

Master of Science in Translational Research

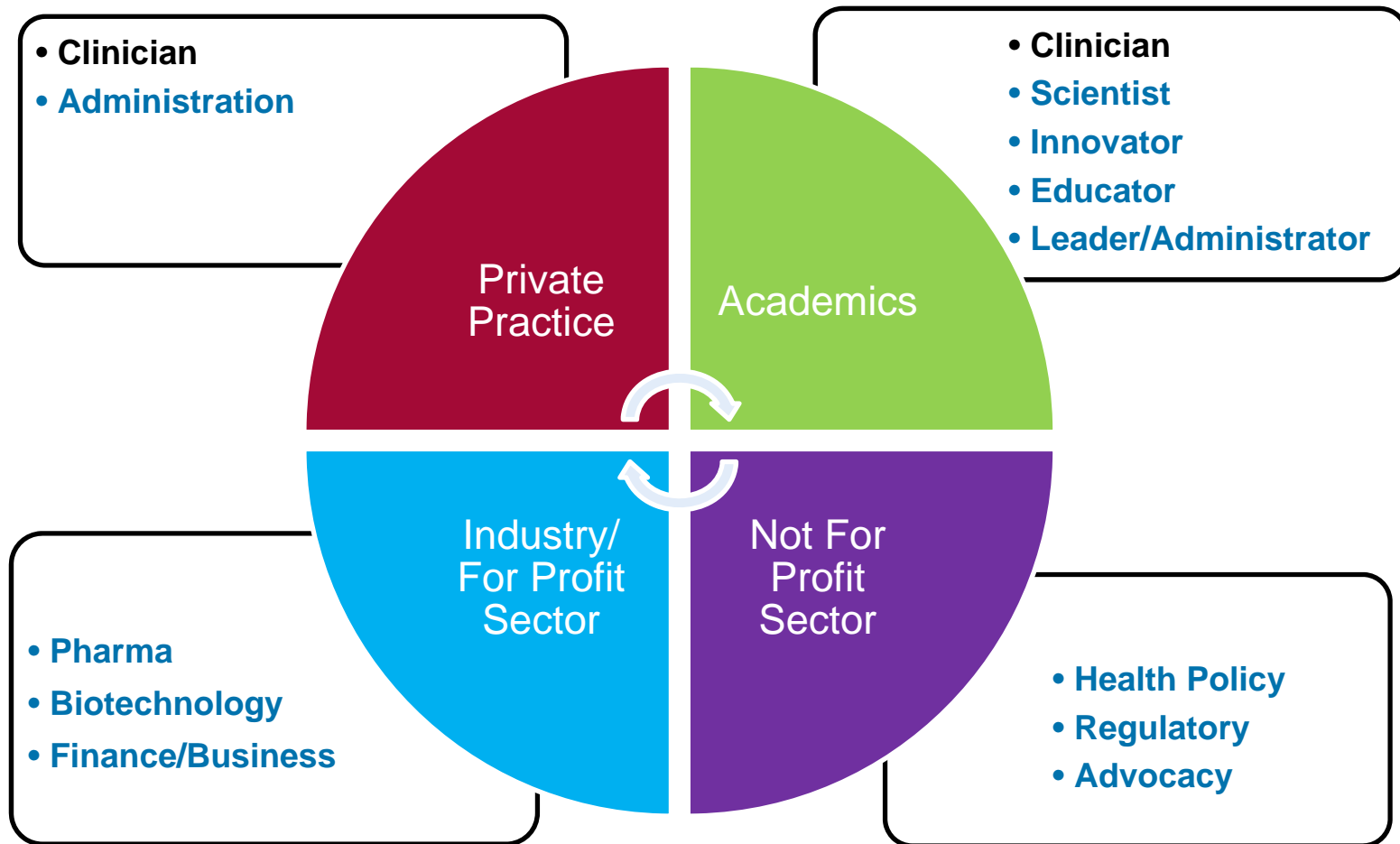
Emma A. Meagher, MD

Program Director, MTR

Vice Dean, Clinical Research



Education for Heterogeneous Career Endpoints



