Five-Year Academic Program Review

Department of Medical Informatics and Clinical Epidemiology

Reviewed by: Charles Allen, David Covell, Karla Kent, Owen McCarty, Sean Molloy, Tracy Bumsted, Joanne Noone, Margaret Scharf

Reviewed on: February 15, 2013

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*Two programs submitted the Five-Year Academic Program Review prior to the development of the new template. Original submissions were included to demonstrate the difference in reporting requirements.
July 15, 2013

William Hersh, M.D., Professor and Chair
Department of Medical Informatics and Clinical Epidemiology
School of Medicine

Dear Dr. Hersh and Faculty:

The primary goal of the Academic Program Review is to maintain and strengthen the quality of OHSU’s undergraduate and graduate degree programs. Reviews are intended to be helpful and supportive in (i) recognizing strengths and achievements of academic programs; (ii) promoting program planning and goal setting aligned with OHSU’s strategic plan (Vision 2020) and the requirements of the Northwest Commission on Colleges and Universities and specialized accreditation agencies; and (iii) identifying areas unique to and/or common among academic programs that require attention. In carrying out these aims, each program will be reviewed at least once every five years. In preparing for this review, each unit scheduled for review conducts a self-review that focuses on its current situation and expectations for the next three to five years.

Completing the five-year Academic Program Review indicates Medical Informatics and Clinical Epidemiology’s commitment to on-going programmatic improvements and excellence. As this self-review process is new to OHSU, the Academic Program Review Committee values your contribution as we contemplate the most effective and efficient way to carry out this trailblazing work.

Between the time you submitted the self-review report and the APR Committee was installed fully, the self-review template changed to improve clarity. The evolution was taken into account when your self-review report was discussed and evaluated by a Review Team of three members of the Academic Program Review Committee in February 2013. Noting that the program submitted the APR prior to the revised format, the committee’s recommendations primarily focus on changes to make in future reports. The following commendations and recommendations summarize the Review Team’s findings.

Commendation: The Review Team commends DMICE in three areas: (1) being collaborative and interprofessional in program design and implementation; (2) utilizing a highly trained, expert faculty; and (3) monitoring graduate progress or alumni outcomes and the evidence of solid workforce placement.

Recommendation: The next review in 2017 should strive for more analysis and self-reflection about future plans and goals. This might be considered in light of the program’s financial model and funding sustainability.

The Review Team’s comprehensive evaluation including ratings, commendations and recommendations specific to each section of the report follows.

Part I. Introduction
Finding: The original template did not ask programs to record the data required in this section. The committee acknowledges this change in requirements from the original submission.
Part 2. Overview
Rating: Highly Developed. Program has established its own set of Mission, Purpose, and Goals (MPGs) unique to the program, AND are aligned with university MPGs and stated clearly and concisely.
Commendation: The program did a good job describing the alignment with and contribution to the OHSU mission.
Recommendation: For future reports, separate the program purpose and goals from the program mission statement.

Part 3. Faculty and Staff Resources
Rating: Developing. Discussion of faculty trends; preliminary planning for program development, faculty diversity recruitment and retention. All courses are taught by highly qualified faculty. Program uses academic program services to a limited extent.
Commendation: The faculty list represents an impressive cross-section of the university.
Recommendation: The committee felt that more analysis in this section is needed in future reports.

Part 4. Enrollment/Degree Production
Rating: Developing. Curriculum appears to reflect current practice in the discipline. No discussion of employment projections or prospects for program graduates. Some discussion about student diversity and planning for recruitment.
Commendation: Clearly demonstrated understanding of the barriers to having a more diverse student population and articulated ideas of how to address the issue.
Recommendation: Provide more discussion and analysis about how the number of students being admitted works toward the program's enrollment goals.

Part 5. Other Resources
Rating: Highly Developed. Detailed analysis of resource adequacy for the 5-year period; uses data to identify program needs and priorities. Informed by comparison to peer universities.
Commendation: The program demonstrated significant available resources and provided good detail regarding the source of those resources.
Recommendation: Provide more information about circumstances influencing program expenditures and adequacy of other resources necessary to support the program.

Part 6. Student Learning Outcomes and Assessment
Rating: Highly Developed. Program-level student learning outcomes are clear and measurable; uses direct measures of learning; courses listed and linked to SLOs (curriculum mapping); defined levels of learning; assessment results regularly discussed by faculty committee; evidence of administrative support, use of technology and regular data collection to support assessment. Most students are aware of the findings.
Commendation: The committee was thoroughly impressed with the alumni tracking system (response to 6.4, Employment Outcomes).
Recommendation: More clearly link SLO's and assessments; spell out acronyms.

Part 7. Other Information (Optional for Programs)
N/A
Part 8. Analysis and Conclusions
Rating: Highly Developed. Reflects spirit of continuous improvement and self-reflection; specific program/curricular changes are discussed and based on evidence and trends.

Commendation: Overall the committee felt the report did a great job describing the program. Some of the strengths of the program as demonstrated in the report: students seem to be doing extremely well finding positions based on their training; the program is finding needs in the larger community for their program and successfully placing students to meet community needs; demonstration of expert faculty; collaborative and interprofessional; funding for students is impressive and strong (coupled with concern below); program mission accomplished.

Recommendation: In general more self-evaluation and analysis is needed in all areas in future reports. Set benchmarks for improvement. Provide more description and evidence of the program's financial model and funding sustainability.

Part 9. Response to Previous Program Reviews
N/A

Part 10. Overall Recommendations
The program submitted their report prior to the development of the new Academic Program Review template and the committee took this into consideration in every part of the evaluation.

The Medical Informatics and Clinical Epidemiology program is invited to submit comments addressing the Review Team’s findings, or any component of the Academic Program Review process. Send comments to Sarah Kennedy (kennedsa@ohsu.edu) by August 19, 2013, and those comments will be included in the report to Faculty Senate at the September 12, 2013, meeting.

The Academic Program Review Committee determined that the Medical Informatics and Clinical Epidemiology program meets the academic standards of Oregon Health & Science University. Based on these findings, your next review is scheduled for 2017-18 by the Faculty Senate APR Committee, with your self-review and school-level processes beginning and concluding no later than 2016-17.

Sincerely,

Charles Allen, Ph.D., Committee Chair

CC: Jeanette Mladenovic, M.D., M.B.A., M.A.C.P., Provost
Mark Richardson, M.D., M.Sc.B., M.B.A., Dean
Allison Fryer, Ph.D., Associate Dean
1. Introduction

Program Name: Biomedical Informatics Graduate Program

1.1 Identify the participants in the self-evaluation process. Please select all that apply.

- Faculty
- Students
- Staff
- Alumni
- Employers

1.2 When were meetings held to complete this self-evaluation process? Add date fields as needed.

1.3 Who prepared the document?

1.4 Who reviewed the report?

1.5 Provide the faculty vote on the final draft of the report.

Number of faculty eligible to vote: 
Number Agreed: 
Number Disagreed: 
Number Abstained: 

2. Overview
2.1 Describe the program.

Use the box below to write the program mission

The mission of the Biomedical Informatics PhD Program is to develop independent researchers, dedicated teachers and imaginative leaders in healthcare, academia, and industry. The development of leaders who can bring novel strategies and new ideas to the interdisciplinary domain of biomedical informatics is also a high priority objective.

Use the box below to describe the program’s purpose

Use the box below to identify the program’s goals.

2.2 How do these align with, and contribute to, the fulfillment of OHSU’s mission, strategic goals, and core themes?

This program impacts all four missions of OHSU: healing, learning, discovery, and community service. The healing mission is fulfilled by the fact that biomedical informatics applications have the potential to improve the outcomes and reduce the costs of health care. The learning mission recognizes that OHSU provides education in the broad array of health care professions, including biomedical informatics. The discovery mission is met by the well-funded research programs of the program faculty who develop new means to improve health and biomedicine.

The community service mission results from the outreach programs that improve the ability of health care practitioners and others to use information resources knowledgably. In general, this program will contribute to all the missions of OHSU, developing new researchers, teachers, and leaders in this area in biomedical informatics.

2.3 Describe the curriculum, and if more than one award is given, highlight the progression in difficulty. Use the "Attach File" button below to upload the curriculum.

[Attachment: DMICE Curriculum.docx]

3. Faculty and Staff Resources (Use the State of the Program Reports from the last five years to address these questions.)

3.1 Describe the major research thrusts of faculty, areas in which the research is particularly strong, areas that need to be strengthened and current research support.

<table>
<thead>
<tr>
<th>Name/Degree(s)</th>
<th>Rank</th>
<th>Primary (&amp; Secondary) Appointment(s)</th>
<th>Role in Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joan Ash, PhD</td>
<td>Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Associate Director, Clinical Informatics Faculty, Advisor/</td>
</tr>
<tr>
<td>Name/Degree(s)</td>
<td>Rank</td>
<td>Primary (&amp; Secondary) Appointment(s)</td>
<td>Role in Program</td>
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</tr>
<tr>
<td>Armand Bankhead, PhD</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Eilis Boudreau, MD, PhD</td>
<td>Assistant Professor</td>
<td>Department of Neurology (Department of Medical Informatics &amp; Clinical Epidemiology) (Portland VA Medical Center)</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Lucia Carbone, PhD</td>
<td>Assistant Professor</td>
<td>Medical and Molecular Genetics (Department of Medical Informatics &amp; Clinical Epidemiology) (Oregon National Primate Research Center)</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Michael Chiang, MD</td>
<td>Professor</td>
<td>Department of Ophthalmology (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Aaron Cohen, MD, MS</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>David Dorr, MD, MS</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Division of General Internal Medicine and Geriatrics, Department of Medicine)</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Karen Eden, PhD</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Associate Director for Fellow Evaluation and Progress; Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Mark Englestad, MD, DDS</td>
<td>Associate Professor</td>
<td>Oral &amp; Maxillofacial Surgery, School of Dentistry (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor, Dental Informatics</td>
</tr>
<tr>
<td>Justin Fletcher, PhD</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>Paul Gorman, MD</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Providence Portland Medical Center)</td>
<td>Faculty, Advisor/Mentor</td>
</tr>
<tr>
<td>William Hersh, MD</td>
<td>Professor and Chair</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Division of General Internal Medicine and Geriatrics, Department of Medicine) (Department of Public Health &amp; Preventive Medicine)</td>
<td>Program Director; Faculty, Advisor/Mentor</td>
</tr>
</tbody>
</table>
### Name/Degree(s)  
**Michelle Hribar, PhD**  
**Instructor**  
Department of Medical Informatics & Clinical Epidemiology  
Faculty

**Holly Jimison, PhD**  
**Associate Professor**  
Department of Medical Informatics & Clinical Epidemiology (Department of Public Health & Preventive Medicine)  
Faculty, Advisor/Mentor

**Jayashree Kalpathy-Cramer, PhD**  
**Instructor**  
Department of Medical Informatics & Clinical Epidemiology (Department of Radiation Oncology)  
Faculty, Advisor/Mentor

**Kathryn Pyle Krages, AMLS, MA**  
**Assistant Professor**  
Department of Medical Informatics & Clinical Epidemiology  
Faculty

**Judith Logan, MD, MS**  
**Associate Professor**  
Department of Medical Informatics & Clinical Epidemiology  
Faculty, Advisor/Mentor

**Curt Machida, PhD**  
**Professor**  
Department of School of Dentistry  
Advisor/Mentor, Dental Informatics

**Shannon McWeeney, PhD**  
**Associate Professor**  
Department of Public Health & Preventive Medicine (Department of Medical Informatics & Clinical Epidemiology) (Knight Cancer Institute) (Oregon Clinical and Translational Research Institute)  
Associate Director, Bioinformatics and Computational Biology; Faculty, Advisor/Mentor

**Vishnu Mohan, MD**  
**Assistant Professor**  
Department of Medical Informatics & Clinical Epidemiology  
Faculty, Advisor/Mentor

**Eli Schwarz, DDS, PhD, MPH**  
**Professor and Chair**  
Department of Community Dentistry, School of Dentistry  
Faculty, Advisor/Mentor, Dental Informatics

**Kemal Sonmez, PhD**  
**Associate Professor**  
Department of Biomedical Engineering (Department of Medical Informatics & Clinical Epidemiology)  
Faculty, Advisor/Mentor

**Denice Stewart, DDS, MHSA**  
**Professor; Associate Dean for Clinical Affairs**  
Department of Community Dentistry, School of Dentistry  
Head, Dental Informatics; Faculty, Advisor/Mentor

**Joanne Valerius, MPH**  
**Assistant Professor**  
Department of Medical Informatics & Clinical Epidemiology  
Faculty

**Amanda Vinson, PhD**  
**Assistant Professor**  
Department of Medical and Molecular Genetics (Department of Medical Informatics & Clinical Epidemiology) (Oregon National Primate Research Center)  
Faculty, Advisor/Mentor

**Beth Wilmot, PhD**  
**Instructor**  
Oregon Clinical and Translational Research Institute (Department of Medical Informatics & Clinical Epidemiology)  
Faculty, Advisor/Mentor

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3.2 Describe how OHSU has maintained adequate qualified faculty members and staff members in relation to the program’s growth over the last five years.
3.3 How successful has the program been in attracting and retaining faculty and leadership from demographically diverse backgrounds?

