Doctor of Philosophy (PhD) in Translational Science (TS)

Overview

This proposal describes a unique interdisciplinary joint doctoral program involving four Texas institutions. The focus is on a research-intensive doctoral program in an evolving area called translational science. Methods and mechanisms of studying the process of translational science are now emerging, and these four institutions wish to play a major role in the development of students who will become the next generation of scientists in this exciting area.

Essential Role of Translational Science:

Improving human and world health is a primary goal of multiple disciplines – every day, important contributions are being made in laboratories, clinical settings, classrooms, and communities. Continually improving health is inherently interdisciplinary, requiring collaborations and partnerships across multiple sites and locations. To date, developing new knowledge and applying it to health related problems have been inefficient endeavors. Community health needs don't rapidly get taken up as topics of basic research; new discoveries in the lab often take decades to result in therapies that are broadly applied in human populations. Significant barriers continue to exist in moving knowledge bi-directionally between basic research, clinical research, and applications to improve community health outcomes.

Translational Science (TS) is evolving as an essential research-based discipline to address these barriers. TS is an academic scientific discipline that seeks to move discovery more efficiently and effectively into application. TS investigators must react, interact, facilitate change, and perform evaluations within and among varied organizational behaviors, structures, and cultures. TS conducts investigations to close the knowledge gaps between different levels of the research process – the basic science laboratory, clinical research discoveries, and application of these research findings toward prevention, disease management, and strategies to improve health outcomes.

The TS continuum extends from fundamental basic research (e.g., chemistry of viral gene regulation) to practical application and implementation, dissemination, and policy studies (e.g., vaccine delivery). Translational research is often broadly sub-divided and defined at two levels, Type 1 (T1) and Type 2 (T2). T1 research covers a spectrum that applies and advances laboratory discoveries to clinical studies and trials with human subjects (“bench to bedside”). T2 research covers the spectrum that promotes the infusion and adoption of effective evidence-based results into clinical practice settings and the community. Key components of TS research involve intensive study on how to best “apply and advance” new discoveries, and how to “promote the infusion and adoption” of results into the community. The proposed TS PhD Program will prepare the next generation of scientists to lead the multi-disciplinary biomedical research teams of the future in increasingly complex research environments.

Vision for a New Translational Science PhD Program in the University of Texas System:

The four components of the University of Texas (UT) with programs geographically located in San Antonio have created a vision for a joint TS PhD program. All four components have the necessary expertise to contribute to the research training of PhD candidates. The concept is to create a TS PhD program that effectively makes the resources of all four UT components readily available to students and their supervising professors. By joining forces and partnering with each other, the TS PhD Program will lead to in-depth, rigorous, individualized research training to address complex problems in novel ways.

Historically, this proposal for a TS PhD Program evolved in response to the promotion of a new view of clinical and translational science by the National Institutes of Health. The UT Health Science Center and its partnering organizations received funding for a Clinical and Translational Science Award (CTSA) from the National Institutes of Health/National Center for Research Resources (NIH/NCRR) on May 19, 2008. The CTSA is a large peer-reviewed grant that provides infrastructure and educational resources to improve translational science. The NIH Roadmap outlined the
expectation that CTSA consortium members will develop academic homes to provide connections for basic, clinical, and translational investigators, community health practitioners in clinical practices, industry, and professional societies. The objective is to facilitate interactions among healthcare and research professionals in all phases of basic, clinical, outcomes, and health services research (that is, across the T1/T2 research spectrum). Within this new institutional, multi-disciplinary approach to biomedical research, it is expected that innovative advanced degree programs will be developed to foster the discipline of Translational Science. The UT Health Science Center CTSA award includes a plan for a multi-disciplinary, multi-institutional PhD program in Translational Science.

