HEALTH AND CLINICAL INFORMATICS (HCIN) TWO-STEP Ph.D. EXAM PROCESS

Prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of biomedical informatics fundamentals and a potential for research by passing an exam. The Exam process will be divided into two steps. The PhD Comprehensive (Step 1) and Qualifying Exam (Step 2) have several goals.

1. To evaluate the student's understanding of fundamental concepts in biomedical informatics in critically reviewing informatics research [Comprehensive exam, Step 1]
2. To motivate students to synthesize course work and existing research [preparation for Qualifying Exam, Step 2]
3. To evaluate the student's ability to present orally and to respond to questions and comments from fellow researchers [Qualifying Exam, Step 2]
4. To identify areas that need to be strengthened for the student to be successful as a PhD student and independent scholar [Comprehensive and Qualifying Exams, Steps 1 and 2].

Timeline
Step 1: Comprehensive Exam – The test will be taken as early as 9 months after starting the PhD program but no later than 24 months (unless permission obtained). Upon passing the Comprehensive Exam, the student begins preparations for Step 2.

Step 2: Qualifying Exam – Based on cognate area of study and research methods – This test must be passed before completion of year 2. Advancement to Candidacy – After successful completion of Qualifying Exam

Step 1: Comprehensive Exam

Offered: Yearly –August/September

Background: Our comprehensive exam focuses on synthesis and application of knowledge by critically reviewing a set of informatics research papers provided by faculty leading the 6 HCIN curriculum domains. Examiners representing these HCIN domains (biomedical informatics, healthcare, computer science, evaluative sciences, organizational behavior/project management, ethics) will provide 2-3 research articles (preferably published in the last 3 years however, you may also include classic papers) to the PhD director by the end of May. The majority of these will be selected for the comprehensive exam; the remainder will be considered for the mock exam session*. *The faculty will also provide context and/or a few "guiding questions" with their selected articles*. In addition, the students will provide 3 papers in the research area they are considering. They too will provide context about why they chose these papers for the examiners. The student articles will be included in the oral exam as time allows.

Timing: Students will be given the set of papers at the beginning of the summer of the comprehensive exam. Students who matriculate in either summer or fall term will take the exam at the same time. The student will provide 3 informatics research papers on the topic they are considering for their own research at the time of the written exam (these will be used in the oral exam only). The exam will take place by the end of summer term.

Format: Written exam followed by an oral exam

Written (4 hour, proctored exam). Students will be given 4 hours to answer questions posed by faculty about the packet of articles. These questions will be essay style and designed to have the students critically think about the papers leveraging their domain knowledge. The students will have laptops (provided by the examiner), the article packet, their own paper notes and blank paper. During the exam students cannot access the internet or OHSU network. The written comprehensive exam will be followed by an oral exam session within 2-4 weeks.

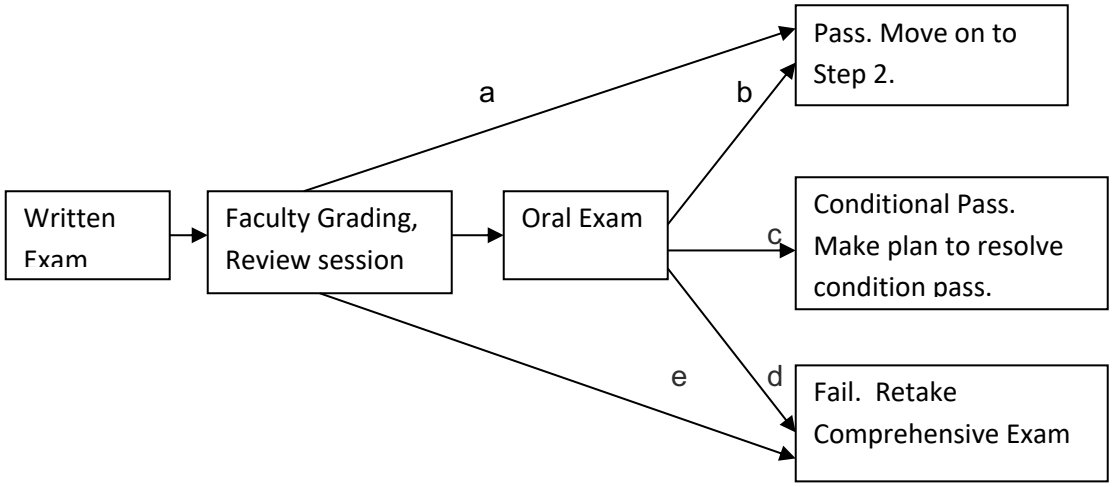
Oral only (90 minute discussion) with the student and faculty examiners. The goal is to assess the student's ability to think critically and to communicate effectively with other researchers. When they take stances, it will be important to demonstrate that they are able to cite supporting evidence from the examination packet. Additionally, students will be asked questions about the 3 papers they provided on an area of research interest as time allows.

