

2022-23

# CLINICAL & TRANSLATIONAL SCIENCE

Degree Offered: Master of Science



## Program Description

This program is operated by the Clinical and Translational Science Institute (CTSI) of Southeast Wisconsin. The mission of the CTSI is to develop an integrated, shared home for clinical and translational research and to establish a borderless, collaborative, and investigator/community/patient-friendly, research environment. The CTS Master's and Certificate degree programs fit with the CTSI's strategic goals of providing quality education and training to cultivate the next generation of clinical and translational researchers.

The goal of the Master's in Clinical and Translational Science (MSCTS) degree is to train the next generation of health care professionals, clinical investigators, research scientists, and other individuals working in translational research sciences. The curriculum incorporates the full spectrum of the translational continuum (T0 through T5) and provides training and skills to position candidates to be successful in the growing field of Clinical and Translational Science. Topics covered include foundations of translational research, clinical statistics, epidemiology, ethics and safety, and study designs across the continuum. Candidates seeking a Master's degree will select from one of four emphasis tracks and complete a thesis.

## Admission Requirements

In addition to the general [Graduate School admission requirements](#), this program has an additional specific requirement.

Potential students must apply by July 1<sup>st</sup> for Fall term enrollment.

## Fields of Study

Candidates seeking a Master's degree will select from one of four emphasis tracks and complete a thesis. Certificate students will select from the same four tracks and complete 4 classes, or 12 credits. The emphasis tracks include Translational Science, Population Science, Health Systems Science, and Community Based Science.

## Translational Science

This track is focused on the foundational principles of the translational process. This "bench-to-bedside" process involves moving discoveries from their basic foundation to clinical settings. Discoveries of focus include diagnostics, therapeutics, medical procedures, and other interventions. Suggested electives for this program include Translational Genomics and Survey of Biomedical Engineering.

## Population Science

There are a variety of factors that can influence health outcomes at a population level, and this track will focus on the relationship between these factors, health, and research. This program will focus on factors such as socioeconomic status, health disparities, social determinants of health, healthcare systems, environment, and policies. Suggested electives

include Health Economics, Introduction to Statistics using Stata, Regression using Stata, and Health and Medical Geography.

### **Health System Science**

The focus of this track is on principles and processes within the healthcare system. The topics of focus will include delivery of healthcare, how healthcare professionals work together, and improvements that can be made within the system to improve healthcare delivery. Suggested electives for this program include Health Economics, Health and Medical Geography, Dissemination and Implementation Science, and Qualitative and Mixed Methods.

### **Community Based Science**

This track is focused on engaging the community in research being conducted near the end of the translational spectrum. Emphasis is placed on collaboration with community members and organizations to promote engagement in developing community-wide approaches to improve health for all. Suggested electives include Health Disparities, Health and Medical Geography, Dissemination and Implementation Science, and Qualitative and Mixed Methods.

### **Credits Required to Graduate**

36 credits

### **Required Courses**

#### **10226 Regulatory Issues in Human Subject Research Protections. 3 credits.**

There is no question that the fruits of research have fueled medical progress. Yet, the history of research involving human subjects is not unblemished. Federal regulations, based on ethical principles set forth in the Belmont Report, now govern much of the research undertaken in the United States. In this course, we will explore the history and substance of research regulations in the United States, the application of the regulations to specific research issues, and situations where the regulations do not provide clear guidance.

#### **20101 Introduction to Clinical and Translational Science. 3 credits.**

The goal of this course is to help students understand the foundations of translational science, develop an understanding of the benefits and difficulties associated with translational research, and to understand and evaluate the role of interdisciplinary and team science in translational research. Coursework will include weekly reading of peer-reviewed manuscripts, assignments, and a final project. Weekly classes will include discussion of reading and assignments are designed to allow practice of critically reading and planning translational science projects. The course will meet once per week for a total of 18 weeks.

#### **20151 Introduction to Epidemiology. 3 credits.**

This course provides an introduction to the concepts, principles, and research methods specific to epidemiology. Students will learn about population health, how to select appropriate study designs for collecting evidence for medical practice, how to summarize evidence for medical practice and how to translate evidence into medical practice. By the end of the course, students should be able to apply the skills learned to assess the health of a population, describe determinants of health, and select an appropriate study design to evaluate population health. The course will meet once per week for a total of 18 weeks.

**20160 Foundations in Health Services Research. 3 credits.**

The course will provide the student with a broad understanding of health services research design and methodology, as well as provide the student with the opportunity to engage in a mentored, individualized, in-depth study experience. By the end of the course the student will be able to understand key theories that serve as the foundation of health services research and understand the process of developing a research idea and translating it into an R-series level NIH proposal. Coursework will include weekly reading of peer-reviewed manuscripts, one introductory textbook on health services research, and one introductory textbook on designing clinical research. Weekly classes will include discussion of reading and assignments are designed to allow practice of critically reading and planning health services research projects.

