

**Report of the  
Task Force on Physician Scientist Education**

**Submitted to**

**Dr. Catharine Whiteside, Dean of Medicine**

**By**

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**Chair, Task Force on Physician Scientist**

**Education**

**and**

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**June 7, 2012.**

**Report from the Physician Scientist Training Task Force  
University of Toronto  
June, 2012**

## **1.0 Background**

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Physician scientist training programs aim to prepare physicians-in-training for a career leading medical discovery and application of new knowledge to improve human health. These programs aim to educate a physician-in-training to become bilingual in medicine and science. While no quantitative methods have been developed to demonstrate the value of physician scientists to the health system, a large body of literature demonstrates the critical contribution by physician scientists to medically relevant discoveries and innovations in health.

Since their creation in the 1960s, physician scientist training programs aligned with North American undergraduate and postgraduate medical education programs have graduated physician scientists capable of sustaining investigative careers in academia or industry, publishing scientific work with high impact and successfully competing for research funds. However, the educational model used to train physician scientists has been largely unchanged since these programs were created.

The Faculty of Medicine at the University of Toronto launched its MD/PhD program in 1984. Eleven years later, in 1995, both the Comprehensive Research Experiences for Medical Student Programs (CREMS) and the Clinical Investigator Program (CIP) were established. MD/PhD students engage in undergraduate medical and PhD studies culminating in the receipt of the dual-degree designation after approximately 8 years. CREMS students participate in non-degree research experiences, from 3 to 20 months in duration, within the undergraduate medical education program. CIP trainees engage in research training at the level of a MSc or PhD degree or postdoctoral fellowship in addition to postgraduate medical education. In both the MD/PhD Program and the CIP, clinical and research training are generally undertaken in series such that the time periods dedicated to clinical and research training are distinct.

Several indicators suggest that the viability of the physician scientist career track is presently threatened. US-based analyses of both National Institutes of Health (NIH) funding over several decades and success of physician scientists within academia have identified several critical issues. First, the number of physicians engaged in research in the United States has declined from 1980 to 2005. While the number of physician scientists has been stable during this time period, the number of physicians has doubled, resulting in a proportional decline in the number of physicians conducting research. Second, demographic research indicates other threats: the average age at which physician investigators now achieve their first independent research funding in the United States is over 40 and continues to rise. This advanced age at the time of 1<sup>st</sup> independent funding limits the number of years spent as an independent physician scientist. Third, while physicians well-trained in research are as competitive in NIH ROI competitions as their PhD-only (non-clinician) counterparts, the number of physicians applying for research grants is declining. Fourth, increased economic pressures are negatively affecting the capacity

of academic medicine and research granting organizations to support physician scientists. Together, these factors, which have been highlighted in a series of high profile publications during the last 20 years, are limiting recruitment of individuals into the physician scientist pipeline.

A literature review and environmental scan of physician scientist programs in North America and Great Britain, performed under the direction of the Associate Dean, Physician Scientist Training in September 2011 (Appendix A), revealed the following findings:

- The length of physician scientist training (approximately 14-18 years post-secondary) is viewed by physician scientist candidates, trainees, graduates and program leaders as a threat to the recruitment and retention of physician scientists.
- The vast majority of physician scientist training programs feature parallel clinical and scientific tracks, thereby limiting integration across these domains. However, some MD/PhD programs feature integrated curricular components (e.g. pathophysiology for the physician scientist, challenges in translational medicine) that are designed to enhance learner's knowledge of the links between science and clinical medicine and skills to conceptualize medical problems within a scientific framework.
- The current period is one of unprecedented opportunity to apply biomedical research to human health and to transfer clinical and population health research for the benefit of the community. At the same time, physician scientist training needs to be broadened from its predominant focus on biomedical research to the full breadth of health research domains with a particular focus on translational medicine.
- Effective mentoring is key to the success of the physician scientist during training and career development.
- Minimization of debt is critical to the recruitment and retention of physician scientist trainees.
- Uncertainty in career sustainability threatens the physician scientist career path. Academic institutions vary greatly in the support provided in the form of salary, infrastructure, and start-up support to physician scientists. Funding to support research at the local, provincial and federal levels is dynamic in form, highly competitive and variable in quantity. Accordingly, physician scientists, among the community of health scientists, lack confidence that research, even at an excellent level, will be supported.

