

University of Colorado Anschutz Medical Campus

Pharmaceutical Outcomes Research PhD Program

<http://www.ucdenver.edu/academics/colleges/pharmacy/AcademicPrograms/PhDPrograms/PharmaceuticalOutcomesResearch/Pages/PharmaceuticalOutcomesResearch.aspx>

PhD Student Handbook

a. Graduate School, University of Colorado Anschutz Medical Campus Doctor of Philosophy Degree

The Doctor of Philosophy (PhD) degree is the highest academic degree conferred by the University. To state the requirements of the degree in terms of credit hours would be misleading because the degree is not conferred merely upon the satisfactory completion of a course of study, however faithfully pursued. Students who receive this degree must demonstrate that they are proficient in some broad subject of learning and that they can critically evaluate work in this field; furthermore, they must have shown the ability to work independently in their chosen field and must have made an original contribution of significance to the advancement of knowledge.

b. Pharmaceutical Outcomes Research PhD

The Pharmaceutical Outcomes Research (PHOR) PhD training program is housed within the Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS). The University of Colorado, Anschutz Medical Campus (AMC) Graduate School confers the PhD degree in Pharmaceutical Outcomes Research. The below information should be used by students as a guide toward completing all the requirements for the PHOR PhD program. This guide has been approved by the PHOR faculty. However, this guide may be updated by PHOR faculty on an ongoing basis if deficiencies in students' training are observed. The below guide refers to the specific curriculum, exams, advising, and additional competencies required by PHOR PhD program students. All other requirements for the PhD degree will follow the guidelines of the AMC Graduate School, which can be found in the University of Colorado (AMC) Graduate School Resources website:
<http://www.ucdenver.edu/academics/colleges/Graduate-School/current/Pages/resources.aspx>

c. Pharmaceutical Outcomes Research (PHOR) PhD Program Overview

The overall goal of The Pharmaceutical Outcomes Research (PHOR) PhD Program is to prepare nationally competitive pharmaceutical outcomes researchers that are able to educate, serve and lead team-based pharmaceutical outcomes research within the context of prescription drug use and policy. Students in our program are highly motivated to seek additional rigorous training to become leaders in their field and make significant contributions to research in the area of prescription drug use. The PhD program consists of successful completion of: didactic coursework, a Preliminary Examination, a Comprehensive Examination, approval, completion and defense of a dissertation in addition to a few other requirements. There are approximately 36 credit hours of required core coursework. In addition, a minimum of 30 dissertation credit hours must be completed.

d. Major Components of PHOR PhD Program

Pharmacoepidemiology

Pharmacoepidemiology is the application of epidemiologic methods, measurement, analysis and reasoning to the study and quality improvement of uses and effects, including the intended and unintended effects of and risk management strategies for drugs (including biologicals and vaccines) in defined populations, to optimize the benefit to risk balance, and contribute to the quality of medical care. The application of pharmacoepidemiologic methods is a primary mission of academic medical and health centers, pharmaceutical companies, government agencies, and contract research organizations, and properly trained researchers in the field are uniquely qualified to engage in investigative and policy relevant studies. Within the PHOR graduate program, training in pharmacoepidemiology occurs across many disciplines and methods:

- Clinical trial design
- Epidemiology and biostatistics

- Advanced quantitative methods and techniques
- Use of both primary and secondary data for research
- Collaboration with clinicians and other researchers

Pharmacoeconomics

Health economics is the study of how scarce healthcare resources are used and should be used. Pharmacoeconomics, a sub-discipline of health economics, is the scientific discipline that evaluates the clinical, economic, and humanistic aspects of pharmaceutical interventions to provide valuable information for optimal outcomes and the allocation of health care resources (Bingefors et al 2003). Although resources are scarce, healthcare decision makers must decide, given the available evidence, how to deploy such resources. Pharmacoeconomics aids decision makers in their deployment strategies by: clearly identifying the relevant alternatives and their corresponding value, transparently evaluating the perspectives and inputs of the strategies, and modeling uncertainty and what if scenarios. Pharmacoeconomics is at the vanguard of health research across the globe. PhD trained outcomes researchers are prepared to advance the mission of a variety of health-based agencies including: academia, pharmaceutical firms, government, consultancies, and other research organizations. Within the PHOR graduate program, training in pharmacoeconomics occurs across many disciplines and methods:

- Cost analysis
- Return on investment
- Comparative effectiveness research
- Cost-effectiveness, cost-utility, and cost-benefit analysis
- Advanced quantitative methods

Pharmaceutical and Drug Related Policy

Pharmaceutical Drug Use and Policy involves evaluation of the structure, organization, delivery, and reimbursement in health care with an emphasis on drug use policies. The goal of the PHOR graduate program is to educate students on current drug use policies within major payer systems nationally and internationally and to evaluate the utility of these policies in improving medication use and other health related outcomes. Core competencies that will be covered in this disciplinary area include:

- Identify the main components of the organization, financing and delivery of health services and public health systems in the US with an emphasis on drug use policies.
- Understand existing drug use policy models within the US.
- Research methods to appropriately evaluate healthcare policies in a natural setting.
- Identification and the use of data sources, including both primary and secondary data collection to conduct longitudinal research in healthcare
- Discuss the policy process for improving the health status of populations

e. Advising

At the time of admission to the program, an Academic Advisor will be identified from one of the PHOR faculty and assigned to the incoming student for the duration of one year. At the start of every new academic year in the fall, students will be assigned a new faculty mentor from the PHOR faculty. The Academic Advisor will assist the student with identifying and scheduling required coursework, identifying areas of research and collaborations, and selecting committee members for the comprehensive examination and dissertation. When the student identifies a dissertation mentor, this faculty member will become their regular Academic Advisor.

f. Developing and updating a Plan of Study

Each student will be responsible for developing and maintaining a plan of study which includes: a) a checklist of both required and elective courses to meet the degree requirements, b) projected date for completion of the Preliminary Examination, Comprehensive Examination and the Dissertation Defense. The plan will be developed by the student with the help of their Academic Advisor at the start of their studies and will be updated at the start of a new academic year with their new Academic Advisor. Providing development plans and current address and phone number to the PHOR PhD Program Director is the responsibility of the student.

g. Course Information

Completion of the program requires a minimum of 38 hours of required core course credits and a minimum of 30 hours of dissertation credits. All coursework must receive a grade of B- or better in order to count towards the credits required for program completion. Course titles, credits and semester of offering are listed below (p. 13). Students should also consult the Graduate School Course book and the Colorado School of Public Health Course book to get up to date information on courses, the term they are offered in, credit hours, descriptions and instructors. Semesters listed are the semester that each course is usually offered and is subject to change. Some courses require pre-requisites. The PHOR PhD program reserves the right to provide a substitute course or modify the curriculum for students who have decelerated.

h. Preliminary Examination

At the end of the first year of didactic course work, students will take a written Preliminary Examination to assess their comprehension of the educational concepts covered in the coursework. The Graduate School requires a Preliminary Examination to ensure that students are qualified for doctoral study. The purpose of the Preliminary Examination is to determine potential for successful completion of the program and to use the results in subsequent academic advising. The Preliminary Examination covers the core content areas of Biostatistics and Research Methods/ Epidemiology, and possibly Economics-related courses taken within the first year of study.

The Preliminary Examination is held every year (as needed) over a one-day period during the summer (May - July). Students take the Preliminary Examination after *completing the first year of required core courses*. Students will be asked to indicate the intention to take the examination about 4-6 weeks prior to the date of the Preliminary Examination.

Course Requirements for Taking the Preliminary Exam

Core courses include those required core courses that a student has taken by the end of the first year in the program.

Exam Format

The Preliminary Examination is a **CLOSED BOOK** exam. On the morning of the exam, the student will be given the exam questions in electronic format. The student is given a total of six hours to answer questions from the core content areas within the one-day period. The exam day will not exceed six hours.