MD+ Programs

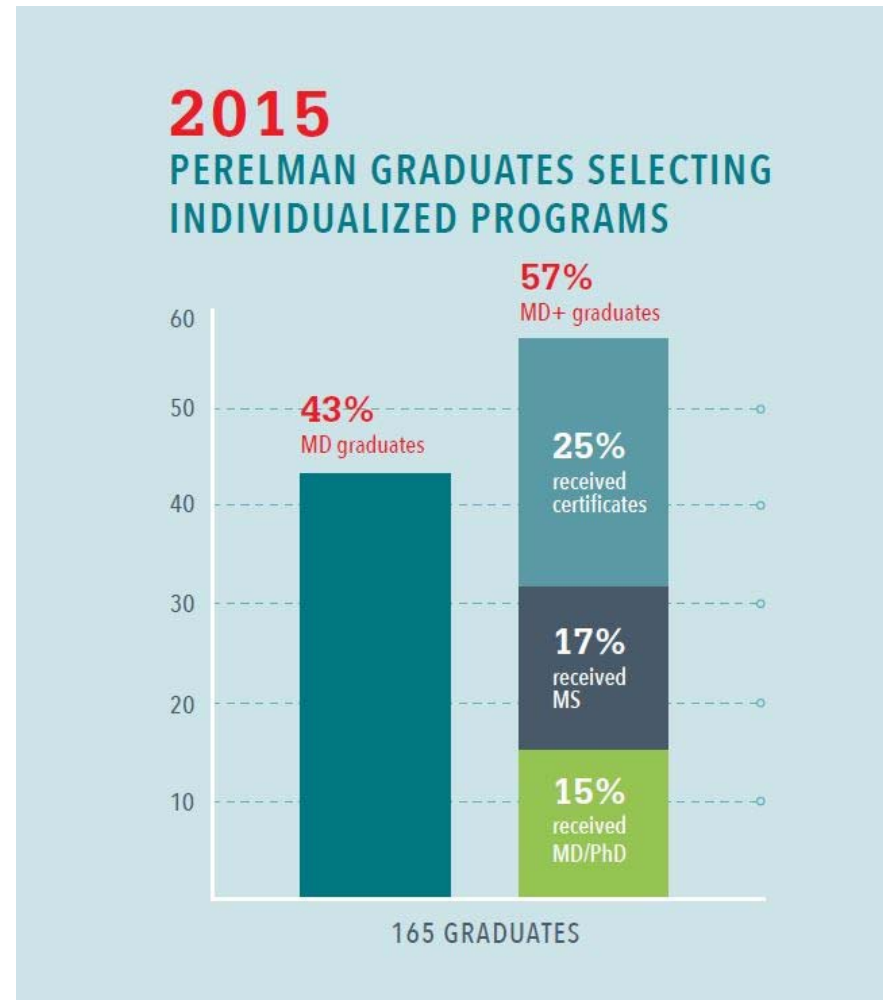
Research Dual Degrees

- PhD
- MSc in Clinical Epidemiology
- MSc Health Policy Research
- MSc Medical Ethics
- MSc Translational Research