In contrast to factors that are threatening the physician scientist role, there has never been a more opportune time to apply science towards the improvement of health. Within the Canadian Institutes of Health Research (CIHR), the developing Strategic Patient Oriented Research Strategy (SPOR) aims to increase investment in clinical, population and health services

research in Canada. The combined continued commitment of the CIHR to fundamental discovery together with SPOR presents an opportunity for the physician scientist in Canada.

The 2010 and 2012 AFMC Future of Medical Education (FMEC) Reports on Undergraduate and Postgraduate Medical Education<sup>1,2</sup> and the 2011 Report of the Global Commission on the Education of Health Professionals<sup>3</sup> for the 21st Century highlight the importance of science within medicine and the need to educate physician scientists. FMEC and the Global Commission call for educational reform within medicine aimed at recruiting students with diverse knowledge and skills and preparing physicians to undertake diverse roles within medicine. Consistent with these reports, educational innovation and the training of the next generation of physician scientists are central to the 2011-2016 Faculty of Medicine Strategic Plan.

We are faced with two co-existing realities. One, physician scientists make an important, indeed critical, contribution to the health system. Second, the pipeline to generate physician scientists is threatened. The appetite for reform in medical education, together with a newly-felt urgency to apply scientific discovery to improved human health, creates a new opportunity to re-examine the approach to educating and supporting the physician scientist role. In this context, the Associate Dean, Physician Scientist Training Programs struck this Task Force on Physician Scientist Training.

## 2.0 Terms of Reference

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The following Terms of Reference were approved by the Task Force:

- 1) Identify the existing strengths, weaknesses, opportunities and threats (SWOT) within the current landscape for educating future physician investigators/scientists in biomedical, clinical, population-based, and policy-based sciences using as reference points:
  - current Accreditation Standards for Undergraduate and Postgraduate medical education,
  - the 2010 AFMC Future of Medical Education Report,
  - the 2011 Report of the Global Commission on the Education of Health Professionals,
  - Association of Professors of Medicine (APM) Report: Recommendations for Revitalizing the Nation's Physician-Scientist Workforce,
  - AAMC-HHMI Report: Scientific Foundations for Future Physicians,
  - the University of Toronto's Towards 2030 Long-term Planning Framework,
  - the Faculty of Medicine's Strategic Plan,

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<sup>1</sup> [http://www.afmc.ca/fmec/pdf/collective\\_vision.pdf](http://www.afmc.ca/fmec/pdf/collective_vision.pdf)

<sup>2</sup> [http://www.afmc.ca/future-of-medical-education-in-canada/postgraduate-project/pdf/FMEC\\_PG\\_Final-Report\\_EN.pdf](http://www.afmc.ca/future-of-medical-education-in-canada/postgraduate-project/pdf/FMEC_PG_Final-Report_EN.pdf)

<sup>3</sup> doi:10.1016/S0140-6736(10)61854-5



- the background report prepared for the Task Force Proceedings,
  - evolving nature of research and developing conditions within the research economy in academia, hospital-based research institutes and the private sector in relation to the model of the physician scientist during the next 10-20 years
- 2) Using the SWOT analysis, above, engage in a 'blue sky' visioning process, and make recommendations for future steps in alignment, cohesion, integration and innovations of undergraduate, postgraduate and graduate school curricula in physician scientist training programs. This can be focused in the following five areas:
- Provide recommendations regarding the kinds of programs that are needed to develop the physician scientists of the future and the relation of these programs to existing programs.
  - Where appropriate, make recommendations regarding the MD/PhD Program at the University of Toronto.
  - Where appropriate, make recommendations regarding the Royal College Clinician Investigator Program at the University of Toronto.
  - Where appropriate, make recommendations regarding the CREMS Programs at the University of Toronto.
  - Provide recommendations to optimize or develop Faculty Development Programs in order to support those individuals who choose to pursue a career path as clinician scientists.
- 3) Recommend specific steps with timelines to pursue the newly articulated vision for Physician Scientist Training Programs.
- 4) Report to the Dean, Faculty of Medicine, the Vice-Dean, Undergraduate Medical Education, the Vice-Dean, Postgraduate Medical Education and the Vice-Dean, Graduate Affairs in draft for consultation by March 30, 2012 with final report no later than June 1, 2012.