Grading Policy

PHOR Faculty members will grade the exam. The pass/fail designation a student receives will reflect an overall pass/fail grade for the content areas. In order to pass the Preliminary Exam, the student will need to **receive a passing designation in ALL content areas**. If the student fails one or more section, they will have the opportunity to retake that particular exam section(s) within 60 days. If the

student fails to pass the entire exam or fails any retake sections, the faculty may recommend that the Graduate School dismiss the student from the program.

i. Dissertation Plan

Students will be required to develop a clear and concise dissertation plan to be approved by the PHOR faculty after passing the Preliminary Exam. The dissertation plan will describe the student's idea for their dissertation, including planned specific aims, background/significance, and proposed methods. Based on the dissertation plan, the PHOR faculty need to be able to determine the following: (1) are the aims collectively a dissertation; (2) is the plan feasible; (3) does the student understand what research methods should be used; and (4) what expertise will the student need from committee members.

A quality and acceptable dissertation idea should have the following key elements:

- 1) Demonstrates a contribution to intellectual debate in
 - a. A clinical area/empirical field; **or**
 - b. Measurement or methodological approach; **or**
 - c. Policy-making of broad importance, such as national policy **AND**
 - d. Has a medication use (i.e., pharmaco-component) aspect in the research plan

AND

- 2) Develops demonstrable expertise for the student in
 - a. A clinical/disease/drug area **and**
 - b. A methodological approach

The dissertation plan should be brief, only 3-5 pages, and must include the following components (page lengths below are suggested, not required):

- 1) Background/Rationale/Gaps (1/2 – 1 page)
- 2) Specific Aims (1/2 page)
- 3) Methods (2-3 pages; should describe the following)
 - a. Design
 - b. Population/data source(s)
 - c. Measures
 - d. Proposed analytic/statistical methods
- 4) Preliminary Data (1/2 page, if applicable)
- 5) A list of proposed dissertation committee members, including their role on the committee, and expertise needed
- 6) Timeline for Developing Dissertation Proposal, Conducting the Research and Proposal Defense
- 7) IRB approval plan
- 8) Sources of Funding (if applicable)
- 9) Dissemination Plan (target journals, national meetings)
- 10)References

Students must identify their dissertation mentor prior to developing their plan; other members of the Dissertation Committee may also be identified during the Dissertation Plan development. See section *J. Dissertation Committee Formation* for more detailed information on the composition guidelines for the dissertation committee. Students are encouraged to get feedback from the Dissertation mentor

and other committee members, if identified, on multiple versions of their dissertation plan before submitting the plan to the PHOR faculty for final approval.

Approval of the Dissertation Plan:

Approval of the dissertation plan is conducted in a meeting with PHOR faculty. The meeting should be scheduled for 1.5 hours at a minimum. The student's Dissertation Mentor must approve the dissertation plan prior to the student being able to schedule a meeting with the PHOR faculty. The student is required to submit their Dissertation Plan to all PHOR faculty members at least one week prior to the approval meeting. During the meeting, the student will present their Dissertation Plan using a 15-20 minute PowerPoint presentation. The presentation will be followed by a question and answer session with the faculty. All PHOR faculty shall attend this meeting. In certain circumstances, non-PHOR SSPPS faculty on the student's Dissertation Committee may be invited to attend the meeting. Only once the dissertation plan is approved by the PHOR faculty can a student proceed with a comprehensive examination.

j. Comprehensive Examination

Before admission to candidacy for the PhD in Pharmaceutical Outcomes Research program, each student must pass a Comprehensive Examination in their field of concentration. The purpose of the Comprehensive Examination is to provide the candidate with the opportunity to demonstrate mastery of a broad range of knowledge in pharmaceutical outcomes research including their specific dissertation topic.

Consistent with Graduate School guidelines, the Comprehensive Exam shall be conducted by the end of the third year of the training program.

Pre-requirements for the Comprehensive Examination

Students must meet the following requirements before they are eligible to take their comprehensive exam: a) successful completion of the preliminary examination; b) approval of the dissertation plan by the PHOR faculty; c) completion of, or registration for, all core courses; d) a minimum G.P.A of 3.0; e) identification of the student's dissertation committee; and e) submission of the *Application for Admission to Candidacy* to the Graduate School.