Study strategies: As preparation for exam, students should carefully review each paper in the packet and the guiding questions provided by the faculty members. They should also answer the sample questions (below) for each paper. As a strategy for understanding an article, some students may choose to draft an "accompanying editorial" for each paper in the packet. This is an editorial, often written by an expert or journal editor, who summarizes and discusses a specific research article, typically in the same journal issue. We encourage students to partner with others also studying and use the room that has been set aside for the cohort during the summer to discuss the sample questions below.
Below are some sample questions you may be asked during the written and oral exams.

- Identify the research question
- Discuss methods used in a paper and other options for addressing the research question
- Discuss the paper's results and their implications
- Discuss how the paper compares to other research papers in the packet addressing similar types of research questions
- Discuss limitations and additional questions a paper raises
- Design a followup study
- Discuss ethics reported in a paper

*Mock Exam Session: We plan to have 1 mock oral session approximately 3 weeks before the written exam to focus on up to 6 "sample" papers so that students get a sense of the session format. All examinees will attend the mock session with the examiners. Instructions and up to 6 papers for the mock exam session will be sent out 2 weeks prior.

FLOW THROUGH THE COMPREHENSIVE EXAM PROCESS



Possible outcomes from the written Comprehensive Exam are that the student:

Written Exam	**Nature of Oral Exam Session**	**Overall Outcome**	**Next Step**
Unconditional Pass (a)	Minimal questions on domain papers; questions on the 3 papers the student provided; Focus of session is on preparing for Step 2 Passed Oral exam session	Passed	Proceed to Step 2
Pending (b)	Additional questions on the domain papers; questions on the 3 papers the student provided Passed Oral Exam session	Passed	Proceed to Step 2
Pending (c)	Additional questions on the domain papers; as time allows, questions on the 3 papers the student provided or these papers may be part of the condition for passing. Marginal pass of Oral Exam session	Conditional Pass	Must complete condition for passing within 1 academic term.
Pending (d)	Additional questions on the domain papers only Failed Oral Exam Session	Failed	Retake Comprehensive Exam if eligible
Failed (e)	No Oral. Give feedback on domains that need strengthening	Failed	Retake Comprehensive Exam

	prior to retaking written exam.		if eligible

a. Passed written unconditionally. The student may be asked a few questions on domain papers during the Oral Exam Session but the focus is on preparing the student for completing Step 2 by asking questions about the 3 papers the student provided. The student moves on to completing Step 2.
b. Passed written marginally and requires further probing about the domain papers during the Oral Exam Session. The student will also be asked questions about the 3 papers the student provided. If the student presents convincing mastery in the Oral Exam Session, the student moves on to completing Step 2.
c. Passed written marginally and requires further probing during the Oral Session. Questions on the 3 papers the student provided will be asked as time allows. After the Oral Exam Session, the faculty sense minor weaknesses (on 1-2 domains only) need addressing before the student can pass. The weaknesses must be resolved within 1 academic term of the exam*. The PhD Exam Committee will outline the conditions the student must fulfill before taking Step 2 (e.g., specific course that must be taken with performance at a specified level; communication skills need to be improved as evidenced by a presentation, etc.). With the Chair's endorsement, the student will later request a change from "conditional pass" to "pass" after he/she believes that the conditions have been fulfilled. The student will outline in this request the reasons for this belief. The PhD Exam Committee will meet again to act on the request. *Note: if the condition is that a specific course must be successfully completed but it is not offered the next term, the PhD Exam Committee will adjust the schedule.
d. Passed written marginally and requires further probing during the Oral Exam Session over the domain papers. The student is unsuccessful in answering questions during the Oral Exam Session. The weaknesses are on more than 2 domains OR cannot be resolved in 1 academic term. The student will be given feedback on areas that need additional study before retaking the Comprehensive Exam. The student has one opportunity to retake the written exam either 6 or 12 months following the initial attempt.
e. Failed the written exam by failing 50% or more of the written exam. There will be no oral exam. The session will focus on giving feedback of areas that need strengthening. The student has one opportunity to retake the written exam either 6 or 12 months following the initial attempt.