## **2.1 Task Force Composition**

### **Chair:**

Norman Rosenblum - Associate Dean, Physician Scientist Training Programs

### **Dean of the University of Toronto:**

Brian Corman - Dean, School of Graduate Studies

### **Vice-Deans of the Faculty of Medicine:**

Alison Buchan - Vice-Dean Research and International Relations

Jay Rosenfield - Vice-Dean, Undergraduate Medical Education

Sal Spadafora - Vice-Dean, Postgraduate Medical Education

Avrum Gotlieb - Acting Vice-Dean, Graduate Affairs

**Faculty of Medicine Chairs and Directors:**

Allan Kaplan - Director, Institute of Medical Sciences

Don Branch - Director, CREMS Programs

Howard Lipshitz - Chair, Department of Molecular Genetics

**Research Institute Director:**

Arthur Slutsky - Vice President, Research, St. Michael's Hospital

**Clinician Scientists and Physician Scientist Training Program Alumni:**

Sandra Black - Clinician Scientist

Jill Hamilton - Clinician Scientist, CIP Graduate

Gillian Hawker - Clinician Scientist, Chief of Medicine, WCH

Heather Reich - Clinician Scientist, CIP Graduate

Lisa Robinson - Clinician Scientist

Aaron Schimmer - Clinician Scientist

Ross Upshur - Clinician Scientist

**MD/PhD Students:**

Brian Ballios

Greg Costain

**Administrative Staff:**

Sandy McGugan - Senior Administrator, Physician Scientist Training Programs

**Administrative Support:**

Morag Paton - Education Vice-Deans

Ann Vuletin - Clinician Scientist Training Programs

**2.2 Methodology Used by the Task Force**

Convening of the Task Force was preceded by a review of pertinent literature and an environmental scan of physician scientist training programs in North America and the United Kingdom. This was performed by Dr. Beata Gallay and Dr. Norman Rosenblum. This review, 'Physician Scientist Education Programs', key published literature, University of Toronto Strategic Planning Reports, and pertinent reports by key organizations and regulatory bodies were provided to all Task Force members, reviewed within the Task Force, and maintained on a Task Force section of Portal for continued reference. The status of the University of Toronto MD/PhD Program, CREMS Programs and the CIP was presented to the Task Force by Norman Rosenblum (Director, MD/PhD Program and Clinical Investigator Program) and Don Branch (Director, CREMS Programs). Surveys of current MD/PhD and CIP trainees and MD/PhD Program alumni were generated by the committee with the leadership of Brian Ballios and Greg Costain (Appendix B). Analyses of results were generated by Mr. Ballios and Mr. Costain and

were presented to the committee. Together, these resources were used by the Task Force to generate a SWOT analysis. In turn, the SWOT analysis provided a basis for the recommendations of the Task Force.

### **3.0 Current Faculty of Medicine Research Training Programs**

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On the 2011 Canadian Graduate Questionnaire (CGQ) 81.3% of University of Toronto graduating MD students reported having participated in research with a faculty member (all-schools average 59.4%), and only 2.3% reported no available opportunity. On the 2011 Canadian Medical Graduate Post-Match Survey Results provided by CaRMS to the University of Toronto, 53% of Toronto graduates identified research opportunities during residency as a “very influential” or “extremely influential” factor in determining their first-choice location for a residency, compared to a national average of 38%. On the 2011 CGQ, 49.7% reported an intention to pursue research as part of their career, compared to a national average of 42.3%.

The Comprehensive Research Experience for Medical Students (CREMS) Program, established in 1995 has funded 77 CREMS Scholars of Distinction (12 months of research experience), 56 CREMS Scholars (20 months of research experience), and 587 summer studentships. The CREMS program continues to grow in both size and breadth with the addition of Research in Humanities and International Health Research Programs. To date, there have been 96 MD/PhD students enrolled at the University of Toronto and 53 have graduated. Forty-three students are currently enrolled in the program. To date, there have been 433 CIP trainees enrolled at the University of Toronto. University of Toronto CIP trainees constitute 78% of all CIP trainees in Canada since CIP was created.

### **4.0 Task Force Findings and SWOT Analysis**

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The Task Force identifies the following strengths, weaknesses, opportunities and threats to the physician scientist training environment at the University of Toronto.