Dissertation Committee Formation

The dissertation Committee shall be formed by the student prior to the comprehensive exam; confirmed and potential members should be communicated in the dissertation plan document. The minimum size of the dissertation committee is four (4) voting members. The chair must be a PHOR core faculty member and at least half of members must have a graduate faculty appointment within the Skaggs School of Pharmacy and Pharmaceutical Sciences. Further, each committee must have at least one member from a graduate program outside the Skaggs School of Pharmacy and Pharmaceutical Sciences.

A committee must have a mentor/advisor and a Chair. While the mentor can be outside of the PHOR faculty, the chair of the committee must be a PHOR core faculty member. The chair and mentor cannot be the same person for the Comprehensive exam but can be the same person for the dissertation defense. The committee should also have a clinical expert.

1. The committee chair will be responsible for all "process" aspects within the dissertation committee. The chair may or may not be the graduate Program Director, but must be a PHOR faculty member.
2. The dissertation mentor will be the student's primary content expert who works most closely with the student in their dissertation research. The dissertation mentor may or may not be a

PHOR faculty member. If this mentor is not a PHOR faculty member, the choice must be approved by the Program Director.

3. A clinical expert in the relevant area of study must be to be part of the dissertation committee and be engaged with providing input on the clinical relevance of the proposed idea prior to developing the research plan.

For committee members who do not have a Graduate School appointment, students may request that the PHOR program submit an appointment nomination to the Graduate School. Recommendations for membership in the Graduate Faculty will be initiated by the Chair of the committee. The nomination/approval process takes up to three months, so nomination requests must be submitted soon after the Dissertation Plan has been approved. Students can solicit the input of committee members once the committee composition has been approved by the PHOR faculty through the Dissertation Plan approval process.

Note the Graduate School allows students to have a Comprehensive Exam Committee of three voting members and does not require the Comprehensive Exam Committee to be the same as the Dissertation Committee. However, the PHOR Program strongly suggests students identify their Dissertation Committee prior to their Comprehensive Exam and that the Dissertation Committee be used for the Comprehensive Exam (i.e., the Comprehensive Exam Committee is the same as the Dissertation Committee). Any deviations from this should be discussed with and approved by the Program Director.

Comprehensive Exam Content and Format

Content for the exam will represent information from all required core course work as it applies to the student's dissertation plan. In other words, exam content will reflect mastery of the student's knowledge base of the required coursework with its application and integration into the student's dissertation topic. The exam includes two parts: 1) submission of the dissertation proposal (written exam), and 2) a closed oral exam. The dissertation proposal should describe the student's proposed topic, background and relevant literature, theoretical foundations, methods, and intended approaches and be more detailed than the Dissertation Plan. Specifically, the elements of the dissertation proposal will be a complete draft of chapters 1-3 of the dissertation (as outlined under "Dissertation Chapter Content Requirements"). The student should work closely with their committee to receive feedback prior to submitting the proposal for the purposes of the written Comprehensive Exam. The student must submit their dissertation proposal to all committee members at least two weeks prior to the scheduled oral exam.

The closed oral exam is the formal comprehensive exam that is recognized by the Graduate School. Information about the date, time and location of the Comprehensive Exam is reported on the *Exam Request Form*. The examination shall be conducted by the student's Dissertation Committee. The oral exam will be conducted at least two weeks after submission of the written dissertation proposal. It is the student's responsibility to schedule the oral exam which will consist of a two (no longer than three) hour meeting with the student and all members of the student's dissertation committee. All members of the student's dissertation committee must be present for the oral exam. One member, but not the chair or the student, may participate by interactive video. The student will first present the dissertation proposal using a 30-40 minute PowerPoint presentation. Following this presentation, committee members will be allowed to ask questions related to the dissertation proposal or any other related line of inquiry (including completed coursework).

Paperwork and Scheduling

Comprehensive Exams are generally held during the spring or summer semester. It is the responsibility of the student to schedule the exam and ensure that the relevant faculty members are

able to attend the oral portion of the exam. The student should work with their Committee Chair to ensure all processes are in place for the exam (i.e. room scheduling, Graduate School paperwork, etc.). There are two forms that need to be completed by the student: *Application for Candidacy*, and *Exam Request Form*. Both can be found [here](#) (the Graduate School website under FORMS on the Resources page). The student should print their unofficial CU transcript to assist in filling out the *Application for Candidacy* which is the formal application for admission to candidacy for the Ph.D. degree.