One of our graduates and now faculty members, Justin Fletcher, PhD, MS, is Native American.

3.4 If recruitment and retention efforts have not produced desired diversity, what are your plans to recruit diverse faculty? What resources will be used or are needed to achieve these results?

Continue to work with CDI.

3.5 What services has the program utilized to increase program effectiveness and further the academic mission? Please choose all that apply.

- Teaching and Learning Center
- Provost’s Office
- Library
- Center for Diversity and Inclusion
- Student Health

If "None" was selected, please explain why university services are not utilized.

4. Enrollment/Degree Production (Use the State of the Program Reports from the last five years to address these questions. Each question has an "Attach File" option where charts or tables can be uploaded to demonstrate or emphasize your analysis.)

4.1 Is the five-year enrollment trend appropriate to the program’s resources and capacity?

4.2 Has the number and/or quality of matriculates changed in the last five years? If so, how? What is the impact?
4.3 Is the five-year trend in awarding degrees and certificates appropriate to the program’s resources and capacity?

4.4 How successful has the program been in attracting students from demographically diverse backgrounds?

**DIVERSITY.**

Number and percentage of Underrepresented Minorities (URM): 5% of applicants and 2.63% of enrolled students since 2006.

The field of biomedical informatics as a whole has had a challenging time increasing and retaining students from diverse backgrounds. Improving diversity in our program is made even more challenging by the lack of a diverse population in our state. We continue to expand our recruitment plans by creating new relationships with undergraduate universities, diverse professional groups and civic community organizations with the goal of creating a larger pool of prospective candidates to become future trainees in our program. We are pleased to report that our ongoing efforts to increase diversity have achieved success in recent years. Most notably, we currently have three African-American trainees funded on our NIH training grant. Tracie Nettleton is a predoctoral trainee pursuing a PhD in the BCB track, while Yves Vingemon, MD is a postdoctoral trainee pursuing an MS degree in the clinical informatics track. Another African-American predoctoral trainee, Olubumi Akiwumi, started the PhD program this fall. We have also had two STTP diversity slots filled in recent years as part of our NIH-funded summer internship program.

4.5 If you have not achieved desired results, what are your plans to recruit diverse students that add value to the learning environment? What resources will be used or are needed to achieve these results?

Even though we have begun to achieve success in increasing diversity, we still plan work with the OHSU Center for Diversity and Multicultural Affairs (CeDMA).

4.6 What is the evidence of regional, national or international need for additional qualified individuals such as the program is producing? Please specify.

There continues to be strong demand for professionals and academicians in biomedical informatics in the foreseeable future. OHSU has been a leader not only in meeting this demand, but helping to define it. The program successfully competed for ARRA grants related to health information technology workforce development as part of the HITECH Program to provide incentives for adoption of electronic health records. There is also demand in other areas of informatics, most notably in the strong emphasis placed on...
informatics by the NIH Clinical and Translational Science (CTSA) Award.

4.7 Program availability (please select all that apply):

- Full-time
- Part-time
- Evening
- Weekend
- Place-bound

5. Other Resources

5.1 What is the current budget (present year) for this program?

FINANCIAL RESOURCES.

The PhD program in Biomedical Informatics continues to be funded through the National Library of Medicine. The program has received funding from NLM for Pre-docs and Post-docs for the past 20 years and earlier this year obtained a strong score on its competitive renewal for the next five-year cycle of funding. The funding provides students with a living stipend, healthcare coverage, tuition and fees and travel support for two national conferences each year. Pre-docs are allowed up to five years of funding, based on a year-to-year review of successful academic progress. The program has also been awarded ARRA funding to train 13 master’s students in the clinical informatics track. The funding offers a small stipend, healthcare coverage and tuition and fees for 18 months. The 13 slots have been filled to date. We matriculated eight students to this program Fall 2010 and awarded the remaining five slots Fall 2011. With the exception of these 13 master’s students, all other master’s students self-fund their education.

5.2 What revenue sources does the program have access to? Choose all that apply:

- Tuition
- State Appropriations
- Clinical/Patient Care
- Grants/Contracts
- Philanthropy

5.3 How does tuition (or graduate stipends) compare to similar programs at other institutions (ideally, compare against programs on the institutional peer list)?

Tuition for similar programs varies significantly by programs recently surveyed. The Biomedical Informatics Master’s program average tuition is only slightly above average for non-residential students ($34,320 compared with $33,650 average), and about 20% above average for residents although significantly below the most expensive comparable programs. Pre-doctoral students are funded almost exclusively through the department’s NLM Fellowship program, this department being one of 12 in the nation and with continuous funding for this program since 1992.

5.4 Evaluate the adequacy of other resources necessary to support this program (e.g. library, computer equipment, facilities, research labs, clinical placements).

5.5 Has anything happened since the last review that has influenced expenditures?

- Yes
6. Student Learning Outcomes and Assessment (Use assessment reports from the past five years.)

6.1 Summarize how faculty members engage in ongoing systematic collection and analysis of meaningful, accessible and verifiable data that are appropriate indicators of student and graduate achievement of student learning outcomes.

STUDENT ASSESSMENTS.

PhD students are reviewed on an annual basis in late winter. They are rated based on, not only the academic progress and good academic standing in the coursework, but also through expectations that are set for each year of the program.

PhD students receive the below information upon matriculation. Completion of each of these elements will ensure graduates have a strong foundation in biomedical informatics and the activities to become a successful Post-doc and/or Junior Faculty member.

PreDoc Student Expectations
Year 1 – Predocs
Presentations and poster sessions (including, but not limited to)

Present – choose from one event
1. Weekly PhD/Fellowship meeting
2. Thursday research conference
3. Annual Open House
4. AMIA submission
5. NLM Training meeting submission
6. Oregon HIM meeting submission

And

Poster session – choose from one event
1. Open House
2. Student research forum (OHSU)
3. OrHIMSS
4. AMIA submission
5. NLM Training meeting submission

Attendance
1. 80% of weekly PhD/Fellows meeting
2. 80% of Thursday research conference
3. One NLM Fellowship Training meeting
4. One Professional Meeting (AMIA, HIMSS, Bioinformatics meeting)

Mentoring
1. Identify faculty member to work with by Annual Review in March
2. Begin work with mentor after Annual Review in March (if not before)

Academic Progress
1. Student must be in good academic standing (3.0 + GPA)
2. Student must complete 30.0 credits in the first academic year

Comprehensive Examination (predocs in clinical track only)
Year 2 – Predocs

Year 1+ Abstract
Submit abstract to one of the following:
1. National Meeting (AMIA, HIMSS, NLM Fellows Training Meeting, ACM BCB Conference)
2. Manuscript
3. Journal

Must be peer-reviewed
Can be local or national

Complete all required courses, in good academic standing to sit for qualifying exam

Qualifying Examination (predocs only, bioinformatics and clinical tracks)

Convene Advisory Committee for dissertation

Year 3 – Predocs

Year 4 – Predocs

Year 2+

Dissertation Completion

Year 5 – Predocs

Submit K99 grant proposal

Submission Deadlines*

AMIA Annual Symposium (Fall)
https://www.amia.org/meetings
Paper due - March
Panel due - March
Abstracts due - March

AMIA Spring Meeting
https://www.amia.org/meetings/
Due - Usually mid-December

AMIA Joint Summits on Translational Science (Spring)
https://www.amia.org/meetings/
Paper due – August
Panel due – October
Abstracts/Poster due – December

ISMB (many deadlines)
http://www.iscb.org/

NLM Training Meeting
March but watch for emails

Pacific Symposium on Biocomputing
http://psb.stanford.edu/

6.2 Summarize how the results are used to improve the program curriculum, learning experiences, instruction, student recruitment and/or academic and learning support.

6.3 Describe briefly any other evidence considered in evaluating your program's effectiveness (student time-to-degree, retention and graduation rates, advisor/advisee relationships, mentoring).

6.4 What evidence does the program have about employment and/or further professional or graduate-level activities of program completers? What and how are alumni doing (e.g., industry or self-employment, geographic location, job, success indicators)?

EMPLOYMENT OUTCOMES.
Graduates of our program have attained employment in academic and operational positions. We actively track the employment of our alumni to the extent that graduates are willing to provide information to us.

In the academic sphere, our graduates have achieved great success. Some notable examples include:

- **Joan Ash, PhD, MBA, MLS** is Professor and Vice Chair of DMICE, and well-known in the field as a leader and for her research in people and organizational issues (completed NLM Individual Fellowship in 1994).
- **Jason Lyman, MD, MS** is Associate Professor, Division of Clinical Informatics, Department of Health Evaluation Sciences, University of Virginia (graduated in 2000 with MS).
- **Peter Embi, MS, MS** is Associate Professor & Vice Chair in the Department of Biomedical Informatics as well as Chief Research Information Officer at The Ohio State University Medical Center (graduated VA fellowship in 2002 with MS).
- **Aaron Cohen, MD, MS** is Associate Professor in DMICE (graduated in 2005 with MS).
- **Anne Turner, MD, MPH** is Assistant Professor in the Department of Health Services in the School of Public Health at the University of Washington (graduated in 2006).
- **Ellis Boudreau, MD, PhD** is Assistant Professor in DMICE and the OHSU Department of Neurology, and has become a leader in our BCB track (graduate VA fellowship in 2006)
- **Adam Wright, PhD** was the first individual to obtain a PhD from our program in 2007. He won numerous awards while a trainee, including the AMIA Student Paper Competition and the OHSU SOM John A. Resko Award for Outstanding Dissertation. Since obtaining a faculty position at Harvard University and Partners Healthcare, he has led a productive research program and received the AMIA Young Investigator Award in 2010.
- **Jayashree Kalpathy-Cramer, PhD, MS** is a recent trainee who graduated in 2009 and was awarded a K99-R00 by the NLM. She is currently an Instructor in DMICE and is evaluating faculty position offers, including one at OHSU, for activating her R00.
- **Joshua E. Richardson, PhD., MS, MLIS**, is an Instructor in the Division of Quality and Medical Informatics at Weill Cornell Medical College (graduated in 2010 with PhD).

Likewise, many graduates have obtained success in operational informatics employment, examples of which include:

- **Michael Riben, MD** completed the program in 2001 and currently serves as Director of Anatomic Pathology Informatics at the University of Texas MD Anderson Cancer Center in Houston, TX.
- **Thomas Yackel, MD, MPH, MS** completed the program in 2002 and now serves as Chief Health Informatics Officer at OHSU. Dr. Yackel has led OHSU Hospital & Clinic's highly successful implementation of the Epic electronic health record.
- **Michael Lieberman, MD, MS** recently became Associate Chief Health Informatics Officer at OHSU. Prior to that, he served as Director of the Medical Quality Improvement Consortium at GE Healthcare. He completed the program in 2003.
- **Susan Price, MD, PhD** completed the program in 2005 and serves as Senior Program Manager for SQL Server at Microsoft in Seattle, WA.
- **Daren Nicholson, MD** completed the program in 2006 and currently serves as Senior Product Manager at Axolot Corp., a company that makes products for health information exchange.
- **Blake Lesselroth, MD, MS** completed the program in 2007 and serves as Chief of Clinical Applications at Portland VA Medical Center.
- **Susan Woods, MD, MS** completed the program in 2009 and serves as Associate National Director for eHealth in the Office of Informatics & Analytics at Veterans Health Administration.

Two of our PhD graduates have also assumed operational informatics roles.
- **Ken Guappone, MD, PhD** received his PhD in 2008 and currently serves as Clinical Decision Support Physician at Providence Health and Services in Portland, OR.
- **Jianji Yang, PhD** completed her PhD in 2008 and now serves as Bioinformatics Manager at the Portland VA Medical Center.
- **Emily Campbell, RN, MS, PhD** completed her PhD in 2010 and now serves as Director of Clinical Informatics.
at the Oregon Anesthesiology Group in Portland OR.