#### **4.1 Strengths**

##### *Reputation*

- 4.1.1 The University of Toronto is the largest and based on external assessment(s), the most productive Canadian university in the life sciences and medical sciences. In 2010, the Higher Education Evaluation and Accreditation Council of Taiwan (HEEACT), which ranks research productivity, impact and excellence of published scientific papers of 500 universities worldwide, ranked the University of Toronto first in Canada, and 9th in the world. The University of

Toronto's School of Graduate Studies has over 4400 faculty and over 13,000 full time and part time graduate learners<sup>4</sup>. The Faculty of Medicine is the largest in Canada, with over 5,800 total academic faculty, close to 7,000 students at all levels and programs and 22,000 continuing education registrants<sup>5</sup>. The Faculty of Medicine is partnered with 9 fully-affiliated hospitals, 14 research institutes<sup>6</sup> and 19 community-affiliated hospitals and clinical care sites<sup>7</sup>. The research productivity of the Faculty of Medicine is greatly strengthened by the coordinate efforts of its Departments and its hospital-affiliated research institutes. The Institutes are home to a large group of investigators and trainees. Results during the past five years (2006-2011) indicate that the University of Toronto garners more Canadian Institutes of Health Research (CIHR) funding than any other university in Canada - almost double the amount of funding than the next ranked institution. In 2011, the University of Toronto ranked first in Canada and among the top international universities on influential international rankings such as the Times Higher Education Report, the Shanghai Jiao Tong University's Academic Ranking of World Universities, and Newsweek.

- 4.1.2 The University of Toronto, Faculty of Medicine is viewed nationally as a leader in physician scientist training. The Faculty developed the first Canadian MD/PhD Program. Furthermore, the Faculty postgraduate physician scientist training programs were the basis for the development of the Royal College of Physicians and Surgeons of Canada (RCPSC) Clinical Investigator Program (CIP). Both the MD/PhD and the CIP programs graduate more trainees than any other comparable program in Canada.

#### *Breadth and Quality of Our Programs and Learners*

- 4.1.3 The Faculty supports a breadth of opportunities for medical student research with research experiences of different intensity and duration. These programs include the MD/PhD Program, the suite of Comprehensive Research Experiences for Medical Students (CREMS) Programs that feature summer research, a 20 month research experience and international research opportunities, and CIP. The number of trainees participating in these programs in 2011 was 43 in the MD/PhD program, 28 in the CREMS Research Scholar Program, 73 in the CREMS Summer Programs and 110 in the CIP.

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<sup>4</sup> <http://www.gradschool.utoronto.ca/aboutgradschool.htm>

<sup>5</sup> <http://www.facmed.utoronto.ca/Assets/FacMed+Digital+Assets/Deans+Report+May+2011.pdf>

<sup>6</sup> <http://www.facmed.utoronto.ca/hospitals/fullyaffiliated.htm>

<sup>7</sup> <http://www.facmed.utoronto.ca/hospitals/communityhospitals.htm>

- 4.1.4 Current MD/PhD and CIP trainees rate their respective programs highly in their dedication to the education of physician scientists and the provision of a strong programmatic framework in support of this educational mission.
- 4.1.5 Survey data from current MD/PhD and CIP trainees indicate that trainees recognize the professional training and personal attributes, and the programmatic features that support success as a physician scientist.
- 4.1.6 The vast majority of current trainees are happy with their own decision to train in these programs and to pursue a career as a physician scientist.

#### *Alignment between the Faculty and Physician Scientist Training*

- 4.1.7 The Faculty of Medicine's Strategic Plan for 2011-2016 reaffirms the commitment to physician scientist training; our new vision statement reads "International leadership in improving health through innovation in research and education". The Faculty recognizes that physician scientists embody this bridge between research and education, between the clinic and the research program, and bear a large responsibility to fulfill this vision of the Faculty of Medicine. Furthermore, the Faculty's strategic goals of integration, innovation and impact are based on a renewed commitment to educating scientists, scholars and clinical professionals, leading research innovation and knowledge translation, and strategically investing in academic priorities. The Faculty's renewed commitment to principles that are at the core of physician scientist training provides an important context under which to re-examine physician scientist training.
- 4.1.8 Within the Faculty of Medicine, the support by clinical departments for physician scientist training is strong as evidenced by department-specific clinician scientist training programs (e.g. surgery, medicine, paediatrics) and investment by practice plans in research training.
- 4.1.9 Faculty of Medicine clinical departments support the career development of physician scientists via salary support within practice plans.

