

# Clinical and Translational Science, M.S., Ph.D.

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## Degrees Offered

- Master of Science
- Doctor of Philosophy
- Joint Doctor of Medicine and Doctor of Philosophy

## Certificate Offered

- Clinical and Translational Science

## Nature of the Program

Clinical and Translational Science is a high priority for the National Institute of Health (NIH). Clinical research encompasses the following research areas: 1) Research with human subjects that attempts to determine disease mechanisms, therapies, clinical trials and new techniques; 2) Epidemiology & Behavioral research and 3) Outcomes research. Translational research, sometimes referred to as "bench to bedside to community," is a concept beginning in the laboratory developing and testing interventions impacting human health, taking that information into trial studies on human subjects and finally, determining best practices for community health. West Virginia University has a Clinical and Translational Science Institute (WVCTSI) which is funded in part from the NIH Institutional Development Award Program for Clinical & Translational Research (IDeA-CTR). The WVCTSI, in partnership with other institutions, has a mission to focus on research that will address the health issues of individuals and communities specifically as they affect West Virginia and the Appalachian region. The mission of this institute is in alignment with the land grant mission of West Virginia University (WVU) and the strategic plan of the WVU Health Sciences Center. An overview of recent projects undertaken by the WVCTSI is available at the following web site: <http://wvctsi.org/>.

As part of the WVCTSI, educational programs at the graduate level prepare trainees to participate in clinical and translational research. WVU offers a **Doctor of Philosophy (Ph.D.)**, **Masters of Science (M.S.)**, and **Certificate in Clinical and Translational Science** which is designed to develop the next generation of clinical and translational scientists through education and mentored research training.

## PH.D. IN CLINICAL AND TRANSLATIONAL SCIENCE

The goal of the **Ph.D. program** is to develop biomedical researchers who can integrate findings, information, and observations across basic, population, and clinical sciences, to accelerate and transform how we improve the health of individuals and populations. By the completion of this degree, students will be able to:

1. Design, implement, conduct, analyze and interpret research projects using the techniques unique to basic science, clinical research, and population science research
2. Demonstrate mastery of research in a focused area as evidenced by academic and scientific presentations and publications
3. Read, understand and critique the scientific literature of the basic, clinical, and population sciences
4. Work effectively with and create collaborative, productive research partnerships with clinicians, population scientists, and basic / laboratory scientists
5. Be able to communicate with and understand the research challenges and perspectives of each of the three branches of clinical and translational science (basic, clinical, and population sciences)
6. Work with communities to translate scientific findings into programs and policies that improve the health of individuals and populations.

The **Ph.D. program** is suitable for students with:

- An undergraduate degree (preferably with some research or allied health work experience).
- Already completed graduate work (at the master or doctoral level)
- Medical students in the MD/PhD program
- Other biomedical professionals seeking expertise in and preparation for careers in clinical and translational research (e.g. including, but not limited to, Doctoral programs for Physical Therapy, Pharmacy, Speech Pathology, etc.)

Information on the **Ph.D. degree** may be found at the program web <http://wvctsi.org/programs/education-mentoring-career-development/phd-in-clinical-translational-science/>

## MASTERS OF SCIENCE IN CLINICAL AND TRANSLATIONAL SCIENCE

Typically, **M.S. trainees** have an undergraduate degree in a health care discipline or a field of study complementary to research in health. The master's degree may also be considered as part of a dual degree program, such as MD/MS. The M.S. degree expands upon Certificate coursework in biostatistics and epidemiology to provide mentored, research training with required and elective courses, the latter to complement research needs and interests. The degree emphasizes a research project(s) that can be clinical (study of medications, devices, diagnostic products, and treatments;

may include clinical trials) and/or translational research (defined as research with human subjects or with populations or with direct application to human health). Completion of the M.S. degree requires a written grant proposal defended orally to three graduate faculty members. The degree can be completed in three semesters, although typically clinical trainees are part-time and complete the program in two to three years. Information on the **M.S. degree** may be found at the program website: <http://wvctsi.org/programs/education-mentoring-career-development/ms-in-clinical-translational-science/>

