Introduction to Medical Student Research

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Meiling 160
Objectives

- Provide goals, expectations and context for your research experience
- Understand how research training prepares you for critical thinking in clinical medicine and career success
- Education about future research opportunities for physicians in training
Medical Student Research Goals

- Introduction to biomedical research
- Progression in biomedical research
- In depth knowledge in a specific scientific discipline relevant to clinical medicine
- Acquisition of research skills
  - Research Inquiry
  - Research Methods
  - Research Communication
- Awareness of research resources
- Understand the research environment and process
- Establish a relationship with COM faculty and the research team
Medical Student Research Goals
An Example: Bumgardner Lab

- Introduction to biomedical research
- Progression in biomedical research
- In depth knowledge in a specific scientific discipline relevant to clinical medicine: Immunology & Transplantation
- Acquisition of research skills
  - Research Inquiry: Alloantibody mediated rejection after transplant; How does graft damage occur?, how are formation of alloantibodies regulated?
  - Research Methods: Flow cytometry, ELISA, ELISPOT, MLC, CMC, tissue culture, in vivo methods, animal handling, transgenic and KO mice
  - Research Communication: Lab presentations, scientific writing for abstract, manuscript, grant proposal, IRB, poster or oral presentations
- Awareness of research resources: mice, tissue culture, reagents, protocols, information, grant opportunities for medical students
- Understand the research environment and process
- Establish a relationship with COM faculty and the research team
- Establish a student research track record of productivity
Medical Student Research Goals

- Set individualized learning objectives
  - Why is this research important?
  - What area of clinical medicine does it relate to and how?
  - What questions are being asked?
  - What is the Hypothesis that is being tested?
  - What methods do the experiments entail?
  - What are the student specific experimental goals and realistic timeline for achieving these goals?
  - What is the future direction of this research?
Medical Student Research Goals
Scholarship application=Preparation of a Plan

- Scholarship Application Elements
  - Training Plan: Set individualized learning objectives
  - Research Compliance completed
  - Background & Significance ?
  - Hypothesis that is being tested?
  - Research design & alternative strategies?
  - How will the results be analyzed and why?
  - What is the future direction of this research?
  - What clinical problem will this research benefit in the near or longterm?
How does research experience benefit physician training?

- Understanding of how science has contributed to what is currently known about disease prevention, diagnosis, prognosis or therapy.

- Awareness of current scientific approaches, animal models of disease etc and how they can be applied to make new discoveries.

- Develop critical thinking skills which can be applied to the research project and to future clinical encounters.

- Foundation for future Career Development towards an academic career which integrates research with clinical activities.
How does research experience benefit physician training? How

- Understanding of how science has contributed to what is currently known about disease prevention, diagnosis, prognosis or therapy. Focused Reading relevant to the Background & Significance

- Awareness of current scientific approaches, animal models of disease etc and how they can be applied to make new discoveries. Focused reading of the current literature, experimentation, observation, participation in scientific discussions

- Develop critical thinking skills which can be applied to the research project and to future clinical encounters. How to select the best question, analyze data, solve problems, revise the plan/paradigm

- Foundation for future Career Development towards an academic career which integrates research with clinical activities. Expand your research skills and begin your track record of research productivity
Context--What is the national perspective on physician scientist contribution to biomedical research?

- Critical clinical perspective to identify the important questions and how to address them
- Critical to future scientific collaborations and team science and research progress
- Strategic Plan: create funding opportunities to recruit, train and retain talent
Current NIH Director
Francis Collins MD PhD
Request for comment from the NIH Director, Francis Collins MD PhD...8.17.11
the importance of research training for physicians...

Characteristics of clinician-research training including issues such as:

☐ The balance between MDs and MD/PhDs

☐ Career development of clinician-researchers.

☐ Recommendations for changes to the curricula for training clinician-researchers.
Why is Medical Student Research an important component of medical education?

Research and Research Training in Medical Schools in the United States

H. STANLEY BENNETT, M.D.
University of Chicago, Chicago, Ill.

This research revolution is powerful. It is improving greatly the effectiveness and excellence of medical education and creating many new medical scientists and faculty members for the future. It will be reflected in better health and medical care for the people. It is the most important trend in American medical education today. It insures strong fountains to feed our streams of medical knowledge and practice.
Historic advances in biomedical research provide unprecedented opportunities to understand and interdict human diseases.

**Insufficient Workforce** to "propel scientific advances into better diagnostics, treatments, and preventatives of disease."

The AAMC convened a Task Force (CRTF II) how to:

(a) attract, develop, and nurture increased numbers of independent translational and clinical investigators,

(b) create the infrastructure needed by these investigators to be successful, and

(c) finance translational and clinical science.
Recommendation 1: Every future physician should receive a thorough education in the basic principles of translational and clinical research, both in medical school and during residency training.