#### *Outputs*

- 4.1.10 The research productivity of University of Toronto MD/PhD and CIP trainees is high. The average number of publications during the MD/PhD program is over 3 per trainee. CREMS program students have also demonstrated productivity through publishing. Original contributions are generally published in good to excellent scientific journals. MD/PhD students garner external scholarships in

numbers disproportionate to the size of the Program. Productivity by CIP trainees is similarly excellent. Approximately 40% of trainees achieve an external award during training.

- 4.1.11 Engagement of MD/PhD graduate alumni in academic research is comparable to that by graduates in the United States. Of the 53 MD/PhD graduates who have completed all postgraduate training, 65% developed a career as a physician investigator within academia. While systematic analyses of CIP graduate career choices are lacking, a national study of CIP graduates, 10 years after CIP was initiated, demonstrated that 75% of graduates are involved in research to some degree. The fact that over 50% of Canadian CIP graduates trained at the University of Toronto suggests that this positive outcome pertains to graduates from this university.
- 4.1.12 The completion rate for the MD/PhD program at the University of Toronto is high. While the MD/PhD Program is demanding and has been characterized by a significant 'drop out' across programs, the rate of completion for *all* students who begin the first year of the program is 85%. Calculated by the fraction of students who enter the PhD phase of the program, which begins after 12-15 months of MD studies, the rate of completion is 95%. This rate of completion is very high in comparison to other graduate programs. Among all doctoral programs in Canada, 62.5% of students who began their PhDs in the year 2000 completed them within 7 years, while 67.7% completed them within 9 years. For doctoral students in Life Science Programs at the University of Toronto, the completion rate of those students who began their doctoral studies in the year 2000 was 73.5% within 7 years, and 80.5% within 9. The average time to completion of the PhD for MD/PhD students at the University of Toronto is 4.3 years. This time of completion compares favorably to the 4-5 year completion time for all MD graduate PhD students in the Institute of Medical Sciences. In the United States, completion rates for NIH-funded MD/PhD programs are, on average, 85-90%.

## 4.2 Weaknesses

### *Wavering Student Satisfaction*

- 4.2.1 While current MD/PhD and CIP trainees indicate satisfaction with their decision to enter these programs, recent alumni of the MD/PhD Program are less positive. 40% of recent MD/PhD graduates indicated that they would not recommend the program for those interested in a career as physician scientists. However, alumni further out from their graduation would recommend the program. It is unknown whether the perceptions of the most recent trainees are due to any structural weaknesses of the program itself, or

due to a changing approach to physician scientist training more broadly. Similarly, it can be posited that those alumni further out from their graduation have a more positive perception of their MD/PhD training due to their distance from the training period and their engagement in their current stage of their career rather than it be a comment on the quality of the training itself.

*Fragmentation of Existing Program Delivery Models / Lack of integration between research and clinical training*

- 4.2.2 Education in science within the existing MD/PhD and CIP training programs exist in parallel to clinical training. 58% of current MD/PhD trainees believe that integration of PhD and MD training needs to be improved while only six percent of the class strongly agrees that the program is well integrated. Current CIP trainees are more positive with almost 75% in agreement that CIP training is integrated with their residency training.

*Perceptions of Careers as Physician Scientists*

- 4.2.3 Survey data indicated that approximately 35% of current MD/PhD students believe that they will not spend  $\geq 75\%$  of their time on research. Approximately 50% of current CIP students believe they will not spend  $\geq 75\%$  of their time on research. Yet, the vast majority of these trainees expect to be a principal investigator on a major grant after graduation. The Task Force expressed concern regarding the apparent perception by trainees that success as a principal investigator can be achieved with a relatively modest contribution of professional time to research.
- 4.2.4 The surveys of MD/PhD students and alumni indicated that 20-40% of these trainees did or do not intend to engage in post-doctoral fellowship training. This finding is viewed with concern given the hiatus between MD/PhD training and attainment of a faculty position.
- 4.2.5 Current trainees express considerable concern regarding balancing work and 'life', balancing clinical and research activity, maintaining excellence in both clinical practice and research, and obtaining reasonable competitive monetary compensation as a physician scientist. Trainees note an absence of role modeling and mentorship regarding these issues.
- 4.2.6 Trainees are concerned that existing models of medical education are not linked to career expectations and realities upon graduation. While the vast majority of MD/PhD students engage in biomedical research, MD/PhD alumni participate in a wider array of research. This finding raises the question of whether the breadth of research available to MD/PhD students is sufficient.