**20220 Clinical Statistics I. 3 credits.**

This is an introductory course in evidence discovery that demonstrates the concepts and application of statistical techniques/tools, given the role of statistics as an information science. The course is intended to inform and provide quantitative skills for graduate students interested in undertaking research in clinical medicine, epidemiology, public health, translational and biomedical sciences. This course emphasizes the basic dogma of statistics namely the central tendency theorem as well as sampling as the core of statistics. With the characterization of statistics as descriptive and inferential, the descriptive arm of statistics is stressed in this course namely summary statistics. Basic probability concepts are covered to stress the importance of sampling prior to reliable inference from the sample data. Sample estimation of the population and the precision (confidence interval) are described as well as the hypothesis testing notion in inferential statistics. The parametric and non-parametric methods are introduced with the intent to describe the methods as applicable to continuous (ratio, interval, cardinal) and discrete (categorical binary, dichotomous) data.

**20299 Master's Thesis. 6-9 credits.**

6-9 Master's Thesis credits are required for program completion. All students will complete a Master's thesis describing a translational or clinical research project in which he or she participated in both the design and execution. The Committee will be comprised of a thesis mentor and two additional faculty members (one of whom is a biostatistician). The Committee will approve the project in advance, will provide guidance and supervision of the project, and will critique and, if appropriate, approve the thesis.

**20302 Research Seminar. 3 credits.**

The goal of this course is to provide Master's students protected time to develop their thesis questions and to provide students with an opportunity to receive feedback on their thesis project at regular intervals in a structured format. By the end of the course students will be able to develop a research question, conduct a comprehensive literature review, select appropriate methods to answer the research question, and present their findings in written and oral formats. This course will also teach students how to provide constructive criticism and to effectively evaluate the work of their peers. Coursework will include developing a systematic review, providing constructive critiques of the work of other students in the seminar, developing a PowerPoint presentation, and developing a scientific poster presentation. All MS students will be required to take the course. First year Master's students will develop their research question, complete a thorough literature review of the topic of interest in the form of a systematic review, and begin to identify methods that will be used to answer their research question. While second year students will conduct the necessary steps to answer their research question, write their results and conclusions, and prepare an oral

presentation of their thesis work to be presented before their colleagues at the end of the semester and during MCW student research day. All students will be expected to provide feedback to their classmates and will receive feedback from their peers and the course director. Each class period four students will present some aspect of their project and will receive feedback from peers and the course director.

### Required Courses as Needed

#### **20002 Master's Thesis Continuation.** 0 credits.

This is a form of registration available to students who have completed all of the required coursework, including thesis credits but have not yet completed the writing of the Thesis. Continuation status is limited to three consecutive terms following the completion of Thesis credits.

#### **20295 Reading and Research.** 0 credits.

The course of study for Reading and Research is designed by each student with his/her advisor to focus on readings in literature in the student's field, to build bibliographic resources for the dissertation, and to conduct supervised, independent research.

### Elective Courses

#### **14200 Survey of Biomedical Engineering.** 3 credits.

*Emphasis Track(s) suggested for: Translational Science*

This course is a review of biomedical technologies employed in medicine for the diagnosis, treatment, and prevention of chronic and acute diseases. The goal of the course is to familiarize students with the operating principles, economic aspects of technology use in clinical practice. Over the duration of the course each student will prepare three reports and one lecture on the use of technology in medicine.

#### **18258 Advanced Epidemiological Methods.** 3 credits.

*Prerequisites: 18201 Principles of Epidemiology or equivalent Department: Public Health*

*Emphasis Track(s) suggested for: Population Science, Health Systems Science*

Epidemiologic Methods builds on introductory epidemiology courses by providing a more in depth understanding of fundamental epidemiologic principles presented in introductory epidemiologic courses such as study design and bias. In addition, Epidemiologic Methods emphasizes more advanced concepts needed in establishing causal relationships from observational data. It is particularly relevant to students who intend to conduct studies investigating the occurrence and determinants of diseases or who wish to be sophisticated consumers or critics of epidemiologic research conducted by others. The course emphasizes practical application of Epidemiologic Methods to real world problems.

#### **19210 Health and Medical Geography.** 3 credits.

*Emphasis Track(s) suggested for: Population Science, Community Based Science*

Geography and physical and social environments have important implications for human health and health care. This course will explore the intersections among geography, environments, and public health, with an emphasis on geographical analysis approaches for health data, to address two key questions: (1) How can concepts from geography help us to better understand health and well-being? (2) How can geographic tools, such as Geographic Information Systems (GIS) be used to address pressing questions in health and medical research?

### **19225 Introduction to Statistics using Stata. 3 credits.**

*Emphasis Track(s) suggested for: Population Science, Health Systems Science*

This course will provide an introduction to the foundations of using Stata for data analysis through an applied format. Statistical analyses covered will include descriptive statistics, univariate and bivariate analysis, and basic regression. Students will become acquainted with the basics of cleaning and organizing datasets, completing descriptive analysis, coding, and interpreting results of univariate and bivariate analyses, as well as linear and logistic regression. By the end of the course students will be able to analyze data independently and interpret results. Coursework will include weekly reading, in-class Stata analyses, and completion of a focused course project developed throughout the semester. Course projects will allow students to develop their skill set and experience independently coding in Stata to complete statistical analyses and interpreting results within the context of strengths and limitations of their data. The final project will also incorporate both literature review and developing a research question that can be analyzed using existing data.