The responsibilities of the student are: a) download and complete the *Application for Candidacy* form and the *Exam Request* form; b) sign the *Application for Candidacy* form, and obtain necessary signatures from mentor, chair, and/or Program Director on both forms; and c) submit both forms to Isabella Jaramillo, the Program Administrator, **at least four weeks prior to the exam**. The Program Administrator confirms accuracy of the information on the forms and forwards them to the Graduate School on behalf of the student at least two weeks before the exam. Forms submitted to the Graduate School after the two-week deadline may not be accepted and the student may have to reschedule the exam. The Graduate School will prepare and distribute the "Notice of Examination" to the student, the academic program, and committee members. The PHOR PhD program will receive not only the "Notice" but all necessary forms to complete the examination. All students must be registered for at least one credit at the time they take the comprehensive examination.

Grading

There are three possible outcomes for the Comprehensive Exam:

- 1) Pass – The student must receive affirmative (passing) votes from a majority of dissertation committee members to pass.
- 2) Pass with conditions – The student has not addressed all questions successfully. The student will be asked to retake portions of the exam within a defined time period. Conditions may also include the completion of other necessary training, such as further coursework. All conditions must be completed within 4 months in a format designated by the committee. Failure to satisfy these conditions will result in failure of the examination.
- 3) Fail – If the student fails the examination, per Graduate School Rules, they are subject to immediate dismissal from the program. At the committee's discretion, the student may be allowed to re-take the examination once.

k. Dissertation Process (Beyond Comprehensive Exam):

Timeline

Students who fail to defend their dissertation within a seven-year period are subject to termination from the Graduate School upon the recommendation of the PHOR Program Director and concurrence of the Dean of the Graduate School. For a student to continue beyond the time limit, the student and/or Program Director must petition the Graduate School and include 1) reasons why the program faculty believe the student should be allowed to continue in the program and 2) an anticipated timeline for completion of the degree. Extensions may be approved by the Graduate School for one additional year.

Dissertation Specifications:

All doctoral students are required to submit a dissertation (i.e., thesis) to the Graduate School as partial fulfillment of the requirements of the degree Doctor of Philosophy. All dissertations must comply with the specifications of the Graduate School regarding formatting. These specifications can be found "Format Guide" on the [Graduate School website](#). Students may also be required to schedule a dissertation pre-check with the Graduate School prior to submission of the final dissertation. The goal is for the student to incorporate all changes/revisions required into the draft dissertation document PRIOR to the Dissertation Defense Examination.

Dissertation Chapter Content Requirements

There are no specific page limit requirements for the dissertation. However, dissertations are expected to range between 100-200 pages. Chapter specifications are as follows:

Chapter 1 (Introduction): Provide an overview, conceptual framework, purpose, and problem statement of the project; state the specific aims and hypotheses.

Chapter 2 (Background/Review of the Literature): Perform a review of the literature that identifies, reviews and critically appraises existing knowledge in the identified fields and topics. Gaps in evidence, knowledge and/or practice should be identified that the project addresses.

Chapter 3 (Methods): Provide the study's overall purpose, research question(s), hypothesis/es, specific aims, and a detailed description of the research methodology and analytical approach used. Where appropriate, detailed data extraction or sample identification and collection protocols should be specified (but may be included in an appendix). A power calculation/sample size calculation should normally be included. If qualitative or exploratory work was involved to complement the primary hypothesis-driven study approach, these study aims and methods should be described. Appendices are helpful to provide copies of instruments, calibration assessments, key diagnostic tests, clinical performance metrics, study data forms, study data definitions, survey instruments, or any other source documents related to the study. The student's dissertation COMIRB application and (at a minimum) COMIRB approval documentation (including HIPAA documentation if appropriate) should be included as a separate appendix.

Chapter 4 (Study Results): Tables, graphs, and detailed descriptions of the study findings should be presented.