- Clear signal that the leadership and faculty consider research to be a foundational element of medical education
- At a minimum equips physicians to read and evaluate the medical literature
- To communicate knowledgeably with researchers
- To explain research in comprehensible language to patients and refer when appropriate for clinical trials
- Enhances awareness and stimulate careers in science and academics
How do you think academic medical research will change over the next five years?

The growing complexity of scientific exploration, plus a broadening agenda which encompasses both bench work and efforts to advance the quality of health care delivery and translate lab discoveries into health outcomes for a diverse population, means academic medical research is on track for major changes in the coming years. In the context of diversity, the most salient change will be the growing emphasis on interdisciplinary, team-based research, with the most innovative breakthroughs emerging from groups of professionals from a range of backgrounds.

"Reframing the Narrative":
New AAMC Chief Diversity Officer Marc Nivet Ed.D.
July 2010
Prestigious Medical Student Research Funding Opportunities

Medical Student Research Fellowships

- HHMI
- NIH
- AOA
- Sarnoff Cardiovascular Foundation
- Doris Duke Clinical Research Fellowship
- Fogarty International Clinical Research Scholars Program
- Foundations (AHA, ADA, AAS, ...)

NIH Scholarship Programs for Pre-Professional Students

- NIH Announces New Research Scholars Program
  Starting September 2012, the National Institutes of Health (NIH) will offer a new program that gives 40 medical and dental students the opportunity to work with intramural investigators across the NIH on a variety of research projects. The Medical Research Scholars Program is designed to prepare clinician-scientists for leadership roles in biomedical research and will offer research experiences in basic science laboratories and in clinical and translational research conducted at the NIH Clinical Center. Program applications will be accepted Oct. 1, 2011 through mid-January 2012.
New NIH Medical Research Scholars Program 8.30.11

NIH News
National Institutes of Health

For Immediate Release
Tuesday, August 30, 2011

NIH launches Medical Research Scholars Program

A new Medical Research Scholars Program for medical and dental students will begin in September 2012 in Bethesda, Md., the National Institutes of Health has announced. The program will offer research experiences with intramural investigators from across NIH in basic science laboratories, and in clinical and translational research conducted at the NIH Clinical Center, the world's largest hospital dedicated to patient-oriented research.

The program is made possible through a partnership with the Foundation for the National Institutes of Health supported by a grant from Pfizer Inc and contributions from the Howard Hughes Medical Institute.

"Medical discoveries of tomorrow depend on the students we train today," said NIH Director Francis S. Collins, M.D., Ph.D. "This program will help ensure that there is a steady pipeline of scientists conducting the full range of biomedical research. The program will offer a broad range of exceptional research opportunities, exposure to cutting-edge technology, and critical policy issues for promising students."

The Medical Research Scholars Program builds upon the long history that the NIH intramural program has had in preparing clinician-scientists for leadership roles in biomedical research and incorporates the Howard Hughes Medical Institute (HHMI)-NIH Research Scholars Program and the NIH Clinical Research Training Program (CRTP). The HHMI-NIH Research Scholars Program has historically focused on research in the basic sciences. CRTP participants engage in clinical and translational research. Basic, clinical, and translational research will be part of the Medical Research Scholars Program.
Physicians-in-Training

- T32 (CCTS TL1) training grants for pre-professional students
- Specialty Specific Foundation grants for medical students
- HHMI, Sarnoff, Fogarty, NIH Research Scholars

FACULTY

K08-basic science
K23-clinical science

T32 training grants for clinician scientists
F32 postdoctoral award
Specialty Specific Foundation Awards
Jon Henry MD

- **MD:** OSU COM, June 2008
- Roessler Scholarship Recipient


- **Residency:** OSU General Surgery
- **2 Research Years, PGY2, Masters in Medical Science in progress...**
  - Awardee, NIH T32 Oncology Training Grant Fellow
  - Awardee, NIH Loan Repayment Program
  - Applications to NIH F32, CCTS,
  - Publications
  - Presentations
  - Awards
What career opportunities are available to physicians interested in research?