For example, there is an increasing need for translational research, which the Institute of Medicine defines as research that moves bi-directionally, from basic research to patient-oriented research and onto population-oriented research and back, involving multidisciplinary collaborations<sup>8</sup>. At this time, curriculum in translational research remains underdeveloped within our training programs. Initiatives to expand the breadth of research training should extend, as well, to the CIP.

- 4.2.7 Unlike other models of physician specialty training, there is no identified physician scientist training track which specifically features the “physician scientist” (versus a clinical subspecialist with research ability) as the primary outcome. This limits trainees in being able to identify a clear career path, universities in designing a cohesive curriculum, academic health science centres in creating sustainable careers, governments in setting aside resources to train and support physician scientists, and regulatory bodies in recognizing/certifying physician scientist careers.
- 4.2.8 Current trainees and career physician scientists express concern that their chosen careers are not sufficiently valued by faculty members. Trainees state that many faculty express concern to them about the viability of their career choice. They see this threat via the decline of salary support, and they see the difficulties in balancing research and clinical responsibilities.
- 4.2.9 Within doctoral programs across the University of Toronto, students express a growing concern regarding their future career opportunities and prospects. There exists a strong view that educational programs need to be better linked to conditions in the marketplace.

#### *Debt Loads and Lack of Salary Support*

- 4.2.10 Physician scientist trainees at all levels are concerned with the length of training and corresponding debt loads.
- 4.2.11 There are disparities among academic health science centres as to the amount of support provided to support graduates and early/mid-career physician scientists. This disparity remains a threat to the sustainability of a breadth of options for our graduates.

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<sup>8</sup> doi:10.1097/ACM.0b013e3181ccd618.

- 4.2.12 Within the University of Toronto, there are no uniform policies for salary and infrastructure support for physician scientists.

### 4.3 Opportunities

#### *Shifting Landscape in Medical Education*

- 4.3.1 This Task Force review emerges at a time when medical education is focused on the creation of more tailored, individualized and competency-based training pathways. The 2010 AFMC *Future of Medical Education Report on Undergraduate Medical Training*<sup>9</sup>, the corresponding 2012 report on *Postgraduate Medical Training*<sup>10</sup> and the 2010 Lancet Report<sup>11</sup> which reviewed health professions training globally, recommend that training programs build on the scientific basis of medicine, adopt competency-based models of training and allow for more individualized and flexible models for trainees. For example, the FMEC-UG report recommends that medical schools “address individual...needs”, and “adopt a competency-based and flexible approach”. The FMEC-PG report advocates for “integrating competency-based curricula in postgraduate programs,” “ensure effective integration and transitions along the educational continuum”, and “implement effective assessment systems”. The Lancet report calls for the “adoption of competency-based curricula that are responsive to rapidly changing needs rather than being dominated by static coursework”. The University of Toronto has the opportunity to lead nationally in the development of programs that build on these recommendations.
- 4.3.2 *The Future of Medical Education Report for Undergraduate Medical Education* calls for Canadian programs to “Build on the Scientific Basis of Medicine”. This recommendation serves not only to support scholarship in medicine but also provides a means for students to become increasingly aware of science in medicine and consider their role in scientific investigation. This could potentially enhance the pipeline to physician scientist careers. Furthermore, it is widely recognized that science is evolving as a field, shifting from solo effort to team-based efforts as scientific questions are complex. This has resulted in an increasing need for an interdisciplinary and collaborative team-based

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<sup>9</sup> [http://www.afmc.ca/future-of-medical-education-in-canada/medical-doctor-project/pdf/collective\\_vision.pdf](http://www.afmc.ca/future-of-medical-education-in-canada/medical-doctor-project/pdf/collective_vision.pdf)

<sup>10</sup> [http://www.afmc.ca/future-of-medical-education-in-canada/postgraduate-project/pdf/FMEC\\_PG\\_Final-Report\\_EN.pdf](http://www.afmc.ca/future-of-medical-education-in-canada/postgraduate-project/pdf/FMEC_PG_Final-Report_EN.pdf)

<sup>11</sup> doi:10.1016/S0140-6736(10)61854-5

training environment. Trainees need to understand the nature of this shift and learn to lead in this context.