Additional employment outcome information can be provided if desired.

7. **Other Information** (optional)

8. **Analysis and Conclusions**

8.1 *What are the strengths and achievements of the program’s faculty, students and graduates?*

8.2 *How will the self-study be used for improvement against goals and targets? How will it inform planning, decision making and allocation of resources and capacity for the next five years?*

Our major plan for the coming year is to continue to train and mentor our existing fellows for success in the field as well as improve the infrastructure of the program. One effort was an information gathering effort of other programs’ approaches to tracking and evaluating fellows to develop better methods for doing it ourselves. Under the leadership of faculty member Dr. Karen Eden, we put into place a new tracking and evaluation process that we applied this year to all fellows.

8.3 *What new resources and/or support do you need to achieve these goals and improvement targets?*

9. **Response to Previous Program Reviews**

10. **Signature and Submission**

The preparer’s email address below acts as a signature verifying the report is complete and ready for submission.

Preparer’s email address: 

Date Submitted: 
**ACADEMIC PROGRAM.**

The OHSU Biomedical Informatics Graduate Program offers a variety of Graduate Certificates and degrees in three tracks: clinical informatics (CI), bioinformatics and computational biology (BCB), and health information management (HIM). The CI and HIM tracks are focused on the healthcare and public health arenas, while the BCB track is focused on translational bioinformatics and personalized medicine. The Graduate Certificate and degree programs are implemented on a building-block model, where courses at any level can be carried to programs at higher levels. The most basic program is the Graduate Certificate program, which is offered for the CI and HIM tracks. (The health information and management Graduate Certificate is CAHIIM-accredited and allows graduates to sit for the examination for the RHIA credential.) OHSU offers two master’s degree programs which differ only in the culminating project being a thesis (Master of Science) or a capstone or internship (MBI). The master’s degree programs are offered for the CI and BCB tracks (although HIM Graduate Certificate graduates can easily move into the CI master's programs). OHSU's PhD program is offered for the CI and BCB tracks. All CI and HIM track programs up to and including the master's degree programs are available both on-campus and via distance learning. The BCB track and PhD program are only available on the OHSU campus.

**Biomedical Informatics Track information for PhD and Master's Program**

**Bioinformatics and Computational Biology**

Bioinformatics has become increasingly algorithmic and quantitative, in particular in the area known as computational biology. The primary goal of both our Master's programs (MBI and MS) in bioinformatics is to provide students with a rigorous grounding in the tools needed to successfully address current problems in the field. To this end, our bioinformatics track focuses on developing five core strengths. Taken together, these domains make up the knowledge base of bioinformatics:

* Bioinformatics algorithms and statistical methods to research problems.
* Knowledge of biology, especially its genetics aspects, to bioinformatics and computational biology problems.
* Basic statistical analyses to bioinformatics problems.
* Basic computer science principles to problems in health and biomedicine.
* Students will build strong skills in advanced scholarship, including the ability to address ethical issues in the field, communicate effectively in oral and written form, and complete a dedicated research project in the form of a thesis (MS degree) or capstone (MBI degree).
Clinical Informatics
The primary goal of both our Master’s programs (MBI and MS) in Medical Informatics is to educate the future developers and managers of health care information systems. Individuals with a variety of backgrounds are provided a strong technical grounding in medical informatics, health and medicine, computer science, and research methods so that they may assume positions that require a thorough understanding of both information technology and the health care environment. The core domains that comprise a solid knowledge base in medical informatics are:

- Basic principles of biomedical informatics to problems in different domains of health and biomedicine.
- Operational knowledge of the human body in health and disease as well as the organization of the health care system.
- Principles of organizational behavior and management skills to biomedical informatics problems.
- Basic statistics and quantitative or qualitative research methods to evaluative research projects.
- Basic computer science principles to problems in health and biomedicine.
- Students will be adept in the tools of advanced scholarship, including the ability to address ethical issues in the field, communicate effectively in oral and written form, and complete a thesis (MS degree) or capstone (MBI degree).

Overview of Biomedical Informatics PhD Program
Our general plan for the PhD program is to impart students with the knowledge base of biomedical informatics and help them develop the skills to carry out research in this area. The knowledge base will primarily build from coursework and experiences already set out in our master’s degree programs but enhanced with more advanced courses. What will distinguish the doctoral program from the master’s degree programs, however, will be its emphasis on the research at a level that will allow students to make novel contributions to the field through the requirements of a doctoral dissertation.

The next table summarizes the course requirement of the doctoral program. Following this is a typical course of study. No course or equivalent can be used to fulfill more than one required element.

<table>
<thead>
<tr>
<th>Required Elements</th>
<th>Notes</th>
<th>Total Minimum Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstration of Clinical Informatics (CI) or Bioinformatics and Computational Biology (BCB)</td>
<td>Students will be required to complete all the subject (non-thesis/non-capstone) courses of the master’s degree programs. These include courses in four general areas: Biomedical Informatics (CI), Health and Biomedicine (CI), Computer Science (CI and BCB), Statistical Methods (CI and BCB), Algorithms and Statistical Methods (BCB), Biology (BCB). They will also be required to complete more advanced electives offered by the DMICE and other departments.</td>
<td>A minimum of 48 credits of subject courses will be required (similar to the master’s degree programs). Students with a background in certain areas (e.g., medicine or computer science) may substitute other courses but still must complete the required minimum 48 credits.</td>
</tr>
<tr>
<td>Advanced Research Methods and Design</td>
<td>These classes should be design and methods classes and can come from computational, social, and other sciences. These classes should be relevant to the proposed area of research; examples include a 3-course sequence in statistics geared toward doctoral students or a comparable sequence in computational analytical techniques.</td>
<td>12 credits minimum; coherent set of courses approved by advisor.</td>
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<td>Cognate Area (Distributed (across departments) or</td>
<td>In consultation with the academic advisor, students will select 4 courses to complement the proposed</td>
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</table>
Concentrated (within one department)) | area of research. These should be graduate level courses and may be taken at other institutions or in other OHSU Departments. | in a cognate area in medical informatics |
---|---|---|
PhD/Post-Doc Meeting | Topics will vary each quarter 1 credit per quarter. | 10 credits minimum. |
Symposium | State of the art literature synthesis in an area of research from which the student will be questioned during a student symposium and graded by 3 faculty members. Student symposia will be scheduled during several weeks during the quarter, and each student presentation can last no more than 20 minutes. | 3 credits; must be taken during the fifth or sixth quarter of enrollment. |
Dissertation and Research | To be taken with advisor | 48 credits |

**Required element Notes Total Minimum Credits**

We anticipate that most students will take from 18 – 24 months to complete coursework and take qualifying exams (written and oral); and another 12 – 24 months to conduct independent research, prepare a dissertation, publicly present and orally defend it. Students who already have a master’s or equivalent degree in biomedical informatics may spend less time in the coursework phase.

The following is a typical timeline for the PhD program:

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + Comprehensive Examination (CI)</td>
</tr>
<tr>
<td>2</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Cognate Area + PhD/Post-Doc Meeting</td>
<td>Cognate Area + PhD/Post-Doc Meeting</td>
<td>Research Credits + Qualifying Examination (CI and BCB)</td>
</tr>
<tr>
<td>3</td>
<td>Research Credits + Directed Reading + Mentored teaching + PhD/Post-Doc Meeting</td>
<td>Research Credits + Symposium + PhD/Post-Doc Meeting</td>
<td>Research Credits + Pre-proposal defense + Mentored teaching + PhD/Post-Doc Meeting</td>
<td>Research Credits</td>
</tr>
<tr>
<td>4</td>
<td>Research Credits + PhD/Post-Doc Meeting</td>
<td>Research Credits + PhD/Post-Doc Meeting</td>
<td>Dissertation defense and final written</td>
<td></td>
</tr>
</tbody>
</table>

Doctoral students will be required to maintain enrollment during the entire period of their training. This requirement will be satisfied by coursework during the pre-candidacy period and with dissertation and research enrollment after being admitted to candidacy. A residency requirement of 12 – 15 credits for six consecutive terms will be required in accordance with the bylaws of the School of Medicine Graduate Council. A minimum of 135 credits will be required for graduation.
Overview of Biomedical Informatics Master’s Program
The goal of the curriculum is to produce students capable of assuming appropriate jobs in biomedical informatics in both industry and academia. The Master of Science (MS) curriculum consists of 60 credit hours, including 41 credit hours of required coursework, 12 credit hours of thesis work, and a minimum of 7 hours of electives. The Master of Biomedical Informatics (MBI) curriculum consists of 52 credit hours including 43 credit hours of required coursework, 6 credit hours of capstone project work, and a minimum of 3 credit hours of electives. A full-time student should be able to complete the coursework portion of the program in 4-6 quarters. Part-time enrollment in the program is allowed.

Following this is a typical course of study. No course or equivalent can be used to fulfill more than one required element.

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The following is a typical timeline for the Master's program:

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<th>Spring</th>
<th>Summer</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Subject courses</td>
<td>Subject courses</td>
<td>Subject courses</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Subject courses</td>
<td>Subject courses</td>
<td>Subject courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ Capstone or Thesis</td>
<td>+ Capstone or Thesis</td>
<td>+ Thesis</td>
<td></td>
</tr>
</tbody>
</table>

**LEARNING OUTCOMES.** At the end of the training period, all of our graduates will be able to:

1. Apply informatics methods and tools to solving problems related to personal health, health care, public health, and biomedical research.
2. Demonstrate knowledge in the underlying biological, clinical, and health domains to be able to apply informatics tools.
3. Critically select, apply, and evaluate information and other technologies in support of informatics methods for solving biomedical and health problems.
4. (For MS and PhD students) Carry out independent research under the mentorship of a faculty member in biomedical informatics.
Field 4.2: Student Selectivity, 2007 – 2011

5: Average GPAs of Matriculating Students

![Chart showing average GPAs from 2007 to 2011. The GPAs range from 3.62 to 3.67.]

6: Average GRE Verbal & Quantitative Scores of Matriculating Students

![Chart showing average GRE scores from 2007 to 2011. The scores range from 668 to 675.]

### 1. INTRODUCTION

- **1. Early Development:**
  Process is incomplete, omitted dates of meetings or voting record; self-study compiled primarily by program head or a senior faculty member; little faculty and staff input; no input from students or other stakeholders.

- **2. Developing:**
  Process is complete, with dates of meetings and record of faculty vote; but engagement of stakeholders is narrow.

- **3. Highly Developed:**
  Process is complete, with dates of meetings and voting record; engagement of faculty, staff, students and other stakeholders is broad and collaborative.

**Reviewer's Comments:**
N/A
In the original template programs were not asked to record the data required in this section. The committee acknowledged this change in requirements from the original submission.

### 2. OVERVIEW

- **1. Early Development:**
  Overview is incomplete; program has not created MPGs or MPGs are not aligned with university MPGs.

- **2. Developing:**
  Program has established its own set of MPGs unique to the program, but MPGs are not aligned with university MPGs.

- **3. Highly Developed:**
  Program has established its own set of MPGs unique to the program, AND are aligned with university MPGs and stated clearly and concisely.

**Reviewer's Comments:**

**Commendations:** The program did a good job describing the alignment with and contribution to the OHSU mission.

**Recommendations:** For future reports, separate the program purpose and goals from the program mission statement.

### 3. FACULTY AND STAFF RESOURCES

- **1. Early Development:**
  No discussion of faculty trends that affect program development and faculty diversity; no succession planning (recruitment, retention, retirement, needs) is evident. Temporary/adjunct faculty teach majority of the courses in the curriculum. Program does not avail itself of academic and student services.
2. Developing:
Discussion of faculty trends; preliminary planning for program development, faculty diversity recruitment and retention. All courses are taught by highly qualified faculty. Program uses academic program services to a limited extent.

3. Highly Developed:
Explicit planning for program development based on faculty diversity and recruitment/retention needs. Supporting data used in planning. All courses taught by high quality faculty current in the field. Program draws upon relevant academic and student services to increase program effectiveness.

Reviewer's Comments:
Commendations: The faculty list represents an impressive cross-section of the university
Recommendations: The committee felt that more analysis in this section is needed in future reports.

4. ENROLLMENT/DEGREE PRODUCTION

1. Early Development:
No analysis of program enrollment and degree production in the context of program development, capacity and sustainability. No discussion of student diversity and plans to increase student diversity to achieve core theme objectives. Static curriculum unreflective of changes in the field. Courses are not integrated into a coherent whole and do not reflect student needs. No discussion of curriculum to reflect current practice in the field, changing student needs or changing employment conditions.