The San Antonio UT Components Collaborating on the TS PhD Proposal:

This TS PhD proposal responds to National and State of Texas directives for developing innovative collaborative doctoral programs. Since the CTSA Award in 2008, the four UT System components with programs geographically located in San Antonio have steadily worked together to develop a model TS PhD program that builds on the strengths of the disciplines and scientists at each institution. The four San Antonio UT Components participating in the TS PhD Proposal include:

- UT Health Science Center – lead organization – Health Science Components
- UT San Antonio (UTSA) – lead organization – Academic Components
- UT College of Pharmacy (UTCOP) – UT Austin
- UT School of Public Health (UTSPH) – San Antonio Regional Campus

In Spring 2010, the UT Health Science Center and UTSA approved the joint TS PhD program on their campuses. The TS PhD program is currently moving forward to the UT System and Texas Higher Education Coordinating Board (THECB) for review (Summer-Fall 2010). In the full TS PhD proposal, more than 100 faculty members from the four San Antonio UT components have agreed to take part in and contribute to this program.

The UTSPH is unable to offer the TS PhD program at this time because of accrediting rules governing Schools of Public Health. However, through joint academic appointments, UTSPH faculty will be able to participate on dissertation committees and have TS PhD students in their courses. Importantly, through telecommunication, this productive relationship makes available an array of in-depth instructional resources and faculty talent at the UTSPH in Houston.

The UTCOP (a UT Austin College) has a Pharmacotherapy Education and Research Center (PERC) located on the UT Health Science Center San Antonio campus. The PERC faculty is fully integrated into San Antonio research activities and, along with their Austin colleagues, have been full partners in creating the TS PhD proposal. The Graduate Studies Committee of the full UTCOP has unanimously supported approval of the TS PhD Program. Given the timelines and logistics for TS PhD approval by the THECB, the UTCOP is currently participating in a manner similar to the UTSPH. However, once the program has been reviewed and approved by the appropriate UT Austin academic committees, the intent is for UTCOP to offer the joint TS PhD. This asynchronous method for moving the joint TS PhD forward has been sanctioned by UT System and the THECB.

The TS PhD Educational Objectives, Competencies, and Curriculum:

The TS PhD program will achieve important educational and organizational objectives for each UT component and the UT System. The educational objectives, competencies, and curriculum for the TS PhD program outlined below are categorized by “domains”, which are classifications or groupings of learning objectives and competencies that enable systematic planning of educational programs.

The overall educational objective of the TS PhD program is to train future research scientists who have the capacity to integrate information from multiple domains and conduct research to improve human and global health. Key elements in TS are the ability to conduct original investigations that 1) apply scientific discoveries in the lab or at the bedside in more efficient
and effective ways; and 2) shorten the time between scientific discovery and application. TS includes multiple disciplines from basic lab discovery to public health policy development. As the national discussion establishing the discipline of TS evolves, several descriptions emerged to define the TS spectrum. To avoid confusion, the following table specifies the terms we use in the TS PhD Program:

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<th>TS PhD Application</th>
<th>Other TS Definitions</th>
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<td><strong>T1</strong> - Basic Discovery to Clinical Trial (‘Bench-to-Bedside’)</td>
<td>T1 – Basic discovery and pre-clinical animal studies. May include metabolic and physiologic human studies.</td>
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<td>T2 – First studies of new drugs, devices, interventions in humans (phase I and II studies) and demonstration of clinical efficacy (phase III studies)</td>
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<td><strong>T2</strong> – Clinical Trial to Community and Policy</td>
<td>T3 – Studies to implement best practices into community settings (e.g., Health Services Research, Implementation and Improvement Sciences)</td>
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<td>T4 – Policy and Guideline development and studying the impact on health and service delivery.</td>
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For this program, two TS PhD tracks have been developed: T1 (Basic Discovery to Clinical Trial) and T2 (Clinical Trial to Community and Policy). These characterizations are consistent with the way TS was originally envisioned in the CTSA funding opportunity announcement from NIH (RFA-RM-09-004): “Translational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans. The second area of translation concerns research aimed at enhancing the adoption of best practices in the community. Cost-effectiveness of prevention and treatment strategies is also an important part of translational science.” As the spectrum of translational science is further divided and specified, we will include the subcategories within the broader definitions as used here.

