Master of Science in Translational Research

Emma A. Meagher, MD
Program Director, MTR
Vice Dean, Clinical Research
Education for Heterogeneous Career Endpoints

- Clinician
  - Administration
- Pharmacist
- Biotechnology
- Finance/Business
- Clinician
- Scientist
- Innovator
- Educator
- Leader/Administrator
- Industry/For Profit Sector
- Not For Profit Sector
- Health Policy
- Regulatory
- Advocacy
What does the Education Pathway look like?

In parallel or in sequence?

Medical School
Residency & Subspecialty Training
Research Training - Apprentice Model or Formalized Program
Non-Research Training - MBA, JD, etc
Research Dual Degrees
• PhD
• MSc in Clinical Epidemiology
• MSc Health Policy Research
• MSc Medical Ethics
• MSc Translational Research

Non Research Dual Degrees
• Master in Law and Health
• Master of Public Health
• Master of Bioethics
• MBA – Healthcare Administration
• JD

Fifth Year Fellowship-Research

Perelman School of Medicine
University of Pennsylvania
The Shifting Interface of Academia and Healthcare

Integrating the translation of discovery into medical education

The Learning Health Care System

- Large Data
- Academic Partnerships/Consortia
- Team Science
- Science of Healthcare Economics
- Science of healthcare operations on outcomes
The Evolution of the Research Landscape

Clinical Research

Basic Research

Proof of Concept Animals

Proof of Concept Humans

“Translational Research”

Innovation

Clinical Trials

+ Observational Studies

+ Pragmatic trials

**The Learning Health Care System**

Health Sciences Policy

+ Health Systems Research
Overall Goals of MTR Program

• Provide mentored training experience in translational research by combining didactic and experiential experiences in a structured degree granting program

• Prepare trainees to think critically to pose and answer research questions
General Information

• The program enrolls ~20 students per year
  • Includes a mix of MD Students, Residents, Fellows, Pre/Postdoctoral Scientists, and early stage Faculty

• There are ~10 funded (TL1) trainee slots for predoc students per year

• MD students apply in October of their 3rd year

• Selection occurs in December

• Students start program at the end of 3rd year (July)
Overview of Curriculum

- Full time student
  - completes a total of 12 credits

- Required Courses
  - 6 credits – each course equals one credit (see next slide)

- Elective Courses
  - 2 credits (a mix of one credit and/or half credit courses)

- Required ‘Lab’ Time
  - Students complete 2 dry or wet lab rotations to learn specific methods and are awarded 2 credits

- Thesis
  - Students are awarded 2 credits for completing their thesis successfully
Core Courses

• Introduction to Biostatistics (MTR 600)

• Review Writing (MTR 601)

• Proposal Development (MTR 602)

• Disease Measurement (MTR 603)

• Scientific & Ethical Conduct (MTR 604)

• Data Manuscript Writing (MTR 605)
Research Project

**Timeline**

- **Application**
  - Summer: Build Proposal Peer Review
  - Fall: Refine Proposal Submit Revised Proposal

- **Project Execution**
  - Spring Year 2: Project Execution
  - Summer: Proposal Presentation
  - Fall: Proposal Presentation

- **Written Thesis & Oral Defense**
Professional Development Core (PDC)

- Things I Wish I Knew: Past & Current Trainees
- Mentee Training: 4 sessions
- Professional Development Core
- Goal Setting with the Individual Development Plan (IDP)
- Negotiation Skills
- Mindful Approaches to Conflict
- Research Toolbox: Penn Data Analytics Center
Providing the Educational Environment

Ingredients for successful outcomes

- Train to a Competency
- Mentoring
- Advising
- Collaboration
- Resources
- Funding
- Professional Development Core
MTR Entrepreneurial Science Track

- Offers trainees the opportunity to translate biomedical research into innovative solutions and to develop approaches to commercialization.

- Provides mentored training in translational research and entrepreneurship by combining didactic and experiential learning in a structured degree program.