2. Developing:
Curriculum appears to reflect current practice in the discipline. Uses some rudimentary analysis of trends in enrollment and degree production in the context of program quality and sustainability. No discussion of employment projections or prospects for program graduates. Some discussion about student diversity and planning for recruitment.

3. Highly Developed:
Innovative, dynamic curriculum; program development based on data about student performance and developmental needs. Well-developed and successful plans for student diversity recruitment, retention and success. Data analysis reflects trends and understanding of both internal and external forces. Informed by comparison to peer universities.

Reviewer's Comments:
Commendations: Clearly demonstrated understanding of the barriers to having a more diverse student population and articulated ideas of how to address the issue.
Recommendations: Provide more discussion and analysis about how the number of students being admitted works toward the program’s enrollment goals.

5. OTHER RESOURCES

1. Early Development:
No discussion about resource adequacy. No 5-year planning for resources. Does not identify needs or priorities. Does not identify important contextual factors or extenuating circumstances related to resource planning.

2. Developing:
Preliminary discussion of the adequacy of resources; no resource planning for or identification of potential new revenue streams for the next 5 years. Identifies needs or sets priorities, but not linked to data. Limited discussion of context and extenuating circumstances affecting resource planning.

3. Highly Developed:
Detailed analysis of resource adequacy for the 5-year period; uses data to identify program needs and priorities. Developed understanding of unique program circumstances affecting resource needs. Informed by comparison to peer universities.
Reviewer's Comments:

**Commendations:** The program demonstrated significant available resources and provided good detail regarding the source of those resources.

**Recommendations:** Provide more information about circumstances influencing program expenditures and adequacy of other resources necessary to support the program.

6. STUDENT LEARNING OUTCOMES AND ASSESSMENT

- **1. Early Development:** Program-level student learning outcomes vague and not measureable; courses or experiences required for the degree/certificate are listed but not linked to the SLOs; assessment methods are not identified; no evidence of faculty engagement in the discussion of assessment results to improve curriculum, academic support services, faculty development and the like.

- **2. Developing:**
  Program-level student learning outcomes clear and measureable, reflecting three learning domains (Bloom’s taxonomy); indirect and direct measures of learning are used; faculty committee discusses assessment results and uses results to improve curriculum and results; evidence of administrative support for assessment and resources for regular data collection. Some students are aware of the findings.

- **3. Highly Developed:**
  Program-level student learning outcomes are clear and measureable; uses direct measures of learning; courses listed and linked to SLOs (curriculum mapping); defined levels of learning; assessment results regularly discussed by faculty committee; evidence of administrative support, use of technology and regular data collection to support assessment. Most students are aware of the findings.

Reviewer's Comments:

**Commendations:** The committee was thoroughly impressed with the alumni tracking system (response to 6.4, Employment Outcomes).

**Recommendations:** More clearly link SLO's and assessments; spell our acronyms.

7. OTHER INFORMATION (OPTIONAL FOR PROGRAMS)

- **1. Early Development:**
  Additional information provided about the program did not contribute to the reviewers’ understanding of the program and its effectiveness.

- **2. Developing:**
  Additional information was relevant, but did not contribute significantly to the reviewers’ evaluation of program effectiveness.

- **3. Highly Developed:**
  Additional information enhanced the discussion of specific actions or changes to be taken in the next 5 years.

Reviewer's Comments:

N/A

8. ANALYSIS AND CONCLUSIONS

- **1. Early Development:**
  Discussion of strengths, accomplishments and improvements needed are superficial and not likely to lead to needed improvements over the next 5 years. Neither selected indicators for improvement, nor set targets; plan does not address curricular or program challenges ahead.
2. Developing:
Reflects spirit of continuous improvement; directions for next 5 years are reasonably developed; selected one indicator for improvement and set a realistic target; Core Themes considered.

3. Highly Developed:
Reflects spirit of continuous improvement and self-reflection; selected more than one indicator for improvement, but no more than three. Set reasonable 5-year targets for each; specific program/curricular changes are discussed and based on evidence and trends; Core Themes are directly addressed.

Reviewer's Comments:
Commendations: Overall the committee felt the report did a great job describing the program. Some of the strengths of the program as demonstrated in the report: students seem to be doing extremely well finding positions based on their training; the program is finding needs in the larger community for their program and successfully placing students to meet community needs; demonstration of expert faculty; collaborative and interprofessional; funding for students is impressive and strong (coupled with concern below); program mission accomplished.

Recommendations: In general more self-evaluation and analysis is needed in all areas in future reports. Set benchmarks for improvement. Provide more description and evidence of the program’s financial model and funding sustainability.

9. RESPONSE TO PREVIOUS PROGRAM REVIEWS

1. Early Development:
Program did not address or implement recommendations, nor give an explanation for not doing so.

2. Developing:
Program implemented some recommendations. Provides explanation for not addressing all.

3. Highly Developed:
Program effectively addressed most, if not all, recommendations or incorporated them into its current 5-year plan.

Reviewer's Comments:
N/A

10. OVERALL RECOMMENDATIONS

Does the sub-committee believe the program meets OHSU academic standards?
- Yes  - No

Additional comments for Faculty Senate consideration.
The program submitted their report prior to the development of the new Academic Program Review template and the committee took this into consideration in every part of the evaluation.
Academic Program Review and Evaluation

PROGRAM INFORMATION

School: Medicine
Program Name: Biomedical Informatics Graduate Program
Degree/Certificate Level(s): PhD, MS/MBI
Program Chair: William Hersh
Contact Information: Holly Jimison
E-mail: jimisonh@ohsu.edu
OHSU Phone: 4-4502

MISSION, CORE THEMES AND EXPECTATIONS

MISSION.
The mission of the Biomedical Informatics PhD Program is to develop independent researchers, dedicated teachers and imaginative leaders in healthcare, academia, and industry. The development of leaders who can bring novel strategies and new ideas to the interdisciplinary domain of biomedical informatics is also a high priority objective.

PROGRAM MISSION FULFILLMENT.
This program impacts all four missions of OHSU: healing, learning, discovery, and community service. The healing mission is fulfilled by the fact that biomedical informatics applications have the potential to improve the outcomes and reduce the costs of health care. The learning mission recognizes that OHSU provides education in the broad array of health care professions, including biomedical informatics. The discovery mission is met by the well-funded research programs of the program faculty who develop new means to improve health and biomedicine. The community service mission results from the outreach programs that improve the ability of health care practitioners and others to use information resources knowledgeably. In general, this program will contribute to all the missions of OHSU, developing new researchers, teachers, and leaders in this area in biomedical informatics.

1: Biomedical Informatics Current Enrollment

<table>
<thead>
<tr>
<th>MBI – Master of Biomedical Informatics</th>
<th>MS – Master of Science</th>
<th>PhD – Doctor of Philosophy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBI</td>
<td>MS</td>
<td>PHD</td>
<td>Total</td>
</tr>
<tr>
<td>77</td>
<td>24</td>
<td>12</td>
<td>113</td>
</tr>
</tbody>
</table>

24 21%
11% 12
21% 77 68%
2: Biomedical Informatics Graduates since 2006-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>MBI</th>
<th>MS</th>
<th>PHD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-2007</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>2007-2008</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>2008-2009</td>
<td>13</td>
<td>4</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>2009-2010</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>2010-2011</td>
<td>11</td>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>15</td>
<td>11</td>
<td>78</td>
</tr>
</tbody>
</table>

3: Submitted Applications vs. Matriculated Students
4: Student Publications (Detail Provided in Appendix)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-2007</td>
<td>26</td>
</tr>
<tr>
<td>2007-2008</td>
<td>12</td>
</tr>
<tr>
<td>2008-2009</td>
<td>15</td>
</tr>
<tr>
<td>2009-2010</td>
<td>17</td>
</tr>
<tr>
<td>2010-2011</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>94</strong></td>
</tr>
</tbody>
</table>

5: Average GPAs of Matriculating Students

![Bar chart showing average GPAs from 2007 to 2011. The average GPAs are 3.66, 3.65, 3.62, 3.64, and 3.67 respectively.]

6: Average GRE Verbal & Quantitative Scores of Matriculating Students

![Bar chart showing GRE scores from 2007 to 2011. The GRE Verbal scores are 668, 652, 678, 675, and 668 respectively. The GRE Quantitative scores are consistently 668 for each year.]
**DIVERSITY.**

Number and percentage of Underrepresented Minorities (URM): 5% of applicants and 2.63% of enrolled students since 2006.

The field of biomedical informatics as a whole has had a challenging time increasing and retaining students from diverse backgrounds. Improving diversity in our program is made even more challenging by the lack of a diverse population in our state. We continue to expand our recruitment plans by creating new relationships with undergraduate universities, diverse professional groups and civic community organizations with the goal of creating a larger pool of prospective candidates to become future trainees in our program. We are pleased to report that our ongoing efforts to increase diversity have achieved success in recent years. Most notably, we currently have three African-American trainees funded on our NIH training grant. Tracie Nettleton is a predoctoral trainee pursuing a PhD in the BCB track, while Yves Vingemon, MD is a postdoctoral trainee pursuing an MS degree in the clinical informatics track. Another African-American predoctoral trainee, Olubumi Akiwumi, started the PhD program this fall. One of our graduates and now faculty members, Justin Fletcher, PhD, MS, is Native American. We have also had two STTP diversity slots filled in recent years as part of our NIH-funded summer internship program. Even though we have begun to achieve success in increasing diversity, we still plan work with the OHSU Center for Diversity and Multicultural Affairs (CeDMA).

**ACADEMIC PROGRAM.**

The OHSU Biomedical Informatics Graduate Program offers a variety of Graduate Certificates and degrees in three tracks: clinical informatics (CI), bioinformatics and computational biology (BCB), and health information management (HIM). The CI and HIM tracks are focused on the healthcare and public health arenas, while the BCB track is focused on translational bioinformatics and personalized medicine. The Graduate Certificate and degree programs are implemented on a building-block model, where courses at any level can be carried to programs at higher levels. The most basic program is the Graduate Certificate program, which is offered for the CI and HIM tracks. (The health information and management Graduate Certificate is CAHIIM-accredited and allows graduates to sit for the examination for the RHIA credential.) OHSU offers two master's degree programs which differ only in the culminating project being a thesis (Master of Science) or a capstone or internship (MBI). The master's degree programs are offered for the CI and BCB tracks (although HIM Graduate Certificate graduates can easily move into the CI master's programs). OHSU's PhD program is offered for the CI and BCB tracks. All CI and HIM track programs up to and including the master's degree programs are available both on-campus and via distance learning. The BCB track and PhD program are only available on the OHSU campus.

**Biomedical Informatics Track information for PhD and Master's Program**

**Bioinformatics and Computational Biology**

Bioinformatics has become increasingly algorithmic and quantitative, in particular in the area known as computational biology. The primary goal of both our Master's programs (MBI and MS) in bioinformatics is to provide students with a rigorous grounding in the tools needed to successfully address current problems in the field. To this end, our bioinformatics track focuses on developing five core strengths. Taken together, these domains make up the knowledge base of bioinformatics:

* Bioinformatics algorithms and statistical methods to research problems.
* Knowledge of biology, especially its genetics aspects, to bioinformatics and computational biology problems.
* Basic statistical analyses to bioinformatics problems.
* Basic computer science principles to problems in health and biomedicine.
* Students will build strong skills in advanced scholarship, including the ability to address ethical issues in the field, communicate effectively in oral and written form, and complete a dedicated research project in the form of a thesis (MS degree) or capstone (MBI degree).
Clinical Informatics
The primary goal of both our Master’s programs (MBI and MS) in Medical Informatics is to educate the future developers and managers of health care information systems. Individuals with a variety of backgrounds are provided a strong technical grounding in medical informatics, health and medicine, computer science, and research methods so that they may assume positions that require a thorough understanding of both information technology and the health care environment. The core domains that comprise a solid knowledge base in medical informatics are:

* Basic principles of biomedical informatics to problems in different domains of health and biomedicine.
* Operational knowledge of the human body in health and disease as well as the organization of the health care system.
* Principles of organizational behavior and management skills to biomedical informatics problems.
* Basic statistics and quantitative or qualitative research methods to evaluative research projects.
* Basic computer science principles to problems in health and biomedicine.
* Students will be adept in the tools of advanced scholarship, including the ability to address ethical issues in the field, communicate effectively in oral and written form, and complete a thesis (MS degree) or capstone (MBI degree).