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## FACULTY

### MASTERS AND CERTIFICATE GRADUATE PROGRAM DIRECTOR

- Joan M. Lakoski - PhD

### PH.D. GRADUATE PROGRAM DIRECTOR

- I. Mark Olfert - PhD, FAHA
- Paul Chantler - PhD

## Admissions for 2025-2026

### PH.D.IN CLINICAL AND TRANSLATIONAL SCIENCE

For the Ph.D. in Clinical and Translational Science, the minimum requirements for admission consideration are as follows:

- Completed undergraduate degree with a cumulative GPA of 3.0 or higher
- GRE score of 300 (total; minimum of 150 verbal and 150 quantitative) or MCAT of 28 (total). In the instances where the applicant is a clinician, successful completion of the USMLE Step 1 and Step 2 board exams may be accepted *in lieu* of the GRE or MCAT scores.
- TOEFL score where applicable (minimum score requirement depends upon the test taken; standards established by the WVU Office of Admissions, International Graduate Students)
- Significant undergraduate coursework in the physical or biological sciences is strongly recommended (1 year of biology, 1 year of math, 1 year of chemistry, and 1 year of social sciences) as is research experience

**Applicants for the Ph.D. in Clinical and Translational Science must:**

Submit WVU Graduate application for admission, found at <http://admissions.wvu.edu/how-to-apply> (<http://admissions.wvu.edu/how-to-apply/>).

Applications must be dated, completed, and received in the department by **January 15, 2024**. Make sure to **upload** all required information listed below.

- A personal statement that addresses their desire to complete a doctoral program in clinical and translational science, a career in biomedical research, and how their background, including their research experiences, have prepared them for this doctoral program
- A résumé or CV that indicates relevant experience and the years and location (institution) of completion of undergraduate degrees and any graduate or professional coursework or degrees
- Three letters of recommendation from professional and / or academic referees, in which the referees clarify how long and in what capacity they have known the applicant and their assessment of the student's likelihood of success in doctoral-level work. Letters should come from professors or supervisors who evaluate your performance in research (if you have prior research experience) and/or coursework (only if you have no prior research experience). **Letters must be signed by your recommender and should be placed on official university or company letterhead.**

Applications to this program will be reviewed by a program-specific admissions committee comprised of representatives from the WVU HSC Interdisciplinary Research Centers (Center for Cancer Cell Biology, Center for Cardiovascular and Respiratory Sciences, Center for Neuroscience, and the WV Stroke Center), the WV-CTSI, and the WVU HSC Office of Research and Graduate Education. A senior student in the program will be a representative on the committee.

It is anticipated that admission to this program will be competitive; meeting the minimum admission requirements will not assure acceptance to this program.

### MASTERS OF SCIENCE IN CLINICAL AND TRANSLATIONAL SCIENCE

The M.S. in Clinical and Translational Science is targeted to faculty, medical residents, fellows, clinicians, and scientists with health-related professional degrees, those seeking a dual degree (such as MD/MS or PhD/MS), or health professional students. Prospective students must have an earned bachelor's degree from an accredited university with an overall GPA of at least 3.0.

**Applicants for the M.S. in Clinical and Translational Science must:**

Submit WVU Graduate application for admission, found at <http://admissions.wvu.edu/how-to-apply> (<http://admissions.wvu.edu/how-to-apply/>). All applications should be dated, completed, and received by the department by the dates below.

- The application deadline for **Fall semester is July 1**
- The application deadline for **Spring semester is December 1**
- The application deadline for **Summer semester is April 1**

Make sure to **upload** all required information listed below.

- Official transcripts from all undergraduate institutions attended.
- TOEFL scores, if applicable (may be waived in some circumstances)
- A personal statement outlining past accomplishments (with an emphasis on research, future research interests, and a clear career vision of how becoming a clinical/translational researcher is part of a long-term career plan)
- Three letters of recommendation that evaluate potential as a clinician scientist
- A list of potential research mentors
- A Curriculum Vitae or resume

For faculty applicants, a support letter from the Department Chairperson is required stating how research activities integrate with other responsibilities.

For clinicians, support letters from the department Chair and fellowship or residency director (if applicable) are required.

Student applicants must be in good academic and professional standing.

Any other interested applicants should follow the WVU requirements for application to graduate programs as described below.