- Key Components:
  i. Entrepreneurship Seminar (MTR 640)
  ii. Elective options across campus (ie Healthcare Entrepreneurship (HCMG 867), Medical Devices (HCMG 853))
  iii. Thesis project with a commercialization plan
  iv. Business mentorship
  v. Internships

Track Director: Nalaka Gooneratne, MD, MSCE
MTR Bioinformatics Track

• Medical informatics: how we compare and evaluate health/care data to both understand and introduce improvements to care

• Bioinformatics: the use of health/care data to conduct discovery-based investigation of biological systems

• MTR Track: To enable clinician scientists to utilize existing informatics tools and to collaborate effectively with informatics specialists

• Key Components:
  i. EPID 632 Introduction to Biomedical and Health Informatics
  ii. EPID 600 Data Science for Biomedical Informatics  
     or MTR 535 Introduction to Bioinformatics
  iii. MTR 999 Lab with Bioinformatics Focus

In collaboration with the Penn Institute for Biomedical Informatics
MTR Translational Therapeutics Track

• Focuses on discovery of new treatments in an academic setting and transfer of this technology to industry for implementation in clinical practice.

• Three main components:
  i. core didactic class in Translational Therapeutics (MTR 620)
  ii. an internship in industry
  iii. thesis project with a focus in translational therapeutics.
## Integration of Curricula - Sample MTR Study Plan

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<thead>
<tr>
<th>YEAR</th>
<th>FALL</th>
<th>SPRING</th>
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<tr>
<td>1</td>
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<td>Module 5</td>
<td>MTR 602</td>
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<td>MTR 600, 601, 603</td>
<td>MTR 604, 605, Elective 1</td>
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<td>5</td>
<td>2 x MTR 999, Elective 2</td>
<td>Module 5 + 2 Thesis Credits</td>
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<td>Research</td>
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<td>Module 2 MD tuition</td>
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<td>Module 2 MD tuition</td>
<td>Module 4 MD tuition</td>
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<td>3</td>
<td>Modules 4 MD tuition</td>
<td>Module 5 MD tuition</td>
<td>MTR tuition TL1 starts July 1st</td>
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<td>MTR tuition TL1 grant</td>
<td>MTR TL1 ends June 30th</td>
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<td>5</td>
<td>MTR tuition</td>
<td>Module 5 + MTR MD tuition</td>
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Grant Funding & Tuition Costs

• TL1 scholars receive a cost of living stipend of $23,376

• Cost of MTR (12 c.u.) is $60,719 in 2017
  ➢ Subtract $20,500 (TL1 tuition benefit)
  ➢ Subtract $10,012 (PSOM additional course policy for 2 courses)
  ➢ Subtract $29,422 (1 semester of MD tuition/fees)

• The total MD-MTR degree cost for a TL1 scholar is approximately $785 greater than a traditional MD degree for an MD student with no PSOM scholarships who has not previously used PSOM additional courses.

• Students with PSOM scholarships can only use scholarship funds during 7 MD semesters. These funds cannot be used during the MTR program.

• Tuition estimates are based on FY18 rates and may increase in future.
## Current MD-MTR Students