Overview of Biomedical Informatics PhD Program
Our general plan for the PhD program is to impart students with the knowledge base of biomedical informatics and help them develop the skills to carry out research in this area. The knowledge base will primarily build from coursework and experiences already set out in our master’s degree programs but enhanced with more advanced courses. What will distinguish the doctoral program from the master’s degree programs, however, will be its emphasis on the research at a level that will allow students to make novel contributions to the field through the requirements of a doctoral dissertation.

The next table summarizes the course requirement of the doctoral program. Following this is a typical course of study. No course or equivalent can be used to fulfill more than one required element.

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  * Biomedical Informatics (CI)  
  * Health and Biomedicine (CI)  
  * Computer Science (CI and BCB)  
  * Statistical Methods (CI and BCB)  
  * Algorithms and Statistical Methods (BCB)  
  * Biology (BCB)  
  They will also be required to complete more advanced electives offered by the DMICE and other departments. | A minimum of 48 credits of subject courses will be required (similar to the master’s degree programs). Students with a background in certain areas (e.g., medicine or computer science) may substitute other courses but still must complete the required minimum 48 credits. |
<p>| Advanced Research Methods and Design                                             | These classes should be design and methods classes and can come from computational, social, and other sciences. These classes should be relevant to the proposed area of research; examples include a 3-course sequence in statistics geared toward doctoral students or a comparable sequence in computational analytical techniques. | 12 credits minimum; coherent set of courses approved by advisor.                                           |
| Cognate Area (Distributed (across departments) or                                  | In consultation with the academic advisor, students will select 4 courses to complement the proposed                                                                                               | 12 credits minimum, cohesive set of courses to demonstrate depth                                         |</p>
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<tr>
<th>Required element</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Concentrated (within one department)</td>
<td>area of research. These should be graduate level courses and may be taken at other institutions or in other OHSU Departments.</td>
<td></td>
</tr>
<tr>
<td>PhD/Post-Doc Meeting</td>
<td>Topics will vary each quarter 1 credit per quarter.</td>
<td>10 credits minimum.</td>
</tr>
<tr>
<td>Symposium</td>
<td>State of the art literature synthesis in an area of research from which the student will be questioned during a student symposium and graded by 3 faculty members. Student symposia will be scheduled during several weeks during the quarter, and each student presentation can last no more than 20 minutes.</td>
<td>3 credits; must be taken during the fifth or sixth quarter of enrollment.</td>
</tr>
<tr>
<td>Dissertation and Research</td>
<td>To be taken with advisor</td>
<td>48 credits</td>
</tr>
</tbody>
</table>

**Required element Notes Total Minimum Credits**

We anticipate that most students will take from 18 – 24 months to complete coursework and take qualifying exams (written and oral); and another 12 – 24 months to conduct independent research, prepare a dissertation, publicly present and orally defend it. Students who already have a master’s or equivalent degree in biomedical informatics may spend less time in the coursework phase.

**The following is a typical timeline for the PhD program:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Subject courses + Comprehensive Examination (CI)</td>
</tr>
<tr>
<td>2</td>
<td>Subject courses + PhD/Post-Doc Meeting</td>
<td>Cognate Area + PhD/Post-Doc Meeting</td>
<td>Cognate Area + PhD/Post-Doc Meeting</td>
<td>Research Credits + Qualifying Examination (CI and BCB)</td>
</tr>
<tr>
<td>3</td>
<td>Research Credits + Directed Reading + Mentored teaching + PhD/Post-Doc Meeting</td>
<td>Research Credits + Symposium + PhD/Post-Doc Meeting</td>
<td>Research Credits + Pre-proposal defense + Mentored teaching + PhD/Post-Doc Meeting</td>
<td>Research Credits</td>
</tr>
<tr>
<td>4</td>
<td>Research Credits + PhD/Post-Doc Meeting</td>
<td>Research Credits + PhD/Post-Doc Meeting</td>
<td>Dissertation defense and final written</td>
<td></td>
</tr>
</tbody>
</table>

Doctoral students will be required to maintain enrollment during the entire period of their training. This requirement will be satisfied by coursework during the pre-candidacy period and with dissertation and research enrollment after being admitted to candidacy. A residency requirement of 12 – 15 credits for six consecutive terms will be required in accordance with the bylaws of the School of Medicine Graduate Council. A minimum of 135 credits will be required for graduation.
Overview of Biomedical Informatics Master’s Program

The goal of the curriculum is to produce students capable of assuming appropriate jobs in biomedical informatics in both industry and academia. The Master of Science (MS) curriculum consists of 60 credit hours, including 41 credit hours of required coursework, 12 credit hours of thesis work, and a minimum of 7 hours of electives. The Master of Biomedical Informatics (MBI) curriculum consists of 52 credit hours including 43 credit hours of required coursework, 6 credit hours of capstone project work, and a minimum of 3 credit hours of electives. A full-time student should be able to complete the coursework portion of the program in 4-6 quarters. Part-time enrollment in the program is allowed.

Following this is a typical course of study. No course or equivalent can be used to fulfill more than one required element.

<table>
<thead>
<tr>
<th>Required Elements</th>
<th>Notes</th>
<th>Total Minimum Credits</th>
</tr>
</thead>
</table>
| Demonstration of Clinical Informatics (CI) or Bioinformatics and Computational Biology (BCB) | Students will be required to complete all the subjects (non-thesis/non-capstone). These include courses in four general areas:  
  - Biomedical Informatics (CI)  
  - Health and Biomedicine (CI)  
  - Computer Science (CI and BCB)  
  - Statistical Methods (CI and BCB)  
  - Algorithms and Statistical Methods (BCB)  
  - Biology (BCB) | A minimum of 48 credits of subject courses will be required. Students with a background in certain areas (e.g., medicine or computer science) may substitute other courses but still must complete the required minimum 48 credits. |
The following is a typical timeline for the Master’s program:

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Subject courses</td>
<td>Subject courses</td>
<td>Subject courses</td>
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</tr>
<tr>
<td>2</td>
<td>Subject courses + Capstone or Thesis</td>
<td>Subject courses + Capstone or Thesis</td>
<td>Subject courses + Thesis</td>
<td></td>
</tr>
</tbody>
</table>

**Learning Outcomes.** At the end of the training period, all of our graduates will be able to:

1. Apply informatics methods and tools to solving problems related to personal health, health care, public health, and biomedical research.
2. Demonstrate knowledge in the underlying biological, clinical, and health domains to be able to apply informatics tools.
3. Critically select, apply, and evaluate information and other technologies in support of informatics methods for solving biomedical and health problems.
4. (For MS and PhD students) Carry out independent research under the mentorship of a faculty member in biomedical informatics.

**Student Assessments.**

PhD students are reviewed on an annual basis in late winter. They are rated based on, not only the academic progress and good academic standing in the coursework, but also through expectations that are set for each year of the program.

PhD students receive the below information upon matriculation. Completion of each of these elements will ensure graduates have a strong foundation in biomedical informatics and the activities to become a successful Post-doc and/or Junior Faculty member.
PreDoc Student Expectations

Year 1 – Predocs

Presentations and poster sessions (including, but not limited to)

Present – choose from one event
1. Weekly PhD/Fellowship meeting
2. Thursday research conference
3. Annual Open House
4. AMIA submission
5. NLM Training meeting submission
6. Oregon HIM meeting submission

And

Poster session – choose from one event
1. Open House
2. Student research forum (OHSU)
3. OrHIMSS
4. AMIA submission
5. NLM Training meeting submission

Attendance
1. 80% of weekly PhD/Fellows meeting
2. 80% of Thursday research conference
3. One NLM Fellowship Training meeting
4. One Professional Meeting (AMIA, HIMSS, Bioinformatics meeting)

Mentoring
1. Identify faculty member to work with by Annual Review in March
2. Begin work with mentor after Annual Review in March (if not before)

Academic Progress
1. Student must be in good academic standing (3.0 + GPA)
2. Student must complete 30.0 credits in the first academic year

Comprehensive Examination (predocs in clinical track only)

Year 2 – Predocs

Year 1+
Abstract
Submit abstract to one of the following:
1. National Meeting (AMIA, HIMSS, NLM Fellows Training Meeting, ACM BCB Conference)
2. Manuscript
3. Journal
Must be peer-reviewed
Can be local or national

Complete all required courses, in good academic standing to sit for qualifying exam

Qualifying Examination (predocs only, bioinformatics and clinical tracks)

Convene Advisory Committee for dissertation

Year 3 – Predocs

Year 2+
Symposium
Proposal defense

Year 4 – Predocs

Year 2+
Dissertation Completion

Year 5 – Predocs
Submit K99 grant proposal

Submission Deadlines*

<table>
<thead>
<tr>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMIA Annual Symposium (Fall)</td>
<td><a href="https://www.amia.org/meetings/">https://www.amia.org/meetings/</a></td>
</tr>
<tr>
<td>AMIA Spring Meeting</td>
<td><a href="https://www.amia.org/meetings/">https://www.amia.org/meetings/</a></td>
</tr>
<tr>
<td>AMIA Joint Summits on Translational Science</td>
<td><a href="https://www.amia.org/meetings/">https://www.amia.org/meetings/</a></td>
</tr>
<tr>
<td>ISMB (many deadlines)</td>
<td><a href="http://www.iscb.org/">http://www.iscb.org/</a></td>
</tr>
<tr>
<td>NLM Training Meeting</td>
<td><a href="http://www.iscb.org/">http://www.iscb.org/</a></td>
</tr>
</tbody>
</table>

*Submission Deadlines are subject to change. Please check official websites for the most up-to-date information.
**PROGRAM ASSESSMENTS.**

All students are required to submit an online course evaluation upon the completion of a course. The evaluation is submitted through the Sakai course management system. Below you will find the survey provided. All questions in the survey are required, however, faculty are able to include additional questions that are specific to their class. Evaluations are shared with faculty each quarter.

**EMPLOYMENT OUTCOMES.**

Graduates of our program have attained employment in academic and operational positions. We actively track the employment of our alumni to the extent that graduates are willing to provide information to us.

In the academic sphere, our graduates have achieved great success. Some notable examples include:

- Joan Ash, PhD, MBA, MLS is Professor and Vice Chair of DMICE, and well-known in the field as a leader and for her research in people and organizational issues (completed NLM Individual Fellowship in 1994).
- Jason Lyman, MD, MS is Associate Professor, Division of Clinical Informatics, Department of Health Evaluation Sciences, University of Virginia (graduated in 2000 with MS).
- Peter Embi, MS, MS is Associate Professor & Vice Chair in the Department of Biomedical Informatics as well as Chief Research Information Officer at The Ohio State University Medical Center (graduated VA fellowship in 2002 with MS).
- Aaron Cohen, MD, MS is Associate Professor in DMICE (graduated in 2005 with MS).
- Anne Turner, MD, MPH is Assistant Professor in the Department of Health Services in the School of Public Health at the University of Washington (graduated in 2006).
- Eilis Boudreau, MD, PhD is Assistant Professor in DMICE and the OHSU Department of Neurology, and has become a leader in our BCB track (graduate VA fellowship in 2006).
- Adam Wright, PhD was the first individual to obtain a PhD from our program in 2007. He won numerous awards while a trainee, including the AMIA Student Paper Competition and the OHSU SOM John A. Resko Award for Outstanding Dissertation. Since obtaining a faculty position at Harvard University and Partners Healthcare, he has led a productive research program and received the AMIA Young Investigator Award in 2010.
- Jayashree Kalpathy-Cramer, PhD, MS is a recent trainee who graduated in 2009 and was awarded a K99-R00 by the NLM. She is currently an Instructor in DMICE and is evaluating faculty position offers, including one at OHSU, for activating her R00.
- Joshua E. Richardson, PhD., MS, MLIS, is an Instructor in the Division of Quality and Medical Informatics at Weill Cornell Medical College (graduated in 2010 with PhD).

Likewise, many graduates have obtained success in operational informatics employment, examples of which include:

- Michael Riben, MD completed the program in 2001 and currently serves as Director of Anatomic Pathology Informatics at the University of Texas MD Anderson Cancer Center in Houston, TX.
- Thomas Yackel, MD, MPH, MS completed the program in 2002 and now serves as Chief Health Informatics Officer at OHSU. Dr. Yackel has led OHSU Hospital & Clinic’s highly successful implementation of the Epic electronic health record.
- Michael Lieberman, MD, MS recently became Associate Chief Health Informatics Officer at OHSU. Prior to that, he served as Director of the Medical Quality Improvement Consortium at GE Healthcare. He completed the program in 2003.
- Susan Price, MD, PhD completed the program in 2005 and serves as Senior Program Manager for SQL Server at Microsoft in Seattle, WA.
- Daren Nicholson, MD completed the program in 2006 and currently serves as Senior Product Manager at Axolotl Corp., a company that makes products for health information exchange.
- Blake Lesselroth, MD, MS completed the program in 2007 and serves as Chief of Clinical Applications at Portland VA Medical Center.
- Susan Woods, MD, MS completed the program in 2009 and serves as Associate National Director for eHealth in the Office of Informatics & Analytics at Veterans Health Administration.
Two of our PhD graduates have also assumed operational informatics roles.