Prospective graduate trainees interested in one of the above programs are urged to initiate application for admission as early as possible. The first step of a student interested in a degree program should be to ask for information from the department, division, school, or college offering the program desired; the reply to such an inquiry will include instructions for applying to the particular program.

Application for admission to graduate study must be made online or on standard forms provided online at <https://graduateadmissions.wvu.edu/>. If using a paper application, the completed form may be returned to the Office of Admissions, PO Box 6009, West Virginia University, Morgantown, WV 26506, and must be accompanied by payment of a nonrefundable special service fee of \$60. Applicants who have attended another institution, other than WVU, must request that the registrar or records office of the college(s) attended send an official transcript directly to the Office of Admissions. No one is admitted to graduate study that does not hold a baccalaureate degree from an accredited college or university.

If the applicant meets the minimum admission requirements of WVU, a copy of the application is forwarded to the faculty of the program of interest. Any graduate degree program is permitted to set admission requirements which go beyond the minimum admission standards of the University. No one can pursue an advanced degree at WVU unless admitted to the appropriate degree program.

MS Major Code: 8368

PhD Major Code: 8369

## Master of Science

### MAJOR REQUIREMENTS

Code	Title	Hours
BIOS 501	Applied Biostatistics 1	3
EPID 611	Concepts and Methods of Epidemiology	3
EPID 625	Principles of Clinical Trials	3
CTS 600	Foundations of Scientific Integrity	1
CTS 610	Clinical Research: Ethics and Regulatory Aspects	2
CTS 620	Scientific Manuscript Writing and Publishing	2
CTS 695	Independent Study (*Grant Proposal Prep)	1
Research		9
CTS 697	Research	
Electives		9
Grant Proposal Defense		
Total Hours		33

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**Grant Proposal Defense or Thesis Defense**

The degree culminates with a written grant proposal or thesis defended orally to three graduate faculty members. Satisfactory performance in the oral defense will result in recommendation for granting of the M.S. degree.

**Suggested Plan of Study****First Year**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer</b>	<b>Hours</b>
BIOS 501		3 CTS 600		1 CTS 620	2
CTS 610		2 CTS 697		1 CTS 695 (*Grant Proposal Prep)	1
CTS 697		2 EPID 625		3 CTS 697	6
EPID 611		3 Elective		3	
Elective		3 Elective		3	
		13			9

Total credit hours: 33

NOTE: The graduate curriculum is finalized with a plan of study once the mentor and laboratory have been selected in the first year. The plan of study is developed by the graduate committee in consultation with the student. The courses listed above include the required and elective coursework necessary for the student to finalize his/her plan of study.

**Doctor of Philosophy****MAJOR REQUIREMENTS**

<b>Code</b>	<b>Title</b>	<b>Hours</b>
<b>Core Courses</b>		<b>16</b>
BMS 700	Scientific Integrity	
BMS 720	Scientific Writing	
CTS 700	Fundamentals of Clinical and Translational Sciences	
PSIO 750	Graduate Physiology and Pharmacology 1	
BMM 705	General Biochemistry	
500-level higher Statistical Methods Course		
<b>Elective Courses</b>		<b>12</b>
<b>Core Elective List (Select nine hours from the following): *</b>		
BIOS 611	Data Management and Reporting	
EPID 501	Epidemiology for Public Health	
EPID 611	Concepts and Methods of Epidemiology	
EPID 625	Principles of Clinical Trials	
PHAR 757	Patient Reported Outcomes	
PHAR 758	Ethical and Regulatory Aspects of Clinical Research	
PUBH 511	Epidemiology for Public Health Practice	
PUBH 662	Clinical Research Methods and Practices	
<b>Research Experiences **</b>		<b>12</b>
CTS 780	Clinical and Translational Science Research Experience	
<b>CTS Journal Club ***</b>		<b>6</b>
CTS 707	Seminar: CTS Journal Club	
<b>Examinations</b>		
Candidacy Examination		
Comprehensive Examination		
<b>Dissertation Research ****</b>		<b>40</b>
CTS 797	Research	
<b>Peer-Reviewed Publication</b>		
Total Hours		86

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Selection of Core and Additional Electives (for a total 12 hours) should be made in consultation with the Program Director and/or guidance of the Dissertation Committee. Selected Elective Courses should include 2 of three branches of clinical and translational science. These courses are intended to allow the students to develop expertise and focus in an area of interest, and to prepare students to be able to successfully complete their dissertation research. These courses may also serve as the basis for a portion of the Comprehensive Exam (discussed in additional detail below). If recommended by the Dissertation Committee, a student may replace these courses with additional research hours when appropriate.