The four UT components in San Antonio developed the collaborative strategy of designing a brand new PhD program tailored to the strengths and resources in South Texas. Representatives from each campus have been meeting in monthly sessions since June 2008 to plan the TS PhD program. A one-day facilitated retreat in October 2009, attended by 32 faculty and 2 representatives from the UT System, specifically focused on defining the domains, competencies, and structures necessary for the TS PhD curriculum. In contrast, most existing TS PhD programs at other universities around the U.S. share two common features: (a) they were derived from existing PhD programs, and (b) the majority emphasize only the ‘bench-to-bedside’ or T1 (basic discovery to clinical trial) content.

In San Antonio, the collaborating UT Components are taking a different approach. We recognized that each of the four UT components had necessary expertise for the transformative vision of a TS PhD program; however, none of them had sufficient capacity to mount the envisioned TS PhD on their own. Over the past two years we rigorously discussed the concepts of TS, assessed our unique strengths and resources, and then developed this PhD proposal. Along the way, we have been cognizant of and incorporated key concepts that are evolving in the National CTSA consortium, especially with respect to the key domains and competencies necessary for becoming a successful translational scientist. The result is a core curriculum that then differentiates into a T1 or T2 track, based on the interests of the candidate, supervising professor, and graduate committee. The San Antonio TS PhD program structure is summarized in the following figure:
This straightforward structure lays the groundwork for including multiple disciplines in the delivery of TS training. The dotted arrows between the two tracks symbolize the need for communication between multiple disciplines to effectively conduct translational science. For prospective researchers who seek a rigorous, advanced training program designed to enhance their capacity to conduct high quality translational investigations, this program will provide in depth training in targeted research concepts and methods. **The goal is to produce graduates who not only demonstrate core TS domain competencies, but are able to conduct innovative independent research.**

It is the core domains that drive the structure of the curriculum. In our discussions, the eight domains for every graduate of this PhD program include:

1. **A Clear Understanding of Translational Science:** Students will articulate what constitutes T1 and T2 translational science and the inter-relationships between the two broad tracks.

2. **Responsible Research Conduct:** Students will be knowledgeable about and be able to apply research ethics and work effectively with regulatory groups within their organization(s).

3. **Expertise in Research Design and Analysis in their Scientific Discipline:** Students will formulate research questions and appropriately design experiments and studies to test hypotheses. They will develop specific analytic strategies based on the study design and assure that their studies are adequately powered to test the hypotheses.

4. **Ability to Lead, Motivate, and Manage Collaborative Team Science:** Students will work effectively in and be able to lead interdisciplinary research teams to (a) identify health related problems and (b) design and conduct research to address the problems.

5. **Utilization of Multi-level Cultural Proficiency:** Students will be able to identify the different cultures that exist within and among (a) organizations and (b) communities (locally and globally). In recognizing these differences, students will learn to use cultural competence and work effectively to conduct research investigations in different settings.

6. **Communicate Effectively:** Students will be able to effectively write abstracts and manuscripts, give oral presentations, and communicate the relevance of their scientific expertise. Beyond the core requirements, students will receive training in grant writing and be expected to develop grant applications for career development (e.g., F-32 or K-grant series) or independent funding.

7. **Display Competence in the Business of Translational Science:** Students will become functionally informed about intellectual property licensing and the business of developing products or devices for human use. They will be able to design and implement research protocols to study improvement in health care processes. Students will be able to function within different legal, regulatory, and economic environments.
8. **Evidence Based Implementation and Policy:** Students will be able to independently read and interpret the scientific literature in their content area. They will be able to systematically review a body of scientific literature to positively effect policy implementation.