- Ken Guappon, MD, PhD received his PhD in 2008 and currently serves as Clinical Decision Support Physician at Providence Health and Services in Portland, OR.
- Jianji Yang, PhD completed her PhD in 2008 and now serves as Bioinformatics Manager at the Portland VA Medical Center.
- Emily Campbell, RN, MS, PhD completed her PhD in 2010 and now serves as Director of Clinical Informatics at the Oregon Anesthesiology Group in Portland OR.

Additional employment outcome information can be provided if desired.

**Improvement.**

Our major plan for the coming year is to continue to train and mentor our existing fellows for success in the field as well as improve the infrastructure of the program. One effort was an information gathering effort of other programs’ approaches to tracking and evaluating fellows to develop better methods for doing it ourselves. Under the leadership of faculty member Dr. Karen Eden, we put into place a new tracking and evaluation process that we applied this year to all fellows.

**Resources and Capacity**

**Advisory Board.**

The program maintains an External Advisory Board the provides advice on research and educational matters for our program. The EAB meets about three time per year. Members include:

- John Kenagy, VP and CIO, Providence Health and Services (Chair, EAB)
- Malcolm Costello, SVP Marketing and Strategic Relations, Kryptiq
- Jay Eisenberg, Chief Medical Information Officer, Southwest Washington Health System
- Bill Newman, Managing Partner, NW Technology Ventures
- Mark Leavitt, Chairman, Certification Commission for Healthcare Information Technology (CCHIT)
- Sandra Shotwell, Principal, Alta Biomedical Group, and Chief Operating Officer, DesignMedix, Inc.
- Scott Dawson, Dean, School of Business, Portland State University
- Dick Gibson, SVP and CIO, Legacy Health System
- Stuart Cohen, CEO, Collaborative Software Initiative
- Patricia Beckmann, Executive Director, Oregon Translational Research and Drug Development Institute (OTRA DI)
- Jim Moon, Chief Technology Officer, Triage Wireless, Inc.
- Bonnie Altus, Quality Improvement Supervisor, Oregon State Hospital; Adjunct Faculty, Oregon Institute of Technology

**Demand.**

There continues to be strong demand for professionals and academicians in biomedical informatics in the foreseeable future. OHSU has been a leader not only in meeting this demand, but helping to define it. The program successfully competed for ARRA grants related to health information technology workforce development as part of the HITECH Program to provide incentives for adoption of electronic health records. There is also demand in other areas of informatics, most notably in the strong emphasis placed on informatics by the NIH Clinical and Translational Science (CTSA) Award.

**Financial Resources.**

The PhD program in Biomedical Informatics continues to be funded through the National Library of Medicine. The program has received funding from NLM for Pre-docs and Post-docs for the past 20 years and earlier this year obtained a strong score on its competitive renewal for the next five-year cycle of funding. The funding provides
students with a living stipend, healthcare coverage, tuition and fees and travel support for two national conferences each year. Pre-docs are allowed up to five years of funding, based on a year-to-year review of successful academic progress. The program has also been awarded ARRA funding to train 13 master’s students in the clinical informatics track. The funding offers a small stipend, healthcare coverage and tuition and fees for 18 months. The 13 slots have been filled to date. We matriculated eight students to this program Fall 2010 and awarded the remaining five slots Fall 2011. With the exception of these 13 master’s students, all other master’s students self-fund their education.
LIST OF APPENDICES

1. Publications with student authors since Sept 2006
2. Awards received by students since Sept 2006
3. Curriculum by Program Track
4. Current faculty
5. Student Evaluation
APPENDIX 1: Publications with student authors since 2006 (BMI students in bold)


8. Enhancing access to the Bibliome: the TREC 2004 Genomics Track.
   Hersh WR, **Bhupatiraju RT**, Ross L, Roberts P, Cohen AM, Kraemer DF.

9. Categorizing the unintended sociotechnical consequences of computerized provider order entry.
   Ash JS, Sittig DF, Dykstra RH, **Guappone K**, Carpenter JD, Seshadri V.
   PMID:16793330[PubMed - indexed for MEDLINE]

10. Advancing biomedical image retrieval: development and analysis of a test collection.
    Hersh WR, Müller H, Jensen JR, **Yang J**, Gorman PN, Ruch P.
    PMID:16799124[PubMed - indexed for MEDLINE]

11. Types of unintended consequences related to computerized provider order entry.
    **Campbell EM**, Sittig DF, Ash JS, **Guappone KP**, Dykstra RH.
    PMID:16799128[PubMed - indexed for MEDLINE]


    Ash JS, Sittig DF, **Campbell E**, **Guappone K**, Dykstra RH.
    PMID:17238293[PubMed - indexed for MEDLINE]

    Hersh WR, **Bhupatiraju RT**, Greene P, Smothers V, Cohen C.
15. A data mining and survey study on diseases associated with paraesophageal hernia.  
   **Yang J**, Logan J.  
   PMID: 17238457 [PubMed - indexed for MEDLINE]

   **Yang J**, Cohen AM, Hersh WR.  
   PMID: 17238770 [PubMed - indexed for MEDLINE]

17. Single nucleotide polymorphisms (SNPs) distinguish Indian-origin and Chinese-origin rhesus macaques (Macaca mulatta).  
   BMC Genomics. 2007 Feb 7;8:43.  
   PMID: 17286860 [PubMed - indexed for MEDLINE]

18. In reply to: "e-Iatrogenesis: The most critical consequence of CPOE and other HIT"  
   **Campbell EM**, Sittig DF, Ash JS, Guappone KP, Dykstra RH.  
   J Am Med Inform Assoc. 2007 Mar 13. [Epub ahead of print]  
   PMID:17356070[PubMed - as supplied by publisher]

   Nagalla SR, Canick JA, Jacob T, Schneider KA, Reddy AP, Thomas A, **Dasari S**, Lu X, Lapidus JA,  
   Lambert-Messerlian GM, Gravett MG, Roberts CT Jr, Luthy D, Malone FD, D’Alton ME.  
   PMID: 17373838 [PubMed - indexed for MEDLINE]

   **Dasari S**, Pereira L, Reddy AP, Michaels JE, Lu X, Jacob T, Thomas A, Rodland M, Roberts CT Jr, Gravett MG,  
   Nagalla SR.  
   PMID: 17373839 [PubMed - indexed for MEDLINE]

   Pereira L, Reddy AP, Jacob T, Thomas A, Schneider KA, Dasari S, Lapidus JA, Lu X, Rodland M, Roberts CT Jr,  
   Gravett MG, Nagalla SR.  
   PMID: 17373840 [PubMed - indexed for MEDLINE]

   Michaels JE, **Dasari S**, Pereira L, Reddy AP, Lapidus JA, Lu X, Jacob T, Thomas A, Rodland M, Roberts CT Jr,  
   Gravett MG, Nagalla SR.  
   PMID: 17373841 [PubMed - indexed for MEDLINE]

   **Laderas T**, McWeeney S.  
   PMID: 17411399 [PubMed - indexed for MEDLINE]

24. The extent and importance of unintended consequences related to computerized provider order entry.  
   Ash JS, Sittig DF, Poon EG, **Guappone K, Campbell E**, Dykstra RH.  
   PMID:17460127[PubMed - indexed for MEDLINE]


   **Bhupatiraju RT**, Hersh WR, Smothers V, Fordis M, Greene PS.  
   PMID: 18479525 [PubMed]

37. Some unintended consequences of clinical decision support systems.  
   Ash JS, Sittig DF, **Campbell EM**, Guappone KP, Dykstra RH.  
   PMID: 18693791 [PubMed - indexed for MEDLINE]

38. Overdependence on technology: an unintended adverse consequence of computerized provider order entry.  
   **Campbell EM**, Sittig DF, Guappone KP, Dykstra RH, Ash JS.  
   PMID:18693805[PubMed - indexed for MEDLINE]

   Sittig DF, **Campbell E**, Guappone K, Dykstra R, Ash JS.  
   PMID:18693921[PubMed - indexed for MEDLINE]

40. Automatic summarization of mouse gene information by clustering and sentence extraction from MEDLINE abstracts.  
   **Yang J**, Cohen AM, Hersh W.  
   PMID:18693953[PubMed - indexed for MEDLINE]

41. A Ferret-based gastrointestinal image retrieval system.  
   PMID: 18693969 [PubMed - indexed for MEDLINE]

42. The ImageCLEFmed medical image retrieval task test collection.  
   Hersh W, Müller H, **Kalpathy-Cramer J**.  
   PMID: 18769695 [PubMed - indexed for MEDLINE]

43. The unintended consequences of computerized provider order entry: findings from a mixed methods exploration.  
   Ash JS, Sittig DF, Dykstra R, **Campbell E**, Guappone K.  
   PMID:18786852[PubMed - indexed for MEDLINE]

44. Field evaluation of commercial Computerized Provider Order Entry systems in community hospitals.  
   **Guappone KP**, Ash JS, Sittig DF.  
   PMID:18998909[PubMed - indexed for MEDLINE]

45. The effects of hands free communication devices on clinical communication: balancing communication access needs with user control.  
   **Richardson JE**, Ash JS.  
   PMID: 18999046 [PubMed - indexed for MEDLINE]

46. A rapid assessment process for clinical informatics interventions.  
   Ash JS, Sittig DF, McMullen CK, **Guappone K**, Dykstra R, **Carpenter J**.  
   PMID:18999075[PubMed - indexed for MEDLINE]
47. **Discovering synergistic qualities of published authors to enhance translational research.**
   **Bahr NJ**, Cohen AM.
   PMID: 18999089 [PubMed - indexed for MEDLINE]

48. **A scientific collaboration tool built on the facebook platform.**
   PMID: 18999247 [PubMed - indexed for MEDLINE]

49. "Doing the yellows" -- analysis of medication review processes by different clinicians in long term care.
   **Bhupatiraju RT**, Gorman P.
   PMID: 18999279 [PubMed - indexed for MEDLINE]

50. Computerized provider order entry adoption: implications for clinical workflow.
   **Campbell EM**, Guappone KP, Sittig DF, Dykstra RH, Ash JS.
   PMID:19020942 [PubMed - indexed for MEDLINE]

51. Evaluation of a gene information summarization system by users during the analysis process of microarray datasets.
   **Yang J**, Cohen A, Hersh W.
   PMID:19208193 [PubMed - indexed for MEDLINE]


53. Akt and 14-3-3 control a PACS-2 homeostatic switch that integrates membrane traffic with TRAIL-induced apoptosis.
   PMID: 19481529 [PubMed - indexed for MEDLINE]

54. Effects of sleep deprivation on medical performance of pediatric residents.
   Domínguez P, Grosso ML, Pagotto B, **Taliercio V**, Allegri R.
   PMID: 19543633 [PubMed - indexed for MEDLINE]


57. S-Methadone augments R-methadone induced respiratory depression in the neonatal guinea pig.
   Silverman DA, **Nettleton RT**, Spencer KB, Wallisch M, Olsen GD.
   PMID: 19744579 [PubMed - indexed for MEDLINE]

58. Effectiveness of Global Features for Automatic Medical Image Classification and Retrieval - the experiences of OHSU at ImageCLEFmed.
   **Kalpathy-Cramer J**, Hersh W.
59. Divided attention in computer game play: analysis utilizing unobtrusive health monitoring.  
   **McKanna JA**, Jimison H, Pavel M.  
   PMID: 19965090 [PubMed - indexed for MEDLINE]

60. Chronic in utero buprenorphine exposure causes prolonged respiratory effects in the guinea pig neonate.  
   Wallisch M, Subban CV, **Nettleton RT**, Olsen GD.  
   PMID: 20043989 [PubMed - indexed for MEDLINE]

61. The effects of hands-free communication device systems: communication changes in hospital organizations.  
   **Richardson JE**, Ash JS.  
   J Am Med Inform Assoc. 2010 Jan-Feb;17(1):91-8.  
   PMID: 20064808 [PubMed - indexed for MEDLINE]

   PMID: 20351818 [PubMed - indexed for MEDLINE]