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Complete 12 hours of research experiences in each of the T1, T2, and T3 research areas.

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Students must complete a minimum of 6 credit hours, 1 credit hour in 6 different semesters, in a journal club specific to their program. Participation in the CTS Research Journal Club is required for every semester the student is in residence.

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Complete minimum 40 credit hours of dissertation research.

## PROGRAM DESCRIPTION

This degree program was developed in response to the fundamental changes taking place in biomedical science research and education worldwide, with an increasing and stronger emphasis on interdisciplinary research to improve clinical care and population health outcomes. Achieving this requires much closer collaboration, integration and alignment of basic, clinical and population sciences. Consistent with this increasingly integrative and interdisciplinary paradigm for clinical and translational science, all aspects of this degree program, including didactic coursework and research experiences, will emphasize the integration of basic, population, and clinical sciences.

This program is intended for full-time students only. Student receiving institutionally-supported stipends are expected to devote full-time effort to their studies and research should not be employed elsewhere. Any exceptions must be approved by CTS Program Director in advance.

Coursework is organized around the three main branches of clinical and translational science: Basic/Laboratory Science, Population Science, and Clinical Science. Research experiences are organized around the three translational (T) research domains:

- **T1 research** expedites the movement between basic research and patient-oriented research that leads to new or improved scientific understanding or standards of care
- **T2 research** facilitates the movement between patient-oriented research and population-based research that leads to better patient outcomes, the implementation of best practices, and improved health status in communities
- **T3 research** promotes interaction between laboratory-based research and population-based research to stimulate a robust scientific understanding of human health and disease

## JOURNAL CLUB

Students are required to enroll in Journal Club each semester. The course involves the presentation and discussion of current research papers and will help acquaint students with the variety of methods used in scientific research.

## DOCTORAL RESEARCH

Students will conduct research with a dissertation mentor during time in the program. Students register for research credits each semester, and their performance is graded by their dissertation mentor.

## QUALIFYING AND DISSERTATION PROPOSAL/PH.D. CANDIDACY

The written qualifying exam is given typically at the end of the second year of study. The dissertation proposal is completed in the third year of study. Admission to Ph.D. candidacy occurs following the successful defense of the dissertation proposal.

## DISSERTATION DEFENSE AND FIRST-AUTHOR PAPER REQUIREMENT

Students are allowed to defend their dissertation when a minimum of one manuscript with the student as first author, based on dissertation research, is accepted in a peer-reviewed journal. The final examination for the Ph.D. degree consists of orally defending a written dissertation in a public seminar and then in private to the dissertation committee. Satisfactory performance in the oral defense will result in recommendation for granting of the PhD.

## PEER-REVIEWED PUBLICATION

Consistent with existing standards at the Health Sciences Center, all students in this program must have one first-authored, peer-reviewed, original research publication relevant to their dissertation research accepted for publication ("in press") before they may defend their dissertation. This manuscript must represent original research; a review article, even a systematic review, will not fulfill this requirement.

## Major Learning Outcomes

### DOCTOR OF PHILOSOPHY (PH.D.) IN CLINICAL AND TRANSLATIONAL SCIENCE

The goal of the Ph.D. program is to develop biomedical researchers who can integrate findings, information, and observations across basic, population, and clinical sciences, to accelerate and transform how we improve the health of individuals and populations.

By the completion of this degree, students will be able to:

- Design, implement, conduct, analyze and interpret research projects using the techniques unique to basic science, clinical research, and population science research
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Students will:

- Apply theories, methodologies, and knowledge to address questions in specific clinical and/or translational science
- Design and conduct research in clinical and/or translational science
- Engage with other students, faculty, and mentors to demonstrate teamwork
- Develop scientific writing skills and knowledge to develop a grant proposal