*An alternative format for Chapter 4 (study Results) is the "papers as chapters" format. Rather than one chapter presenting the results for the entire dissertation, the student includes the papers associated with each Specific Aim as separate chapters (in addition to Chapters 1, 2, 3, and 5). The papers do not need to be submitted or published prior to submitting the dissertation to the Graduate School. If a paper is published prior to completing the dissertation, the student MUST include a footnote in the dissertation that indicates portions have been included with the copyright owner's permission (and actually obtain permission from the journal). References should still be included at the end of the dissertation (rather than at the end of each "paper"), and each "paper" should be reformatted to match the rest of the dissertation (i.e., font, spacing, margins, headings, subheadings). Co-authors should be listed in a footnote or acknowledgements section. **The decision to use this format needs to be discussed with and approved by the student's committee.***

Chapter 5 (Conclusion/Discussion): The project's conclusions are presented and a discussion of the clinical implications should be provided. The impact on health policy should be discussed. Strengths and limitations of the work are also described. Future research directions and/or research projects planned should be discussed in this chapter.

Dissertation Defense

After the dissertation has been accepted by the Dissertation Committee and before the degree is conferred, a final examination of the dissertation will be conducted in two parts: an oral presentation of the dissertation research that is open to the public, and a closed examination conducted by the Dissertation Committee.

Scheduling the Dissertation Defense

The Graduate School must be notified of the dissertation defense on the appropriate forms at least two weeks in advance of the examination. All paperwork is sent by the student at least **four** weeks prior to the examination to Isabella Jaramillo, Program Administrator, who then sends to the Graduate School on the student's behalf. The examination must be taken no later than three weeks prior to the date on which the degree is to be conferred. Students should check with their program and the Graduate School website for specific deadlines. Students' must submit a finalized draft of the dissertation to the defense committee at least **two** weeks before the examination date. The dissertation defense must be held in a room on the AMC campus or an AMC-affiliated campus. Students must be enrolled for 5 dissertation credits during the semester in which the dissertation defense is held.

Defend the Dissertation

The dissertation defense is the official Graduate School final exam for the PhD degree. The dissertation defense consists of an open-to-the-public oral presentation and a question and answer period referred to as the seminar, followed by a closed session with the members of the Dissertation Committee. All PHOR program faculty and students will be invited to attend the seminar. The seminar should last an hour with approximately 30-40 minutes of presentation time and 20-30 minutes of Q & A. All members of the committee must be present for the closed session. One member, but not the chair or the student, may participate in the seminar and closed session by interactive video. At the dissertation defense, a majority vote of the Dissertation Committee members is required. This committee will evaluate both the seminar and written dissertation. Following deliberations that could last up to 2 hours, the committee will vote to pass by receiving affirmative votes from the majority of committee members, pass with conditions or fail a student for their dissertation defense. If changes are required, final review and approval by the committee chair (who will determine that the committee's stipulated modifications have been completed successfully) will be obtained. If a student passes the examination with conditions, those conditions must be satisfied within 60 days for the PhD degree.

Submission of the Dissertation

Students must submit their final dissertation digitally to ProQuest at least two weeks before the date on which the degree is to be conferred. See the Graduate School website for the specific date for each graduation period. Regardless of the dissertation submission deadline date for any graduation period, the final dissertation must be submitted to the Graduate School no later than 60 days after the dissertation defense. Students who fail to meet this deadline may be asked to re-defend their dissertation. Dissertations will be accepted for publication by ProQuest and included in an open-access repository at the Health Science Library. Per the dissertation specifications, a formal approval form, signed by all committee members, must be submitted to the Graduate School before the digital submission can be accepted for publication.

I. PHOR Program Additional Requirements Prior to Graduation

Primary Data Collection Requirement

During any phase of a student's PhD education, they are required to complete a primary data collection experience with human subjects. Patient reported outcomes and clinical research are key components of the outcomes research evidence base. This type of research can take many different forms, but generally includes a questionnaire or telephone survey of human subjects. In successfully completing this requirement, students will understand some of the challenges with primary data collection and the possible solutions to such challenges.