- NIH Career Development Awards for clinical fellows
- T32 institutional training grant
  - CCTS: [ccts.osu.edu](http://ccts.osu.edu)
  - Thematic areas of research
- Individual early faculty development award
  - K08-Mentored Clinical Scientist Research Career Development Award [www.nih.gov](http://www.nih.gov)
  - K23-Mentored Patient Oriented Research Career Development Award [www.nih.gov](http://www.nih.gov)
- K22-Research Scholar Development Award (research or clinical doctorate)--Transition to independence [www.nih.gov](http://www.nih.gov)
- K02-Independent Scientist Award [www.nih.gov](http://www.nih.gov)
- K24-Mid Career Investigator Award for POR [www.nih.gov](http://www.nih.gov)
Prepare for meeting with potential research mentors:

- Read papers that the PI has published
- Prepare questions about the research topic
- Provide your Biosketch and discuss research goals and prior experience, if any
- Convey your time commitment to the research project
- Convey whether or not your participation in research is contingent upon availability of funding
- Determine where the research is performed
- Determine who will supervise the work in the laboratory
- Determine what is the desired outcome of this research
Prepare for meeting with potential research mentors:

- Determine if the project you would be working on already has IRB/ILACUC approval. If not, will approval be obtained before application due date of January 2012?
- Consider asking potential mentor if you could attend a lab meeting to meet the other lab members, hear about ongoing research etc.
- Ask your mentor what professional societies or foundations relevant to their field offers medical student mentored research grants which could potentially fund your stipend to pursue research with them.
- Determine if your potential mentor could provide funding for your stipend if you do not receive a scholarship or other sources of sponsorship.
How are NIH (and other) Career Awards Reviewed?

- Candidate’s Research Experience
- Candidate’s Research Productivity
- Qualifications of the Mentor (Selection of a mentor who can help you achieve your specific research goals)
- Research Project & Strategy
- Career Development Plan
- Environment/Institutional support

These are highly competitive!
How Your Research Advisor Can Help

- Clarify learning objectives, your role, meeting frequency, timeline for completion, realistic outcomes
- Introduce you and your role to the team
- Provide research resources
- Identify important research seminars you can attend
- Guide your awareness of other research projects
- Identify extramural grant funding opportunities
- Get to know you as a person, research team member, research potential and interests
Nationally established core competencies in Translational and Clinical Science

- In January 2008, The National Center for Research Resources and the CTSA Education and Career Development Steering Committee hosted a workshop to develop national standards for core credentialing competencies for clinical and translational science. The overall goal is to create a competency based education for training clinician-scientists that will define the discipline of Clinical and Translational Science.

The NCRR Core Competencies are:
- I. Identify major clinical/public health problems and relevant translational research questions.
- II. Identify/interpret/critique literature/assess state of knowledge regarding problem.
- III. Design and write protocol for clinical/translational research study for peer review. (Study Design)
Nationally established core competencies in Translational and Clinical Science cont.

- IV. Study Methods/Design/Implementation. (Research Implementation)
- V. Laboratory, Clinical, and Population Research Methods. (Sources of Error)
- VI. Statistical Methods and Analysis.
- VII. Informatics.
- VIII. Conduct Ethically Responsible Research.
- IX. Scientific Communication Skills and Dissemination. (Scientific Communication)
- X. Population Diversity and Cultural Competency. (Cultural Diversity)
- XI. Translational Teamwork.
- XII. Leadership and Professionalism.
- XIII. Cross-disciplinary Training and Mentoring.
- XIV. Community Engagement
## MDSR Calendar of Activities 2011-2012

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<thead>
<tr>
<th>Month</th>
<th>Event</th>
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<tbody>
<tr>
<td>August 10, 2011</td>
<td>1st Year Medical Student Research Orientation</td>
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<tr>
<td>September 22, 2011</td>
<td><strong>Medical Student Research Opportunities &amp;</strong></td>
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<td><strong>Identifying a Research Mentor</strong></td>
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<td><strong>Information Session</strong></td>
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<tr>
<td>October 17, 2011</td>
<td>Landacre Research Opportunities Fair</td>
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<td>Meet faculty from OSUCOM and Nationwide Children’s Hospital</td>
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<tr>
<td>October 25, 2011</td>
<td>Competitive Extramural/Intramural Medical Student Research Funding</td>
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<td>Opportunities Information Session</td>
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### 2011-2012

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<tr>
<td>October 26, 2011</td>
<td>COM Medical Student Research Scholarship (and PCRE) Application Released</td>
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<tr>
<td>November 15(^{th}), 2011</td>
<td>“How to Write Effective Research Fellowship Grant Applications” Information Session</td>
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<tr>
<td>November 30(^{th}), 2011</td>
<td>COM Due Date for Extramural Research Applications Internal Review</td>
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<tr>
<td>January 11, 2012</td>
<td>Extramural Research Applications Due (HHMI, Sarnoff...)</td>
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<tr>
<td>December 9, 2011</td>
<td>Phase I, COM Medical Student Research Scholarship</td>
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<tr>
<td>January 13(^{th}), 2012</td>
<td>Phase II, Complete Application Due</td>
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Questions?