Faculty will provide feedback to Andrea Ilg on submitted questions on the written exam within 5-10 days of the exam. The exam questions be graded as follows: (Pass, Marginal Pass, Fail). In cases where the faculty agree that the student has passed all domains, the student is passed. In cases where the student has marginal passes or failures on domains, the PhD Exam Committee will meet in a Review Session to discuss the performance. The students will be notified by email of the outcome of the Comprehensive Written Exam prior to the Oral Exam Session. All students will attend an Oral Exam Session within 2-4 weeks of the initial exam. The examiners, HCIN Program Leader, Associate PhD Director will attend the Oral Exam Session.

Step 2: Qualifying Exam

Offered: By student request (but no later than the end of the second year)

Once the student has passed Step 1 and identified in which time period he or she wishes to take the Qualifying Exam, the student must prepare a folder for review by the PhD Pre-Exam committee (HCIN Program Leader; Associate PhD Director; program administrator, Andrea, student advisor). The folder must be submitted no later than 5 weeks before the scheduled Qualifying Exam week. Work on this folder should commence during year 1 and be completed during year 2.

Required Courses prior to taking Qualifying Exam

BMI 652 – Research in Bioinformatics (Eilis)
Complete 12 credits in Advanced Methodology (see Part e)

Students are *encouraged* to take the following courses *prior to the qualifying exam*. They *must* be taken *prior to the proposal defense*:

HIP 528 – Applied Biostatistics I (Required prior to proposal defense)
HIP 529 – Applied Biostatistics II (Required prior to proposal defense)

The Qualifying Exam folder should contain the following, in order:

a. Updated transcripts of all graduate course work
b. Curriculum vitae with abstract submissions, publications etc
c. Potential research proposal (3 pages not including references). Knowledge and work of the student, and/or others, should be synthesized to present a rationale for the proposed topic (e.g., theory to be developed, hypotheses to be tested) as well as proposed methodology including "draft" statistics to fulfill the dissertation objective. While the student may consult with the advisor (and other faculty as needed) for this proposal, the student should take the lead in preparing the proposal.
d. Statement with defined Cognate area in which the student feels he/she has depth. Students should discuss their cognate area with their advisors. At the bottom of the statement, students should list the course work (and grades) supporting this area of expertise. Students must complete a minimum of 12 credit hours in the cognate area.
e. Statement with defined Advanced Methodology area in which the student feels he/she has depth. Students should discuss this methodology area with their advisors. At the bottom of the statement, students should list the course work (and grades) supporting this area of expertise. Students must complete a minimum of 12 hours in methodology.

   The following courses are required in Advanced Methodology:

   BMI 661 – Qualitative Research Methods (Joan)
   BMI 662 – Quantitative Research Methods (Annette) or equivalent

   The following* are courses that might be included for the remaining 6-8 credits:
   BMI 638 – Medical Decision Making (Karen)
   CS 659 Machine Learning (OHSU). Prereqs: multivariate calculus, linear algebra, MATH 630.
   SOC 610 PSU Combining Quantitative and Qualitative Research Methods

SOC 610 PSU Focus Groups

***Other courses as approved by the PhD Pre-Exam Committee**.

f. List 4 or more faculty names likely to be on the Exam Committee, based on the student's cognate and methodology expertise. Students should contact faculty members to see whether they are available to participate during qualifying exam week. (They need not be invited to join the committee at this point, since approval is needed before the committee is finalized.)

