Vincent Del Casino Jr., Vice Provost for Digital Learning and Associate Vice President of Student Affairs & Enrollment Management

Signature: _____________________________ Date:

Note: In some situations signatures of more than one unit head and/or college dean may be required.

Attachments:

Letters of support:

Hoyme Quinn Aleck Reed
Ramos Al-Kateb Cairns Riordan
Laukaitis Restifo F. Martinez Sweitzer
Gregorio Benson Kraft Heidenreich
Manning
CV’s:

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List of practicing Genetic Counselors in Arizona for potential clinical placements

Implementation budget projection form and our budget