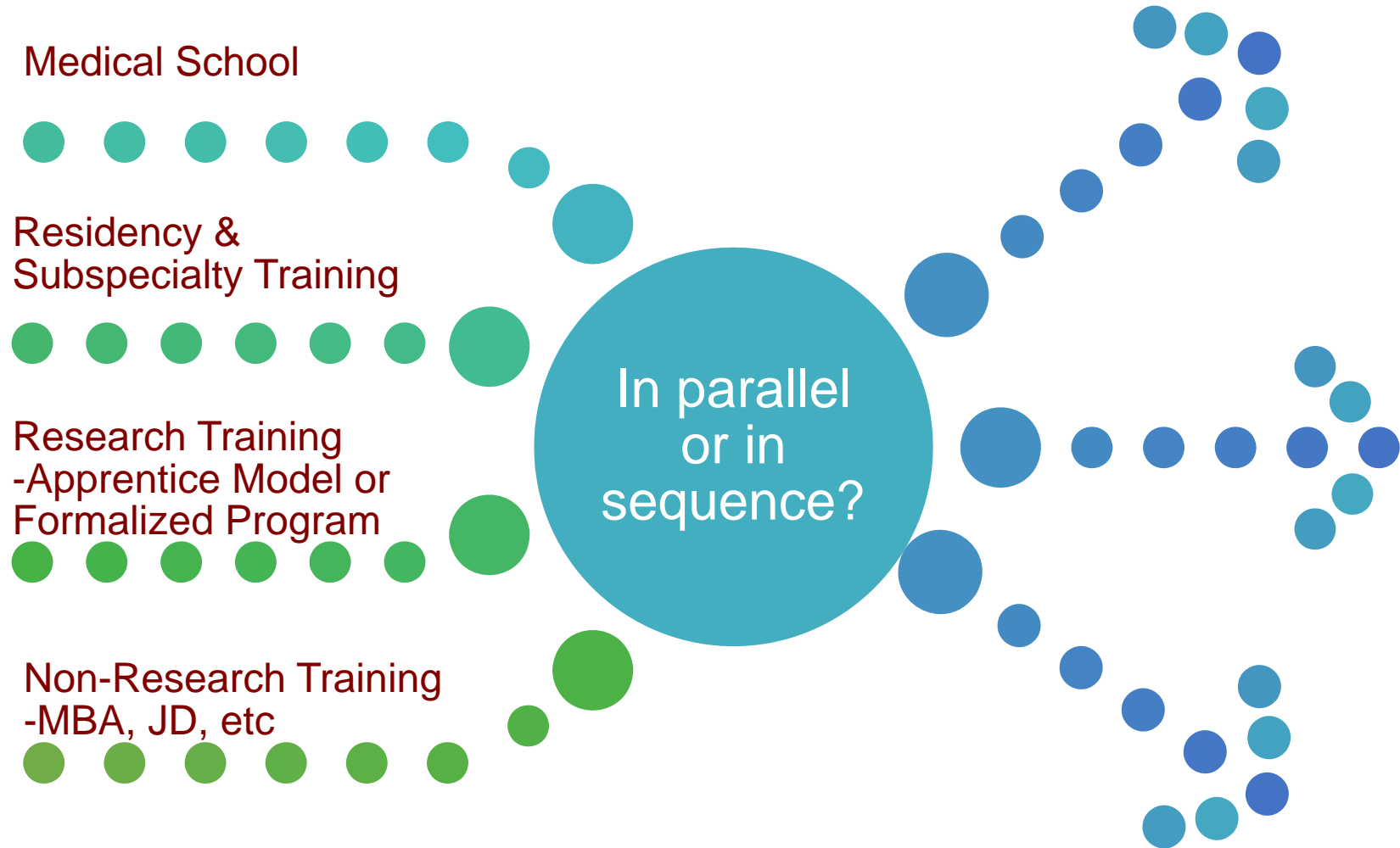
Non Research Dual Degrees

- Master in Law and Health
- Master of Public Health
- Master of Bioethics
- MBA – Healthcare Administration
- JD