Details of the curriculum and student progression in the TS PhD program are provided in the full proposal. Summarizing briefly, these eight domains form the foundation for the TS PhD educational objectives – within each domain will be multiple specific competencies that each candidate will have to fulfill. A minimum of 72 hours of graduate work will be required for the translational science doctoral degree candidates. An overall grade point average of 3.0 must be maintained for program continuation and completion. All translational science doctoral students will be required to take a minimum of 24 hours of core curriculum, 12 hours of prescribed track electives that will be selected from the list of elective courses for this program, and 6 hours of free electives, which may be selected from any course offered at the participating UT institutions’ graduate programs. Some courses will be offered on each campus to provide core curriculum (e.g., there are a number of courses already developed that provide instruction in scientific communication); students may choose to take a course on their home campus, or enroll in the course on another campus if it’s a better fit for their program of study. Many courses will only be offered by one UT Component because of the specialized faculty expertise. Once established, the TS PhD program can promote collaborations among faculty on the different campuses to develop new courses that will more effectively address pedagogical needs. Thirty (30) hours will be devoted to research/dissertation (students will be expected to perform whatever intensive research is necessary to produce an excellent dissertation, but only 30 hours can be counted toward the required graduate workload).

**Admission to Candidacy:** A qualifying exam will be administered before the start of dissertation research, and admission to candidacy will be contingent on its successful completion. Methods for administration of the qualifying exam may be written, oral, or both.

**Doctoral Dissertation:** Each doctoral candidate must complete and submit a dissertation as one of the requirements for graduation. The dissertation must be an original scholarly contribution based on the independent research conducted by the candidate, under the supervision and guidance of the Supervising Professor and a Dissertation Committee. The Dissertation Committee will consist of at least 4 faculty members – the student and supervising professor will be encouraged to include the most appropriate faculty from the participating UT components (and 1 from outside the UT System), to promote synergistic science and research education. The student must submit the dissertation/research proposal to the Committee on Graduate Studies (COGS); approval will be required prior to enrollment for dissertation credit hours. The TS PhD Program will be operationalized by a COGS made up of faculty representatives from each of the four UT Components. Although the TS PhD Program has a novel, non-departmentally based or school based structure, it will adhere to the rigorous academic standards and processes required for monitoring the progress of its students and awarding this research degree.

**ORGANIZATIONAL OBJECTIVES:**

Implementation of the joint TS PhD program will satisfy several important organizational objectives. Within the spirit of the CTSA, the TS PhD can be transformative in forging new procedures in graduate education that make the resources and talent within the entire UT System available to individual graduate students and their supervising professors. These objectives seek to:

1. Produce doctoral-level graduates with exceptional research training and skill in translational science.

2. Develop a multi-disciplinary program among four UT component institutions, and a joint degree program among three UT component institutions in San Antonio utilizing:

   • UT Health Science Center at San Antonio faculty from five Schools (Graduate School of Biomedical Sciences, School of Medicine, Dental School, School of Nursing, and School of Health Professions),
• UT San Antonio faculty from twelve Graduate Departments in four Colleges,
• UTCOP faculty from the Austin and San Antonio campuses, and
• UTSPH-San Antonio Regional Campus, faculty from the Houston and San Antonio campuses.

3. Provide education and research opportunities that will benefit San Antonio and South Texas.

4. Prepare scientists to be leaders in the fields of translational team science.

5. Provide an innovative training program that will enhance the research and educational objectives and missions of the component UT institutions. Processes and procedures will be collaboratively modified among the four UT components to efficiently administer the TS PhD program, dealing with the numerous details about admission, registration, fees, and formula funding. The challenge is to devise fair, practical, and efficient ways to share and provide resources and appropriately crediting the faculty and each component.

6. Support and encourage minority participation in advanced education at all four UT component institutions.

Full details of the TS PhD proposal are available in the proposal developed for the THECB review. Copies may be obtained from:

Carlton Erickson, PhD (erickson.carl@mail.utexas.edu)
Tom Belinoski (belinoski@austin.utexas.edu)
Michael Lichtenstein, MD (lichtenstein@uthscsa.edu)
Susan Stappenbeck (stappenbeck@uthscsa.edu)

We look forward to a constructive review and feedback by the UT Austin faculty engaged in Translational Science, the Academic Committee and Graduate Assembly.