<table>
<thead>
<tr>
<th>Student</th>
<th>Research Area</th>
<th>Research Project</th>
<th>Mentor</th>
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<tbody>
<tr>
<td>Peter Hadar, BA</td>
<td>Neurology</td>
<td>Use of Novel GluCEST Imaging to Identify Epileptic Foci</td>
<td>Kathryn Davis, MD, MTR</td>
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<tr>
<td>Arka Mallela, BA</td>
<td>Neurosurgery</td>
<td>Mapping the Evolution of Acute Mild TBI</td>
<td>Douglas Smith, MD</td>
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<tr>
<td>Nina Ran, BA</td>
<td>Dermatology</td>
<td>Defining B cell tolerance checkpoints in PV</td>
<td>Aimee Payne, MD, PhD</td>
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<tr>
<td>John Riley, BA</td>
<td>Pediatric Fetal Surgery</td>
<td>Augmenting Peripheral Tolerance in IUHCT</td>
<td>William Peranteau, MD</td>
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<tr>
<td>Ari Wes, BA</td>
<td>Pediatric Plastic Surgery</td>
<td>EntSci: Development of an internal, motorized, cranio-maxi</td>
<td>Jesse Taylor, MD</td>
</tr>
<tr>
<td>Alan Workman, BA</td>
<td>ENT: Head/Neck Surgery</td>
<td>Translating observations in the murine nose to the human nose</td>
<td>Noam Cohen, MD, PhD</td>
</tr>
<tr>
<td>John Arena, BA</td>
<td>Neurosurgery</td>
<td>Mechanisms of Axonal Degeneration Following Traumatic Brain Injury</td>
<td>Douglas Smith, MD</td>
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<tr>
<td>Christopher Corbett, BS</td>
<td>Thoracic Surgery</td>
<td>Development of Immunologic Approaches to Eliminate Relapses After Cancer Surgery</td>
<td>Sunil Singhal, MD</td>
</tr>
<tr>
<td>Julia D'Souza, BS</td>
<td>Radiology</td>
<td>Trapping of Chemotherapeutics in Tumors via Antivascular Ultrasound</td>
<td>Chandra Sehgal, PhD</td>
</tr>
<tr>
<td>Yohannes Ghenbot, BS</td>
<td>Neurosurgery</td>
<td>Augmenting Perception Through Direct Electrical Stimulation of the Adult Somatosensory Cortex</td>
<td>Timothy Lucas, MD, PhD</td>
</tr>
<tr>
<td>Anthony Martin, BS</td>
<td>Orthopaedic Surgery</td>
<td>Acellular Hyaluronic Acid Scaffold with Embedded Biofactors for Cartilage Regeneration in a Minipig Cartilage Defect Model</td>
<td>Robert Mauck, PhD &amp; James Carey, MD, MPH</td>
</tr>
<tr>
<td>Alexander Morrison, BS</td>
<td>Immunology</td>
<td>Mechanisms of CD40-dependent T cell trafficking in pancreatic ductal carcinoma</td>
<td>Robert Vonderheide, MD, Dphil</td>
</tr>
<tr>
<td>Neil Patel, BS</td>
<td>ENT: Head and Neck Surgery</td>
<td>Do Solitary Chemosensory Cells drive an IL-25 mediated eosinophilic inflammatory response in chronic rhinosinusitis with nasal polyps?</td>
<td>Noam Cohen, MD, PhD</td>
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<tr>
<td>Robert Schaw, BS</td>
<td>Immunology</td>
<td>Heart CAR-T</td>
<td>A. Posey, PhD, K. Musunuru, MD, PhD, MPH, &amp; C. June, MD</td>
</tr>
<tr>
<td>Nicolas Seranio, BS</td>
<td>Radiation Oncology</td>
<td>Elucidation of the role of circulating tumor cells as biomarkers in the management of bladder cancer</td>
<td>Gary Kao, MD</td>
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<tr>
<td>Elliot Stein, BA</td>
<td>Interventional Radiology</td>
<td>Coaxial Electrochemical Ablation Device</td>
<td>Greg Nadolski, MD &amp; Terence Gade, MD, PhD</td>
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<tr>
<td>Rosaline Zhang, BS</td>
<td>Pediatric Plastic Surgery</td>
<td>&quot;Black Bone&quot; MRI as alternative to CT for craniofacial imaging and evaluation of common bony pathologies</td>
<td>Scott Bartlett, MD</td>
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</tbody>
</table>
27 MD-MTR Graduates - Outcomes

Residency programs

- Penn Neurosurgery
- Penn Radiation Oncology x 3
- Penn Internal Medicine x 2
- Penn Integrated Vascular Surgery
- Penn Integrated Plastic Surgery x 2
- Penn Neurosurgery
- Penn Otorhinolaryngology
- Penn Ortho Surgery
- Jefferson Dermatology
- Johns Hopkins Internal Medicine & Dermatology

- Mass General Surgery X 2
- Mass General Orthopaedic Surgery
- NYU Neurology
- Oregon Health & Science Univ - Ophthalmology
- Seattle Children’s Hospital, Pediatrics
- U of Michigan Anesthesiology & Internal Medicine
- UCLA Neurosurgery
- UCSF Radiation Oncology & Internal Medicine
- Yale Internal Medicine
Outcomes Continued

First author pubs in:

- JAMA
- Ann Thorac Cardiovasc Surg
- J Am Acad Dermatol
- Blood
- Cancer Biol Ther
- Neurosurg Focus
- Neurocrit Care
- J Vasc Interv Radiol
- J Neurointerv Surg
- Eur J Cardiothorac Surg
- Oncology
- J Craniofac Surg
- Acad Med
- JAMA Dermatol
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