Fifth Year Fellowship-Research

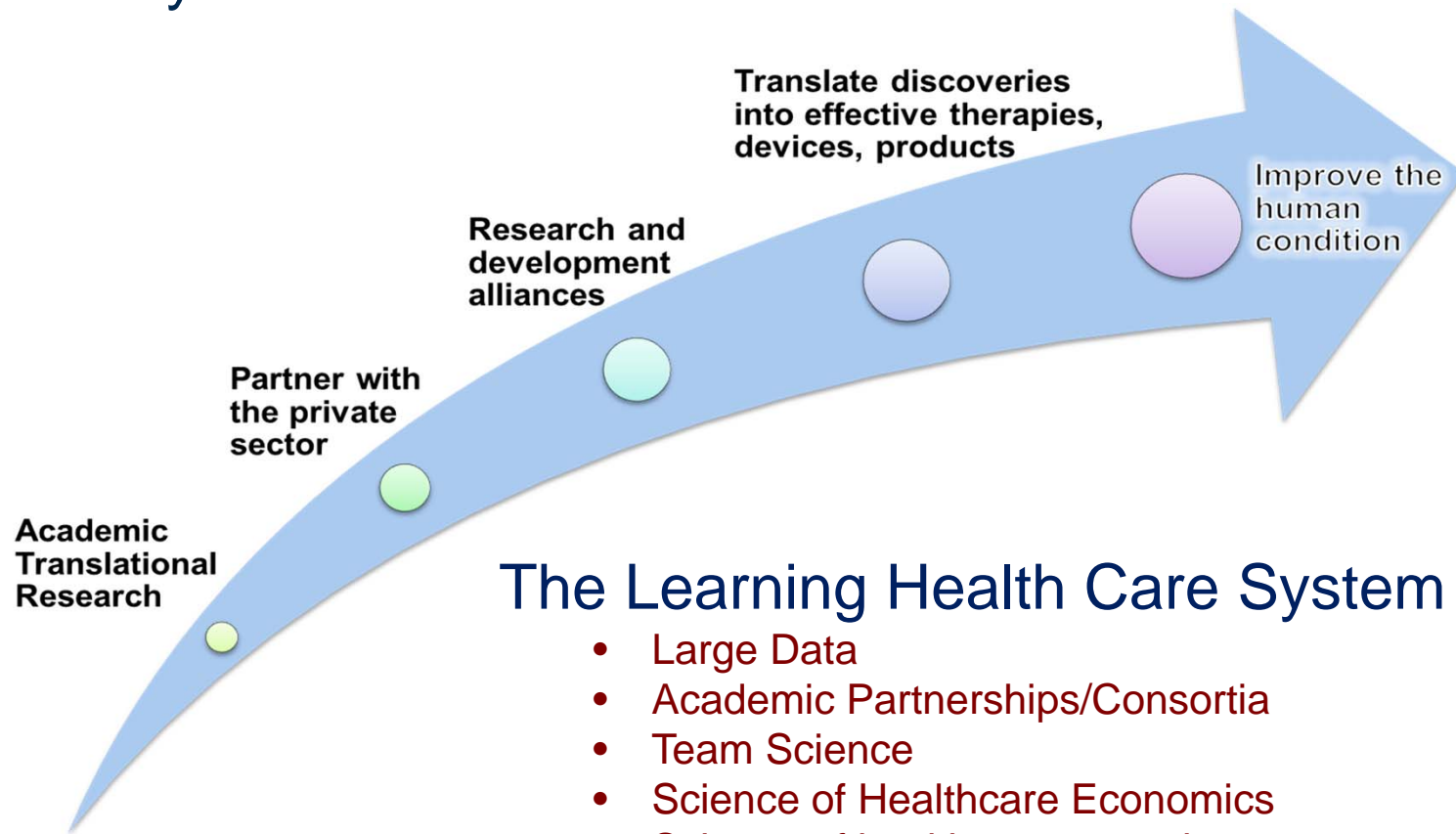


What does the Education Pathway look like?