- 4.3.3 The *Future of Medical Education Report for Postgraduate Medical Education* advocates for the surety of the “Right Mix, Distribution, and Number of Physicians to Meet Societal Needs” and recommends to “establish a national plan to address the training and sustainability of clinician scientists.” Furthermore, the report calls for collaboration, competency-based training and leadership opportunities; consistent with the vision set forth in our recommendations.
- 4.3.4 LCME/CACMS/CFPC/Royal College accreditation requirements for Undergraduate and Postgraduate Medical Education are shifting from traditional time-based models of training towards competency based assessment. Initial consultations with these regulatory bodies indicate their willingness to foster innovations in curriculum delivery. The existing pilot programs at Postgraduate Medical Education (PGME) in Orthopedic Surgery as well as in International Medical Graduate (IMG) training show that competency-based models of training and assessment can be successful. The requirement by LCME/CACMS for a minimum of 130 weeks of undergraduate medical education (compared to the present 149 actual weeks of UME training) combined with the thrust towards competency based education and assessment provides opportunities for accelerated training and customized educational programs.

#### *Positioning of the University of Toronto in the National Context*

- 4.3.5 The University of Toronto is in an especially strong position to lead the development of a national plan for physician scientist training and career development.
- 4.3.6 The University of Toronto is currently taking a leadership role within the CIHR Strategy for Patient-Oriented Research (SPOR). This strategy is synchronous with the Task Force’s recommendations to enhance physician scientist training and career development.

#### *Focused Attention on Physician Scientist Training*

- 4.3.7 The Task Force anticipates that a forthcoming review of CIHR-funded clinician scientists training programs will focus renewed national attention on physician scientist training and provide an opportunity for the University of Toronto to lead at a national level.

- 4.3.8 There is no job profile that is better positioned than the physician scientist to move discovery towards improvement in health.

#### *Existing Successful Models of Training*

- 4.3.9 While most MD/PhD Programs feature parallel clinical and scientific training tracks, educational innovations by programs such as the Weill Cornell/Rockefeller/Sloan Kettering Tri-Institutional MD-PhD Program<sup>12</sup> provides a stimulus for innovation within the University of Toronto, Faculty of Medicine. Examples of offerings include courses that teach biomedical research at an advanced level, introductory courses to clinical and translational research, structured lab rotations to provide early exposure to research options, and a marked reduction in potential time to completion of the MD and PhD designations. Similarly, smaller scale innovations such as competency based programs in orthopedics and international medical graduate programs at the University of Toronto could be replicated at a larger scale within our programs.

#### *Opportunities for Funding*

- 4.3.10 The opportunity to seek private or foundation funds to support physician scientist training programs at Toronto has not yet been fully explored.

### **4.4 Threats**

#### *Lack of Salary Support*

- 4.4.1 One of the largest threats to the present and future sustainability of physician scientist training is the absence of clear salary and infrastructure support for those who pursue this as a career.
- 4.4.2 The changing economics of health care have further threatened the sustainability of investigative careers. Specifically, changes in funding within departments have mitigated against automatic salary support for faculty investigators.
- 4.4.3 There is a decline in CIHR salary awards for mid- and senior level career scientists.

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<sup>12</sup> <http://www.med.cornell.edu/mdphd/>

*Lack of Knowledge and Understanding of the Physician Scientist Career*

- 4.4.4 There exists a lack of understanding of the physician scientist role at the national and provincial levels. This lack of understanding threatens the sustainability of our programs. A national physician scientist program coupled with education about the role of the physician scientist would undoubtedly convey the relevance of research to a greater extent than the existing splintered approach.
- 4.4.5 There is concern among academic educators (e.g. Association of Professors of Medicine) and research interested organizations (e.g. Howard Hughes Medical Institute) that there is a widening gap both in training and practice between basic biomedical research and clinical practice. Indeed, the presence and importance of both science and research in the medical curriculum is debated. As a result, there is a concomitant decrease in emphasis of science training. Thus, the pipeline into medicine may have fewer science-interested students. Furthermore, there is decreased teaching of science in undergraduate medical education that may serve to insufficiently ignite the interest of students to the possibilities of medical research.