63. Persistent paper: the myth of "going paperless".  
   Dykstra RH, Ash JS, **Campbell E**, Sittig DF, Guappone K, Carpenter J, Richardson J, Wright A, McMullen C.  
   PMID:20351841[PubMed - indexed for MEDLINE]

64. Development and implementation of an integrated EHR for Homecare Service: a South American experience.  
   Aguilera Díaz J, Arias AE, Budalich CM, Benítez SE, López G, **Borbolla D**, Plazzotta F, Luna D, de Quiros FG.  
   PMID: 20841647 [PubMed - indexed for MEDLINE]

65. Optimizing medication reminders using a decision-theoretic framework.  
   PMID: 20841794 [PubMed - indexed for MEDLINE]

66. Identifying best practices for clinical decision support and knowledge management in the field.  
   Ash JS, Sittig DF, Dykstra R, **Wright A**, McMullen C, Richardson J, Middleton B.  
   PMID: 20841797 [PubMed - indexed for MEDLINE]

67. Implementation of a clinical decision support system using a service model: results of a feasibility study.  
   PMID: 20841799 [PubMed - indexed for MEDLINE]

68. Retrieving similar cases from the medical literature - the ImageCLEF experience. **Kalpathy-Cramer J**, Bedrick S,  
   PMID: 20841872 [PubMed - indexed for MEDLINE]

69. Computerization of a preanaesthetic evaluation and user satisfaction evaluation.  
   PMID: 20841873 [PubMed - indexed for MEDLINE]
70. An automated technique for identifying associations between medications, laboratory results and problems.  
   **Wright A**, Chen ES, Maloney FL.  
   PMID: 20884377 [PubMed - indexed for MEDLINE]

71. Models of cognitive performance based on home monitoring data.  
   Jimison HB, **McKanna J**, **Ambert K**, Hagler S, Hatt WJ, Pavel M.  
   PMID: 21096045 [PubMed - indexed for MEDLINE]

72. The effects of a hands-free communication device system in a surgical suite.  
   PMID: 2113074 [PubMed - indexed for MEDLINE]

73. Addressing the sociotechnical drivers of quality improvement: a case study of post-operative DVT prophylaxis computerised decision support.  
   Lesselroth BJ, **Yang J**, McConnachie J, Brenk T, Winterbottom L.  
   PMID:21209144[PubMed - indexed for MEDLINE]

74. The Impact of Health Information Technology on Work Process and Patient Care in Labor and Delivery.  
   **Campbell EM**, Li H, Mori T, Osterweil P, Guise JM.  
   PMID:21249956[PubMed]

75. Governance for clinical decision support: case studies and recommended practices from leading institutions.  
   PMID: 21252052 [PubMed - indexed for MEDLINE]

   PMID: 21266350 [PubMed - indexed for MEDLINE]

77. Microcephaly Genes and Risk of Late-onset Alzheimer Disease.  
   Alzheimer Dis Assoc Disord. 2011 Feb 2. [Epub ahead of print]  
   PMID: 21297427 [PubMed - as supplied by publisher]

78. Comparison of clinical knowledge management capabilities of commercially-available and leading internally-developed electronic health records.  
   Sittig DF, **Wright A**, Meltzer S, Simonaitis L, Evans RS, Nichol WP, Ash JS, Middleton B.  
   PMID: 21329520 [PubMed - indexed for MEDLINE]

79. k-Information Gain Scaled Nearest Neighbors: A Novel Approach to Classifying Protein-Protein Interaction-Related Documents.  

   **Campbell EM**, Sittig DF, Chapman WW, Hazlehurst BL, Cohen AM.
81. A Prospective Evaluation of an Automated Classification System to Support Evidence-based Medicine and Systematic Review. 
Cohen AM, Ambert K, McDonagh M. 
PMID: 21346945 [PubMed - in process]

82. Unobtrusive monitoring of divided attention in a cognitive health coaching intervention for the elderly. 
McKanna JA, Pavel M, Jimison H. 
PMID: 21347030 [PubMed - in process]

83. Creating shareable decision support services: an interdisciplinary challenge. 
Paterno MD, Maviglia SM, Ramelson HZ, Schaeffer M, Rocha BH, Hongsermeier T, Wright A, Middleton B, Goldberg HS. 
PMID: 21347049 [PubMed - in process]

84. Multiple perspectives on the meaning of clinical decision support. 
Richardson JE, Ash JS, Sittig DF, Bunce A, Carpenter J, Dykstra RH, Guappone K, McMullen CK, Shapiro M, Wright A. 
PMID: 21347063 [PubMed - in process]

85. Order sets in computerized physician order entry systems: an analysis of seven sites. 
Wright A, Sittig DF, Carpenter JD, Krall MA, Pang JE, Middleton B. 
PMID: 21347107 [PubMed - in process]

86. Multiple perspectives on the meaning of clinical decision support. 
Richardson JE, Ash JS, Sittig DF, Bunce A, Carpenter J, Dykstra RH, Guappone K, McCormack J, McMullen CK, Shapiro M, Wright A. 
PMID: 21347119 [PubMed - in process]

87. Development and evaluation of a comprehensive clinical decision support taxonomy: comparison of front-end tools in commercial and internally developed electronic health record systems. 
PMID: 21415065 [PubMed - in process]

88. Summarization of clinical information: a conceptual model. 
Febelowitz JC, Wright A, Singh H, Samal L, Sittig DF. 
PMID: 21440086 [PubMed - in process]

89. Evaluating gene expression in C57BL/6J and DBA/2J mouse striatum using RNA-Seq and microarrays. 
PMID: 21455293 [PubMed - indexed for MEDLINE]

90. Clinical decision support in small community practice settings: a case study. 
Ash JS, Sittig DF, Wright A, McMullen C, Shapiro M, Bunce A, Middleton B.


APPENDIX 2: Awards received by students since 2006

**Excellence in Informatics - 2009:**
Pavana Anur

**NSRA – Fall 2011:**
James McCormack

**NLM Fellows:**

**2006-2007**
Abrahamson, Jennifer A.
Bedrick, Steven D.
Campbell, Emily M.
Fei, Suzanne S.
Guappone, Kenneth P.
Kalpathy Cramer, Jayashree
Richardson, Joshua E.
Wright, Adam T.
Wright, Hollis J.
Yang, Jianji

**2007-2008**
Abrahamson, Jennifer A.
Bedrick, Steven D.
Campbell, Emily M.
Fei, Suzanne S.
Hill, Heather K.
Kalpathy Cramer, Jayashree
Mooney, Michael A.
Panchenko, Leonid V.
Richardson, Joshua E.
Wright, Hollis J.

**2008-2009**
Bedrick, Steven D.
Campbell, Emily M.
Fei, Suzanne S.
Hill, Heather K.
Kalpathy Cramer, Jayashree
Mooney, Michael A.
Panchenko, Leonid V.
Richardson, Joshua E.
Wright, Hollis J.

**2009-2010**
Ambert, Kyle H.
Bedrick, Steven D.
Brush, Matthew H.
Fei, Suzanne S.
Fletcher, Justin B.
Gibbs, David L.
Hill, Heather K.
Laderas, Ted G.
McCormack, James L.
McKanna, James A.
Mooney, Michael A.
Nettleton, Rosemary T.
Panchenko, Leonid V.
Richardson, Joshua E.
Vimegnon, Yves A.
Wright, Hollis J.

2010-2011
Ambert, Kyle H.
Brush, Matthew H.
Chase, Dian A.
Essaid, Shahim I.
Fletcher, Justin B.
Gamble, Bryan T.
Gibbs, David L.
Laderas, Ted G.
McCormack, James L.
McKanna, James A.
Mooney, Michael A.
Nettleton, Rosemary T.
Panchenko, Leonid V.
Scariati, Paula D.
Vimegnon, Yves A.
Vingara, Lisa K.
Williamson, Steven S.
Yao, Patricia

UBT-Grant Awardees – MBI:

2010:
Larry Bannister
Courtland Fowler
Jeremy Harper
Patricia Martin
Marcela Musgrove
Julie Pefferman
Daniel Slater
Andrew Vanberg

2011:
Michelle Carter
David Choi
Marianne Outzen
Diane Petersen
Leeann Stahn
### APPENDIX 3: Curriculum by Program Track

**PhD - Clinical Informatics Track**

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| Individual competency (6.0 credits) | | | | |
| BMI 612  Clinical Information Systems (3.0) | | | | |
| BMI 614  Information Retrieval (3.0) | | | | |
| BMI 620  Consumer Health Informatics (3.0) | | | | |
| BMI 621  Public Health Informatics (3.0) | | | | |

| Elective courses | | | | |
| BMI 616 Standards and Interoperability (3.0) | | | | |

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<td>BMI 630  Practice of Health Care (3.0)</td>
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| BMI 636  Evidence-based Medicine (3.0) | | | | |
| BMI 637  Healthcare Quality (3.0) | | | | |
| BMI 638  Medical Decision Making (3.0) | | | | |

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<td>BMI 644  Databases (3.0)</td>
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| Individual competency (3.0 credits) | | | | |
| BMI 642  Computer Networks (3.0) | | | | |
| BMI 646  Software Engineering (3.0) | | | | |
| BMI 648  Human Computer Interaction in Biomedicine (3.0) | | | | |

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### Required courses (6.0 credits)
- BMI 617  Organizational Behavior in MI (3.0)
- BMI 618  Project Management (3.0)

### Elective courses
- BMI 619  The Business of HC Informatics (3.0)

**Total (6.0) 0.0**

### DISSERTATION PREP

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### Required courses (5.0 credits)
- BMI 615  Ethical, Legal & Social Issues (2.0-3.0)
- BMI 670  Scientific Writing and Communication for Informatics Students (3)

**Total (5.0) 0.0**

### READING & CONFERENCE

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BMI 605 PhD/Fellows Meeting
PhD - Bioinformatics & Computational Biology Track

Department of Medical Informatics and Clinical Epidemiology

Doctor of Philosophy in Biomedical Informatics

**Bioinformatics and Computational Biology Track**

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**Elective courses**

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<td>Statistical Analysis of Microarrays (3)</td>
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Total (12.0) 0.0

**BIOMEDICAL SCIENCES**

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**Elective courses**

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### COMPUTER SCIENCE

**Required courses (9.0 credits)**
- BMI 644  Databases (3)
- BMI 646  Software Engineering (3)
- BMI 665 Bioinformatics Programming and Scripting (3)

**Elective courses**
- BMI 616 Standards and Interoperability (3)
- BMI 642  Computer Networks (3)
- BMI 648  Human Computer Interaction in Biomedicine (3)

**Total (9.0) 0.0**

### BIOSTATISTICS

**Required courses**
- BSTA 611 Estimation and Hypothesis Testing for Applied Biostatistics (4)
- BSTA 612 Linear Models (4)
- BSTA 513 Categorical Data Analysis (4)

**Total (12.0) 0.0**

### DISSERTATION PREP

**Required courses (5.0 credits)**
- BMI 615  Ethical, Legal & Social Issues (2.0-3.0)
- BMI 670  Scientific Writing and Communication for Informatics Students (3)

**Total (5.0) 0.0**

### READING & CONFERENCE

- BMI 605 PhD/Fellows Meeting (1)
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| RESEARCH                                                                        |      |       |    |
|---------------------------------------------------------------------------------|      |       |    |
| BMI 501                                                                         |      |       |    |

| INDEPENDENT STUDY                                                               |      |       |    |
|---------------------------------------------------------------------------------|      |       |    |
| BMI 502                                                                         |      |       |    |

| INTERNSHIP                                                                      |      |       |    |
|---------------------------------------------------------------------------------|      |       |    |
| BMI 504                                                                         |      |       |    |

| READING & CONFERENCE                                                            |      |       |    |
|---------------------------------------------------------------------------------|      |       |    |
| BMI 505                                                                         |      |       |    |

| SEMINAR                                                                         |      |       |    |
|---------------------------------------------------------------------------------|      |       |    |
| BMI 507                                                                         |      |       |    |

| PRACTICUM: MEDICAL INFORMATICS                                                  |      |       |    |
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| BMI 509                                                                         |      |       |    |

<p>| <strong>Total Credit Hours Required 60.0</strong>                                            |      |       |    |</p>
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### MBI - Clinical Informatics Track

**Department of Medical Informatics & Clinical Epidemiology**

**Master of Biomedical Informatics**

**Clinical Informatics Track**

Current GPA: 
Total Earned Hours: 0.0

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### BIOMEDICAL INFORMATICS

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**Required course (3.0 credits)**

- BMI 510  Intro to Biomedical Informatics (3.0)