The student is required to be a member of a research team and actively contribute to the design and/or data generation phase of primary research. For the purposes of this requirement, it is not sufficient to only contribute to the analysis phase of primary data research. It would be desirable for students to participate in the IRB submission process for their primary data collection experience. Students are encouraged to communicate with their faculty advisor and other PHOR faculty to identify and carryout a primary data experience that will satisfy this requirement. The student will submit a one-page document describing their contribution to a primary data collection experience to the PHOR Program Director. The PHOR faculty will evaluate the student submissions for approval.

Basic Pharmacology Competency

In training PHOR researchers, a key component is to understand the basic pharmacology of drug use within body systems. As PHOR PhD students come from diverse backgrounds, this requirement is to ensure that all doctoral students have a basic understanding of the mechanism of drug action within the human body. Students have several options to meet this requirement:

- a) An online course; for example, the Coursera course on Drug Discovery: <https://www.coursera.org/learn/drug-discovery#about>
- b) Other courses after approval from the PHOR Program Director or Dissertation mentor

Students must obtain the approval of the Program Director for any course they take to meet this requirement. Students who have a clinical background (PharmD or MD, for example) may be able to waive this requirement. Students may request a waiver of the basic pharmacology competency requirement by writing a letter justifying their reasons with any supporting documentation. The PHOR faculty will evaluate the student waiver submissions for approval.

Publication Requirement

Before a student graduates from the PHOR PhD Program, they are required to be an author or co-author on one manuscript that has been accepted *for review* by a journal. The choice of the journal and the content area of the manuscript may be related to the student's dissertation topic or any other research topic that the student has conducted research on. Students will submit documentation of achieving the publication requirement to the PHOR Program Director.

m. Vacation and leave while in the Pharmaceutical Outcomes Research PhD program

The majority of students in the PHOR PhD Program receive funding while they are a student, as either a Teaching Assistant (TA) or Research Assistant (RA). Funding from the program is not guaranteed beyond the first year in the program. It is contingent upon availability, and student progress and success in the program from year-to-year.

While funded as a TA or RA, students must adhere to the Graduate School's Leave Policy, which can be found on the [Graduate School website](#).

Students must also communicate with the PHOR Program Director, and the Course Director (if a TA) or their Principal Investigator (PI)/supervisor (if an RA) regarding any leave of absence or travel that will take them away from their responsibilities. Such leave needs to be reported to and approved by the PHOR Program Director and the Course Director or PI/supervisor in advance. Working remotely (rather than taking leave) must be approved in advance by the PHOR Program Director and the Course Director or PI/supervisor.

Self-funded students must communicate with the PHOR Program Director and their dissertation mentor (post-comps) regarding any leave that would affect their engagement with the program or their progression in the program.

Timeline and Requirements of the PHOR PhD Program: PHOR PhD Program Matrix

The following matrix displays the components of the PHOR PhD Program, with a general timeline for anticipated completion. Note that some requirements must be completed at (or by) certain specific time points per Graduate School rules (see footnotes: components with Fixed deadlines are denoted with a superscripted F; other components have variable deadlines as denoted by a superscripted V).

Program Component	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Other Requirements	<i>Pharmacology Course^V Primary Data Collection^V Publication^V</i>					<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> It is anticipated that most students will complete the PHOR PhD program within 5 years, although 7 years is the official maximum time for completion </div>	
Research	<i>Optional Research Experiences^A</i>						
Exams/ Dissertation	<i>Preliminary Exam (end of Year 1)^F</i>	<i>Dissertation Plan^F</i>	<i>Comprehensive Exam (after required courses and approval of Dissertation Plan)^F</i>	<i>Dissertation Defense^V</i>			
Courses	<i>Required Coursework + Elective Coursework (to complete required credit hours)</i>			<i>Additional Elective Courses (after Comprehensive Exam)</i>			
	<i>Seminar</i>	<i>Seminar</i>	<i>Seminar</i>				
Advising	<i>Advisor 1 Career Development Plan</i>	<i>Advisor 2</i>	<i>Advisor 3</i>	<i>Dissertation Mentor Dissertation Committee</i>	<i>Dissertation Mentor Dissertation Committee</i>		
Year	1	2	3	4	5		