1) During the PhD Pre-Exam Committee session, the advisor will present the student's Qualifying Exam Folder to the committee and give a frank appraisal of the student's readiness for the exam. The PhD Pre-Exam committee will evaluate the student's research progress, depth areas as defined by cognate and methodology statements, supporting coursework, etc. The student will not be present at the meeting.

2) The committee will determine if the student should be offered the PhD Qualifying Examination. The students will be notified within 2 weeks of the packet deadline of the decision. If the student is not offered the exam, the advisor will convey to the student the reasons for the committee's decision.

If the student is offered the exam, the committee will appoint an Exam Committee with four faculty members (with consideration to submitted faculty names), to cover the cognate and research areas specified by the student. The Exam Committee will designate one member as chair. The student's research advisor will usually be included on the Exam committee as well but cannot serve as chair. The committee will then compose a question that will require the student to synthesize from the cognate and methods expertise areas. This question should require the student to demonstrate knowledge beyond the narrow focus of the stated research area. This question will be posed during the Qualifying Exam Session.

If selected to proceed forward with Step 2, the student will schedule the date of the 2-hour Qualifying Exam (approximately 2-3 weeks out). One week prior to the exam, the student will email each Exam committee member with a "reminder" that will include copies of the short proposal, slides and the date, time and place of the Exam.

Qualifying Exam Session

1. During the initial 15 minutes the student will present a slide show highlighting the research presented in the 3-page proposal. The committee will ask questions about proposal.
2. Next, the committee will pose their question(s) that requires the student to synthesize from their cognate and research areas. For example, the committee may ask the student to design a study to respond to a funding opportunity (related to their expertise). The student might be asked to provide potential specific aims, research questions and alternate methods (including statistics) to address the research questions.
3. Generally, the research advisor is encouraged to allow the student to answer independently during the questioning by the other members of the committee, and not act as an advocate or interpreter. Of the four Exam Committee members, the

research advisor will be the final one to examine the student on the research proposal and exam questions.

4. At the conclusion of questioning, the student will be asked to leave so that the Exam Committee can deliberate on all the information it has acquired (from the Exam folder, from the 15 minute slide show and the question/answer session) for deciding whether the student passes, conditionally passes, or fails the Qualifying Exam based on the student's performance in the Qualifying Exam and promise for becoming a doctoral level researcher.
5. When ready, each person will share their observations with the group. The group will then discuss until consensus is reached and vote on the outcome (Pass, Conditional Pass: with stated condition, Fail: with reasons). Note: the advisor will not vote. If all voters indicate "Pass", the voting is completed and the outcome is a "Pass". If the student has 2 or more failed votes out of the 4 or 5 votes, the voting is completed and the outcome is a "Fail". Reasons for the failed vote must documented.

   [*As Needed*] For all other possible voting combinations, group must decide if there is a single weakness that can be addressed with a Conditional Pass. A second deliberation will be held. At the completion of this second deliberation, a second vote (Conditional pass with stated condition or Fail with reasons). The advisor will not vote. To receive a Conditional Pass, the student must have no more than one failed vote out of the 4 or 5 votes.

   When completed, the Chairman will announce the result (Pass, Conditional pass: with an agreed upon condition or Fail: with agreed upon stated reasons) to confirm consensus was reached.

6. The student will be called back in to learn the Qualifying Exam outcome and the Chairman will announce the decision. The Exam Committee, HCIN Program Leader and Associate PhD Director will provide feedback to the student. Possible outcomes from the Qualifying Exam are that the student:

Qualifying Exam Outcome	**Next Step**
Passed unconditionally (a)	Advance to candidacy
Passed conditionally (b)	Complete condition for passing
Failed (c)	Retake Qualifying Exam if eligible

(a) Passed unconditionally; the student advances to candidacy.
(b) Passed conditionally; in this case, the faculty will outline the weakness and the conditions the student must fulfill before reconsideration (e.g., specific courses must be taken with performance at a specified level; communication skills need to be improved as evidenced by...). With the Chair's endorsement, the student will later request a change from "conditional pass" to "pass" after he/she believes that the conditions have been fulfilled. The student will outline in this request the reasons for this belief. The Exam Committee will meet again to act on the request.
(c) Failed, with or without option to retake. The student may retake the Qualifying Exam once.