The Shifting Interface of Academia and Healthcare

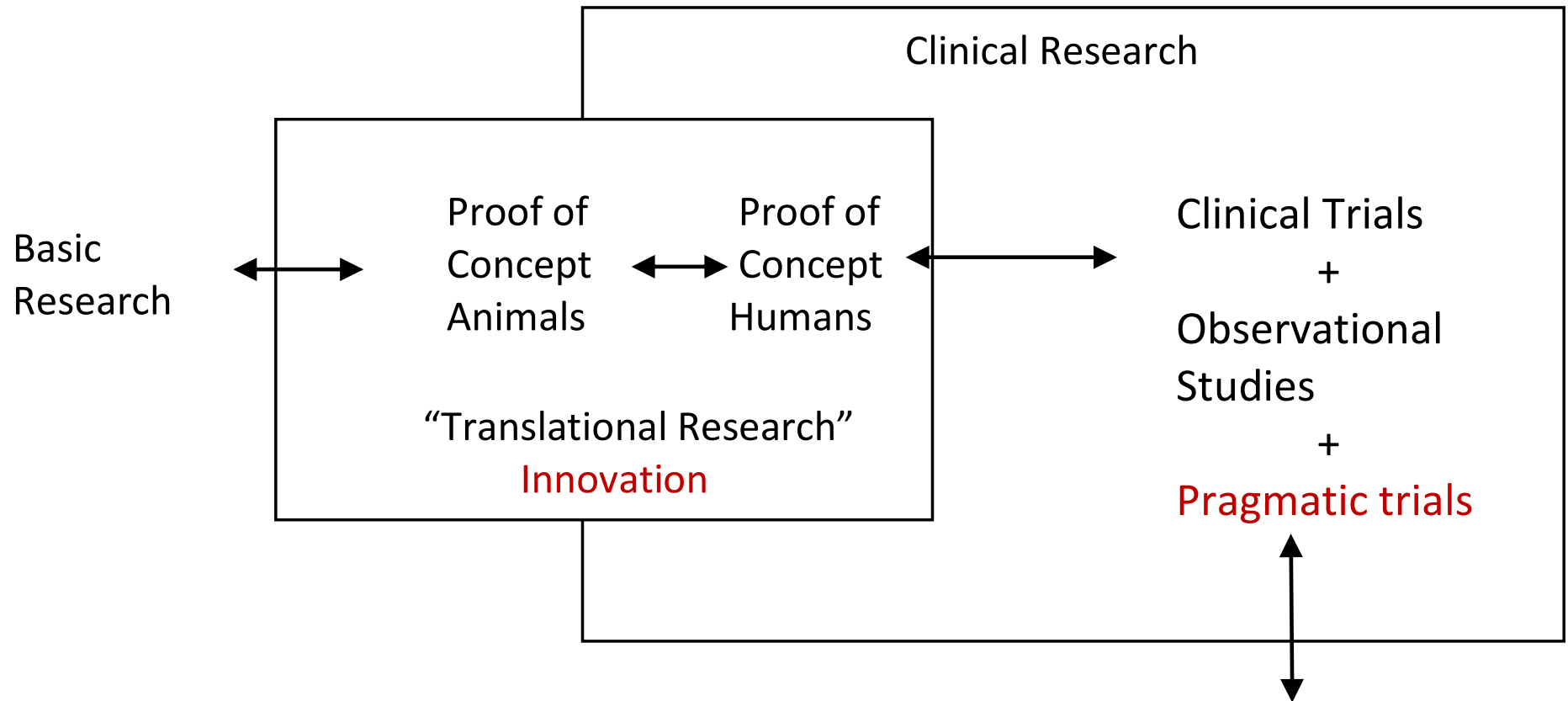
Integrating the translation of discovery into medical education



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



**The Learning Health Care System

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 MD students per year
- MD students apply in the fall of their 3rd year (Sept - Oct)
- Selection occurs in December
- Students start program at the end of 3rd year (July)

Overview of Curriculum

- Full time student
 - Student complete 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)
- Manuscript Writing (MTR 605)

Integration of Curricula - Sample MTR Study Plan

YEAR	FALL	SPRING	SUMMER
1	Module 1	Module 2	
2	Module 2	Module 4	Module 4
3	Module 4	Module 5 Step 1 USMLE	MTR 602 Research
4	MTR 600, 601, 603 Research	MTR 604, 605, Elective 1 Research	Research
5	2 x MTR 999, Elective 2 Research	Module 5 + MTR 607, 608 Research	

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.