A = Optional Research Experiences are not required, but may be available for interested students (in the form of Research Assistantships, elective Independent Study or Research credits, etc.); F = Fixed deadline requirement (Preliminary Exam must occur at the end of the first year; Dissertation Plan and Comprehensive Exam must be completed by the end of the third year); V = Variable deadline requirement (may occur at any time during program, by the end of Year 7)

Pharmaceutical Outcomes Research PhD Program Course Curriculum

Required Courses		Credits	Term*
BIOS 6611 & 6612** ^a	Biostatistical Methods I and Biostatistical Methods II	6	Fa/Sp
EPID 6630**	Epidemiology	3	Fa, Sp
EPID 6626** ^b	Research Methods in Epidemiology	3	Fa, Sp
HSMP 6601**	Introduction to Health Systems Management and Policy	3	Sp or Fa
HSMP 6609** ^c	Cost Benefit and Effectiveness in Health	2	Sp
HSMP 7609 ^d <u>or</u> EPID 6631	Methods in Health Services Research II <u>or</u> Analytical Epidemiology	3	Sp Sp, Su
PHOR 7611	Applied Cost-Effectiveness Modeling (McQueen)	4	Sp (odd)
PHOR 7613	Pharmaceutical Economics (K. Anderson)	3	Fa (odd)
PHOR 7615	Pharmacoepidemiology (Valuck/H. Anderson)	4	Sp (every 2-3 years)
CLSC 7150	Ethics and Regulation in Human Subjects Review	1	Fa/Sp
PHOR 7570 ^e	Graduate Student Seminar (1 credit per semester; PHOR faculty)	Min of 6	Fa/Sp
Total Required Core Course Credits for All Students		38	
PHOR 8990	Doctoral Dissertation	≥30	All

Approved Elective Courses		Credits	Term
BIOS 6603	Statistical Computing - SAS	1	Fa/Su
BIOS 6623	Advanced Data Analysis	3	Fa
BIOS 6643	Analysis of Longitudinal Data	3	Fa
BIOS 6646	Survival Analysis	3	Sp
BIOS 6648	Design of and conduct of Clinical Research	3	Fa
BIOS 6649	Design of Studies in the Health Sciences	3	Sp
BIOS 6655	Statistical Methods in Genetic Association studies	3	Fa
BIOS 6680	SAS Database design/management	3	Fa
BIOS 6683	Introduction to Health Information Technology	3	Sp
BIOS 7711-7713	Advanced Statistical Methods Courses	variable	Fa/Sp
CBHS 6620	Survey Research	2	Fa
ECON 5813	Econometrics I (UCD downtown campus)	3	Fa
ECON 5823	Econometrics II (UCD downtown campus)	3	Sp
HSMP 6604 ^c	Health Care Economics	3	Fa
EPID 6631	Analytical Epidemiology	3	Fa
EPID 6632	Advanced Epidemiology	2	Sp
EPID 6646	Introduction to Systematic Reviews	1	Fa
EPID 6635	Epidemiology of Communicable Disease	3	Sp
EPID 6636	Chronic Disease Epidemiology	3	Sp
EPID 6638	Cardiovascular Epidemiology	1	Fa
EPID 6639	Genetic and Molecular Epidemiology	2	Sp
EPID 7605	Research Methods with Secondary Datasets	3	Su
HSMP 7607	Methods in Health Services Research I	3	Sp

Refer to the [CSPH course book](#) for descriptions of BIOS, CBHS, EPID, HSMP courses

* Term in which courses are offered is subject to change; Fa = Fall, Sp = Spring; Su = Summer.

** Highly recommended during first year of study

^a BIOS 6611 and 6612 prereqs: calculus, probability/stats are required; linear algebra highly recommended

^b EPID 6626 prereqs: BIOS 6611, EPID 6630, BIOS 6680 (or adequate SAS experience)

^c HSMP 6604 or permission from instructor required for taking HSMP 6609

^d HSMP 7607 is required for taking HSMP 7609

^e Minimum of 6 semesters of Graduate Student Seminar are required (first through third years); however, students are required to take Seminar until they have passed the comprehensive exam; further, students are encouraged to participate in Seminar throughout the entire training period.