2025-26

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 1st 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
BIOE 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.

PUBH 18209 Community Health Assessment and Improvement. *3 credits. Recommended: 18203 Public Health Administration*
This course provides students with a comprehensive understanding of the community health assessment and improvement planning process, focusing on achieving health equity. Students will learn to systematically assess community health needs and assets using both quantitative and qualitative data. The course emphasizes identifying priority health concerns and developing data-driven plans to address unmet needs. Students will also explore the role of social, economic, behavioral, and environmental factors that influence health outcomes, and understand the importance of multisector collaboration, community engagement, and evidence-based interventions. By the end of the course, students will be equipped to apply the Mobilizing for Action Through Planning and Partnerships (MAPP) framework, driving positive health outcomes and enhancing public health in their communities.

CTSI 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 18weeks.

CTSI 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.

CTSI 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.

CTSI 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.

CTSI 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.

CTSI 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

CTSI 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.

Elective Courses

HCTM 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.

PUBH 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.

PUCH 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?

PUCH 19225 Introduction to Statistical Analysis. *3 credits.*
Emphasis Track(s) suggested for: Population Science, Health Systems Science
This course will introduce fundamental statistical concepts, reasoning and methods that can be used for exploring, describing, and analyzing quantitative datasets. Students will become acquainted with basic statistical concepts, cleaning and organizing datasets, performing descriptive analysis and statistical reasoning, and interpreting results of univariate and bivariate analyses, hypothesis testing, and linear regression. By the end of the course, students will be able to analyze data independently using statistical software and interpret results. Coursework will include weekly reading, in-class data analyses, quizzes, two exams, and a focused course project. Course projects will enable students to independently develop research questions, acquire appropriate datasets, develop their skills in coding with data analysis software, complete statistical analyses, and interpret results.

PUCH 19226 Applied Regression Analysis. *3 credits.*
Emphasis Track(s) suggested for: Population Science, Health Systems Science
Prerequisites: 19225 Introduction to Statistical Analysis.
This course will provide an introduction to the foundations and principles of regression through hands-on training in advanced regression techniques using statistical software. Statistical analyses covered will include multiple linear regression, analysis of variance, logistic, 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 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 statistical software to complete 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.

PUCH 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 or 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.

CTSI 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.

CTSI 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.

PRME 42100 Introduction to Precision Medicine. *3 credits.*
Introduction to Precision Medicine offers 10 applied learning sessions led by directors of PM Education courses. Students initiate a professional development plan and write and present reports explaining PM concepts, demonstrating research in practice, and judging the validity of PM information.

PRME 42150 Biomedical and Clinical Informatics and Data Science. *3 credits.*
This course provides an overview of the many types of informatics approaches and data science techniques that are used in the realm of medicine and clinical practice. Clinical informatics is a field of medicine focused on transforming health care by analyzing, designing, implementing, and evaluating information and communication systems that enhance individual and population health outcomes, improve patient care, and strengthen the clinician-patient relationship. Bioinformatics is the field focused on how to process high-throughput data for deriving knowledge from it.

PRME 42170 Medical Genetics, Undiagnosed, and Rare Diseases. *3 credits.*
Prerequisite: 42100 Introduction to Precision Medicine
Medical Genetics, Undiagnosed and Rare Diseases allows students examine the application of genomics to core clinical systems and applying that knowledge to personalized management of patients. Experts in their respective fields will guest lecture in several sessions.