### **19226 Regression Analysis using Stata. 3 credits.**

*Emphasis Track(s) suggested for: Population Science, Health Systems Science*

*Prerequisites: 19225 Introduction to Statistics using Stata*

This course will provide an introduction to the foundation's regression through hands-on training in advanced regression techniques using Stata. Statistical analyses covered will include multiple linear regression, analysis of variance, logistic, polytomous, and ordinal logistic regression, and mixed models. Students will become acquainted with the basics of coding and interpreting results of regression analyses, as well as diagnostics to confirm correct model fit. By the end of the course students will be able to conduct regression analyses independently and interpret results. Coursework will include weekly reading, in-class Stata analyses, and completion of a focused course project developed throughout the semester. Course projects will allow students to develop their skill set independently coding in Stata to complete statistical analyses and interpreting results within the context of strengths and limitations of each test. The final project will also incorporate both literature review and developing a research question that can be analyzed using existing data.

### **19230 Qualitative and Mixed Methods. 3 credits.**

*Emphasis Track(s) suggested for: Community Based Science*

Qualitative and mixed methods can be highly useful in the conduct of community-based population health research. This course will provide introductory classroom and field-based learning experience in qualitative and mixed methods research. Students will receive training in the design, implementation, analysis, and synthesis of qualitative and mixed methods. Emphasis will be given to the appropriate uses of commonly used methods in community-based health research. Course participation will provide students with the basic foundation necessary to develop a research study using qualitative or mixed method designs. This course is for graduate students in the doctoral degree program for Public and Community Health.

### **20120 Introduction to Health Disparities Research. 3 credits.**

*Emphasis Track(s) suggested for: Community Based Science*

The course is an introduction to health disparities. By the end of the course, the student will be able to understand the relationship between inequities in social determinants of health and health outcomes in various populations. Coursework will include weekly readings from one textbook on multicultural medicine and health disparities as well as peer-reviewed articles to

demonstrate the concepts in real- world experiences. Weekly classes will include discussion of the readings. Course projects will be assigned and are designed to allow practice of critically reading and appraising the literature related to applied health disparities research and also to understand the theoretical bases for health equity research.

**20241 Translational Genomics. 3 credits.**

*Emphasis Track(s) suggested for: Translational Science*

The primary goal of this course is to teach students how to develop a research program to ask relevant genetic questions in the clinical setting utilizing the molecular genetics toolbox. To this end, students will be provided with background in molecular genetics strategies and study designs as well as an understanding of common genetics questions emanating from the clinic so that they will be better able to make connections between bench and bedside. In addition, they will be challenged to think creatively and through a translational focus during course-long case studies and group projects.

**20253 Methods in Grant Preparation. 1 credit.**

The purpose and goal of this course is to present advanced principles of National Institutes of Health (NIH) Grant preparation. Topics to covered will include Writing with a purpose and intent; writing statements of innovation and significance; research design; and translational research. The course will also address how to succinctly state overall and specific hypotheses and specific aims with affirmation and relevance. The course will suggest specific writing styles with the intent of clearly stating the importance of the specific aims and bringing them to fruition and purpose. Special attention will be placed on how to write in a manner which presents proposal aims in an important and timely manner. The course will stress writing styles which relate distinct importance and purpose in a manner which relates novelty in the experimental design. Most of the course will cover the 12-page RO1 application. However, some time will also be devoted to other specific types of awards (i.e., mentored K awards, training grants, and programmatic initiatives). This course is recommended for individuals who have already located funding resources and are currently working on one or more grant proposals.

**20260 Introduction to Dissemination and Implementation Science. 3 credits.**

*Emphasis Track(s) suggested for: Health Systems Science, Community Based Science*

The course is an introduction to dissemination and implementation and science research methods both theoretical and applied. By the end of the course the student will be able to understand the science of dissemination and implementation and applied methods for dissemination and implementation. Coursework will include weekly reading of peer-reviewed manuscripts and one introductory textbook on dissemination and implementation science. Weekly classes will include discussion of reading and course projects are designed to allow practice of critically reading and planning implementation research.

**20262 Introduction to Health Economics. 3 credits.**

*Emphasis Track(s) suggested for: Population Science, Health Systems Science*

The course is an introduction to health economics both theoretical and applied. By the end of the course the student will be able to understand the basics of health economics including the principles and research methodology used to apply economic concepts to the health field. Coursework will include weekly reading of peer-reviewed manuscripts and one

introductory textbook on health care economics. Weekly classes will include discussion of reading and course projects are designed to allow practice of critically reading and conducting health economic research.

**20265 Clinical Quality Improvement.** *3 credits.*

In the spectrum of Clinical translational research an important but often overlooked component is the ability to implement and maximize the utilization of evidence-based practice. This involves skills in process improvement and change management that overlap with but extend beyond the traditional clinical research and development. This course would serve as an important complement to other aspects of translational research for those who interests are in the "real life" implementation of clinical research.

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