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
 - ii. Building a Life Sciences Startup (MTR 642)
 - iii. Leadership (MTR 641)
 - iv. Elective options across campus (ie Healthcare Entrepreneurship (HCMG 867), Medical Devices (HCMG 853))
 - 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

Providing the Educational Environment



Finances

YEAR	FALL	SPRING	SUMMER
1	Module 1 MD tuition	Module 2 MD tuition	
2	Module 2 MD tuition	Module 4 MD tuition	Module 4
3	Modules 4 MD tuition	Module 5 MD tuition	MTR tuition TL1 starts July 1 st
4	MTR tuition TL1 grant	MTR tuition TL1 grant	MTR TL1 ends June 30 th
5	MTR tuition	Module 5 + MTR MD tuition	

Tuition Costs

- Cost of MTR (12 c.u.) is \$59,172 in 2016
 - Subtract \$29,405 (1 semester of MD tuition)
 - Subtract \$20,500 (TL1 tuition benefit)
 - Subtract \$9,630 (PSOM additional course policy for 2 courses)
- Cost Neutral: bottom line tuition cost for TL1 grant funded student is approximately -\$363
- Cost of living stipend of \$23,376 to offset delay to earning
- For students receiving merit scholarships the scholarship applies for 7 MD semesters only

Current MD-MTR Students

Student	Research Area	Research Project	Mentor
Ian Danford, BS	Ophthalmology/Glaucoma	The role of mitochondrial genetics in contributing to associated optic neuropathy	Joan O'Brien, MD
George Fryhofer, BA	Orthopaedic Surgery	Defining the Achilles tendon response to controlled passive motion rehabilitation following acute tendon tear, in comparison to active motion rehabilitation	Louis Soslowsky, PhD
Harry Han, BS	Pediatric Neurology Oncology	The role of ACVR1 and Histone 3 mutations in pediatric diffuse infiltrative pontine gliomas	Adam Resnick, PhD
Eric Lin, BA	Gastroesophageal Cancer	Role of iNOS in Myeloid Derived Suppressor Cell-mediated Immune Suppression in Esophageal Cancer	Anil Rustgi, MD
Catherine Norise, BA	Neurology	Transcranial Direct Current Stimulation Elucidates Mechanisms of Recovery From Non-Fluent Aphasia	Roy Hamilton, MD, MS
Aeron Small, BA	Cardiology/Genetics	The pathophysiology and clinical progression of aortic valvular disease	Daniel Rader, MD
Wen Xu, BS	Pediatric Craniofacial Surgery	Diagnostic value of spectral domain optical coherence tomography for papilledema in patients with presumed increased intracranial pressure	Jesse Taylor, MD
Peter Hadar, BA	Neurology	Use of Novel GluCEST Imaging to Identify Epileptic Foci	Kathryn Davis, MD, MTR
Arka Mallela, BA, MS	Neurosurgery	Mapping the Evolution of Acute Mild TBI	Douglas Smith, MD
Nina Ran, BA	Dermatology	Defining B cell tolerance checkpoints in PV	Aimee Payne, MD, PhD
John Riley, BA	Pediatric Fetal Surgery	Augmenting Peripheral Tolerance in IUHCT	William Peranteau, MD
Ari Wes, BA	Pediatric Plastic Surgery	EntSci: Development of an internal, motorized, cranio-maxi	Jesse Taylor, MD
Alan Workman, BA	ENT: Head/Neck Surgery	Translating observations in the murine nose to the human nose	Noam Cohen, MD, PhD

20 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
- Penn Neurosurgery
- Penn Otorhinolaryngology
- Jefferson Dermatology
- Johns Hopkins Internal Medicine
- Mass General Surgery X 2
- Mass General Orthopaedic Surgery
- NYU Neurology
- Seattle Children's Hospital, Pediatrics
- U of Michigan Anesthesiology
- UCLA Neurosurgery
- UCSF Radiation Oncology

Over 50 first author pubs

- 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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<http://www.itmat.upenn.edu/mtr/>