**Individual competency (3.0 credits)**

- BMI 512  Clinical Information Systems (3.0)
- BMI 514  Information Retrieval (3.0)
- BMI 520  Consumer Health Informatics (3.0)
- BMI 521  Public Health Informatics (3.0)

**Elective courses**

- BMI 516 Standards and Interoperability (3)

**Total (6.0)**

0.0

### HEALTHCARE

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**Required course (3.0 credits)**

- BMI 530  Practice of Health Care (3.0)

**Individual competency (3.0 credits)**

- BMI 536  Evidence-based Medicine (3.0)
- BMI 537  Healthcare Quality (3.0)
- BMI 538  Medical Decision Making (3.0)

**Total (6.0)**

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### COMPUTER SCIENCE

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**Required courses (6.0 credits)**

- BMI 540  Comp Sci & Java Programming (3.0)
- BMI 544  Databases (3.0)

**Individual competency (3.0 credits)**

- BMI 542  Computer Networks (3.0)
- BMI 546  Software Engineering (3.0)
- BMI 548  Human Computer Interaction in Biomedicine (3.0)

**Elective courses**

- BMI 516 Standards and Interoperability (3)

**Total (9.0)**

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**Required course (7.0 credits)**

- PHPM 524 - Introduction to Biostatistics (4.0)
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<td>BMI 501</td>
<td><strong>INDEPENDENT STUDY</strong></td>
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<td><strong>INTERNSHIP</strong></td>
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<td>BMI 504</td>
<td><strong>READING &amp; CONFERENCE</strong></td>
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<td>BMI 505</td>
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<tr>
<td>Course</td>
<td>Credit Hours</td>
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<td>SEMINAR</td>
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<td>BMI 507</td>
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<td>PRACTICUM: MEDICAL INFORMATICS</td>
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<td>BMI 509</td>
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<td><strong>Total credit hours required:</strong> 52.0</td>
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## APPENDIX 4: Current Faculty

<table>
<thead>
<tr>
<th>Name/Degree(s)</th>
<th>Rank</th>
<th>Primary (&amp; Secondary) Appointment(s)</th>
<th>Role in Program</th>
<th>Research Interest</th>
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<tbody>
<tr>
<td>Joan Ash, PhD</td>
<td>Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Associate Director for Clinical Informatics; Faculty, Advisor/Mentor</td>
<td>Behavioral and social issues related to implementing clinical information systems, specifically computerized provider order entry, and the use of qualitative methods for such studies</td>
</tr>
<tr>
<td>Armand Bankhead, PhD</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
<td>Biological interpretation of high throughput data, genetic regulatory networks, disease classifiers, and simulating cellular-level population dynamics</td>
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<tr>
<td>Eilis Boudreau, MD, PhD</td>
<td>Assistant Professor</td>
<td>Department of Neurology (Department of Medical Informatics &amp; Clinical Epidemiology) (Portland VA Medical Center)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Use of computational techniques such as quantitative trait loci (QTLs) and functional Magnetic Resonance Imaging (fMRI) to study how circadian rhythms and the genes that control them</td>
</tr>
<tr>
<td>Lucia Carbone, PhD</td>
<td>Assistant Professor</td>
<td>Medical and Molecular Genetics (Department of Medical Informatics &amp; Clinical Epidemiology) (Oregon National Primate Research Center)</td>
<td>Faculty, Advisor/Mentor</td>
<td>High throughput approaches to study structural variations and whole-genome methylation in both non-human primate and human disease</td>
</tr>
<tr>
<td>Michael Chiang, MD</td>
<td>Professor</td>
<td>Department of Ophthalmology (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Telemedicine, image analysis, design and evaluation of electronic health records</td>
</tr>
<tr>
<td>Aaron Cohen, MD, MS</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
<td>Development and application of text-mining techniques and tools for biomedical researchers, annotators, and those performing systematic reviews</td>
</tr>
<tr>
<td>David Dorr, MD, MS</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Division of General Internal Medicine and Geriatrics, Department of Medicine)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Care management, coordination of care, chronic disease management, quality to expand systems-based approaches to all of health care</td>
</tr>
<tr>
<td>Karen Eden, PhD</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Associate Director for Fellow Evaluation and Progress; Faculty, Advisor/Mentor</td>
<td>Patient and clinician decision-making using and building decision analyses and shared decision aids</td>
</tr>
<tr>
<td>Name/Degree(s)</td>
<td>Rank</td>
<td>Primary (&amp; Secondary) Appointment(s)</td>
<td>Role in Program</td>
<td>Research Interest</td>
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<tr>
<td>Mark Englestad, MD, DDS</td>
<td>Associate Professor</td>
<td>Oral &amp; Maxillofacial Surgery, School of Dentistry (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor, Dental Informatics</td>
<td>Validity and efficacy of structured terminologies and clinical documentation standards</td>
</tr>
<tr>
<td>Justin Fletcher, PhD</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
<td>Privacy and security of health information</td>
</tr>
<tr>
<td>Paul Gorman, MD</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Providence Portland Medical Center)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Use of information by clinicians, in real-world problem-solving, using observational methods</td>
</tr>
<tr>
<td>William Hersh, MD</td>
<td>Professor and Chair</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Division of General Internal Medicine and Geriatrics, Department of Medicine) (Department of Public Health &amp; Preventive Medicine)</td>
<td>Program Director; Faculty, Advisor/Mentor</td>
<td>Information retrieval, health information technology workforce characterization and training</td>
</tr>
<tr>
<td>Michelle Hribar, PhD</td>
<td>Instructor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty</td>
<td>Human-computer interaction, computer science education</td>
</tr>
<tr>
<td>Holly Jimison, PhD</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Department of Public Health &amp; Preventive Medicine)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Technology for successful aging, home health monitoring, user models for adaptive interfaces for consumer health information</td>
</tr>
<tr>
<td>Jayashree Kalpathy-Cramer, PhD</td>
<td>Instructor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology (Department of Radiation Oncology)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Imaging informatics, image retrieval and classification</td>
</tr>
<tr>
<td>Kathryn Pyle Krages, AMLS, MA</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty</td>
<td>Scientific writing and communications</td>
</tr>
<tr>
<td>Judith Logan, MD, MS</td>
<td>Associate Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
<td>Secondary use of clinical data for research, with attention to user interfaces, underlying controlled vocabularies, and data structures</td>
</tr>
<tr>
<td>Curt Machida, PhD</td>
<td>Professor</td>
<td>Department of Integrative Biosciences, School of Dentistry</td>
<td>Advisor/Mentor, Dental Informatics</td>
<td>Association of Epstein-Barr Virus with Irreversible Pulpitis and Apical Periodontitis&quot;</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Name/Degree(s)</th>
<th>Rank</th>
<th>Primary (&amp; Secondary) Appointment(s)</th>
<th>Role in Program</th>
<th>Research Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shannon McWeeney, PhD</td>
<td>Associate Professor</td>
<td>Department of Public Health &amp; Preventive Medicine (Department of Medical Informatics &amp; Clinical Epidemiology) (Knight Cancer Institute) (Oregon Clinical and Translational Research Institute)</td>
<td>Associate Director for Bioinformatics and Computational Biology; Faculty, Advisor/Mentor</td>
<td>Statistical analysis of microarray data with emphasis on time series analysis and of genome-wide association data</td>
</tr>
<tr>
<td>Vishnu Mohan, MD</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty, Advisor/Mentor</td>
<td>Design, implementation, and evaluation of electronic medical records, developing a model for online medical informatics education</td>
</tr>
<tr>
<td>Eli Schwarz, DDS, PhD, MPH</td>
<td>Professor and Chair</td>
<td>Department of Community Dentistry, School of Dentistry</td>
<td>Faculty, Advisor/Mentor, Dental Informatics</td>
<td>Implementation and sustainability of non-surgical intervention for dental caries in general dental practice</td>
</tr>
<tr>
<td>Kemal Sonmez, PhD</td>
<td>Associate Professor</td>
<td>Department of Biomedical Engineering (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Systems theory, information theory, machine learning, and statistical signal processing in bioinformatics and speech recognition</td>
</tr>
<tr>
<td>Denice Stewart, DDS, MHSA</td>
<td>Professor; Associate Dean for Clinical Affairs</td>
<td>Department of Community Dentistry, School of Dentistry</td>
<td>Head, Dental Informatics; Faculty, Advisor/Mentor</td>
<td>Evaluation of the adoption and use of electronic records, data mining and clinical research in a dental school setting</td>
</tr>
<tr>
<td>Joanne Valerius, MPH</td>
<td>Assistant Professor</td>
<td>Department of Medical Informatics &amp; Clinical Epidemiology</td>
<td>Faculty</td>
<td>Health information management (HIM) education and integration with biomedical informatics education; human resource development</td>
</tr>
<tr>
<td>Amanda Vinson, PhD</td>
<td>Assistant Professor</td>
<td>Department of Medical and Molecular Genetics (Department of Medical Informatics &amp; Clinical Epidemiology) (Oregon National Primate Research Center)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Statistical genetics/genomics of T Cell-mediated Inflammation in Atherosclerosis, statistical genetics/genomics of inflammation in complex disease</td>
</tr>
<tr>
<td>Beth Wilmot, PhD</td>
<td>Instructor</td>
<td>Oregon Clinical and Translational Research Institute (Department of Medical Informatics &amp; Clinical Epidemiology)</td>
<td>Faculty, Advisor/Mentor</td>
<td>Statistical genetics</td>
</tr>
</tbody>
</table>
APPENDIX 5: Student Course Evaluation

10/3/2011

Preview Evaluation

Evaluations dashboard  Preview Evaluation

Preview Evaluation: BMI Summer 2011 (Group: Group title here)

Instructions: Please fill out the following questions regarding courses you took during the term of Summer 2011. Course evaluations will close on Friday, September 9th, 2011, at midnight Pacific Standard Time.

Thank you for your input.

Group/Course Items:

OHSU-WIDE QUESTIONS

1. The course as a whole was

2. The course content was

3. The course organization was

THE COURSE

4. The course was well planned.

5. The course content was up to date, pertinent and comprehensive.

6. Course expectations were clearly stated.

7. The course evaluation methods were fair and clear.

8. The lecture presentations helped me understand and apply course concepts.

9. Course assignments were an appropriate reinforcement of key concepts and enhanced the learning experience.

10. The course reading material helped me understand and apply course concepts.

11. The difficulty of the material in this course meets my expectations for a course at this level.

12. It was easy to navigate and locate information on Sakai.
THE INSTRUCTION

13. The instructor provided timely and effective feedback.  
   - [ ] Strongly disagree  
   - [ ] Disagree  
   - [ ] Uncertain  
   - [ ] Agree  
   - [ ] N/A

14. The instructor stimulated enthusiasm for the subject.  
   - [ ] Strongly disagree  
   - [ ] Disagree  
   - [ ] Uncertain  
   - [ ] Agree  
   - [ ] N/A

15. The instructor was effective in presenting the course materials.  
   - [ ] Strongly disagree  
   - [ ] Disagree  
   - [ ] Uncertain  
   - [ ] Agree  
   - [ ] N/A

16. The instructor was knowledgeable in this field.  
   - [ ] Strongly disagree  
   - [ ] Disagree  
   - [ ] Uncertain  
   - [ ] Agree  
   - [ ] N/A

17. The instructor encouraged questions and discussion.  
   - [ ] Strongly disagree  
   - [ ] Disagree  
   - [ ] Uncertain  
   - [ ] Agree  
   - [ ] N/A

YOUR EXPERIENCE

18. On average, estimate how many hours you invested in the course during a typical week.

   [ ] 1 hour  
   [ ] 2 hours  
   [ ] 3-4 hours  
   [ ] 5-8 hours  
   [ ] 9 hours or more

19. How did the actual number of hours per week compare with your expectations?

   [ ] More than expected  
   [ ] About what I expected  
   [ ] Less than expected

20. Did the length of the course work for you?

   [ ] Yes  
   [ ] No  
   [ ] Not sure
21. This course provided me with practical information that applies to my current employment setting.  
   Strongly disagree ☐ ☐ ☐ ☐ ☐ Strongly agree

Add a comment

22. I would recommend this course to my colleagues.  
   Strongly disagree ☐ ☐ ☐ ☐ ☐ Strongly agree

23. Are you interested in pursuing further informatics training/education at OHSU?

24. Do you feel that this course will be helpful in advancing your career goals?

Add a comment

25. Please comment on aspects of the course that were particularly effective.

26. Additional comments regarding this course.

27. Please comment on aspects of the course that could be improved.