*Lack of Interest and Opportunity in the Pursuit of the Physician Scientist Career*

- 4.4.6 The Association of Professors of Medicine Report, *Recommendations for Revitalizing the Nation's Physician-Scientist Workforce* rightfully acknowledges the risk of low recruitment and poor retention rates of physician scientists, or what they call the “leaking” physician scientist pipeline.” This is a threat to recruitment of potential physician scientists and despite high persistence rates of our current learners, threatens their abilities to remain in their chosen fields.
- 4.4.7 Trainees are correctly sensing the lack of a national career trajectory for physician scientists. One CIP trainee indicated that there is “no clear career path within my specialty” and went on to state that it is “not clear who will pay my salary”. He/she asks for increasing opportunities for mentorship and practical career advice, as well as the recognition that “there might be different models of being a clinician scientist”. One CIP trainee wrote “There’s a lot of groups out there that won’t hire someone with research training. It’s sad but true. I think nationally we need to look at ways of ensuring some sort of job market for future clinician scientists”.

## 5.0 Task Force Recommendations

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### *Guiding Principles*

The recommendations of the Task Force align with the three strategic goals of the FOM:

**Impact:** Research is critical to promoting improvements in the health of individuals and populations and fulfilling the mission of the Faculty of Medicine and its affiliated hospitals and research institutes. The role of the physician scientist is central to this mission through the discovery, application and communication of knowledge. Furthermore, the core of the Strategic Plan and that of our education programs remains a commitment to excellence.

**Innovation:** Medical education is undergoing change. We are witnessing a shift from traditional time-based methods of assessment to competency-based assessment. The Faculty of Medicine Strategic Plan calls for innovation in education. While the existing physician scientist training programs were innovative at the time they were created, the existing threats to the physician scientist training path demand new program innovation.

**Integration:** New training models should integrate curricular elements to reduce redundancy and provide a coherent physician scientist education platform which differs from the undergraduate medical education and PhD platform. Integration should shorten the length of training, enhance cohesiveness among the required elements during training, and better prepare trainees for career opportunities in academia, industry and government. The development of the physician scientist as an individual with unique training, expertise, and skills will be accomplished by supporting the principles of flexible entry into and exit out of the training pathway, customized curriculum for the individual learner, and competency-based assessment resulting in students travelling through the curriculum at different rates.

### *Recommendations*

The Task Force members felt the University of Toronto could and should be an international leader in the development of physician scientist training models. To this end, the Task Force makes four major recommendations. Each is based on the following *recommended* cross-cutting pedagogical shifts:

- Integration of curriculum across graduate and medical studies and across undergraduate and postgraduate phases of education
- Customization and personalized education
- Competency-based assessment (and resulting potential acceleration of studies)

- Flexibility with respect to entry into and from a physician scientist training pathway

It is important to note that the Task Force does not, at this point, suggest specific training models. Rather, we strongly urge that our recommendations form the basis for the next phase – that of implementation - by expert panels whose role it will be to develop and implement specific programs. We seek at this point, not to constrain the imagination and opportunities of these implementation groups.

## **5.1 The Faculty of Medicine should establish an Integrated Physician Scientist Training Pathway (IPSTP).**

The SWOT analysis indicates that physician scientist training needs reform to address the health care needs of Canadians and to enhance the physician scientist training pipeline. Reform aimed at addressing these goals can be accomplished by facilitating a potentially shorter timeline to practice, eliminating redundancy in training; integrating curricula during training and offering a greater breadth of opportunities for learners in order to greater benefit the health system. The Task Force recommends that a defined pathway, termed the Integrated Physician Scientist Training Pathway (IPSTP) be created within the Faculty of Medicine. All accreditation requirements through the LCME/CACMS/CFPC, Royal College and School of Graduate Studies would be satisfied within the IPSTP. Existing relations with external governance structures would be strengthened as the IPSTP is developed.

Curricular integration is a core value in the IPSTP. The Task Force recommends that this new model of training integrate on numerous levels:

### **5.1.1 Integration between levels of training**

*The Task Force recommends:*

The Faculty of Medicine should engage other University of Toronto Faculties with first-entry degree programs in a variety of disciplines to develop potential ‘pipelines’ towards the IPSTP. The Faculty should collaborate to create courses and/or innovative options that highlight medical science and could serve to attract and encourage undergraduate students to consider a career across the breadth of disciplines relevant to physician scientist careers.

- 5.1.1.1 Undergraduate Medical Education and Postgraduate Medical Education take steps to ensure that research is highly valued within the admissions processes thereby facilitating recruitment of science-interested students into medical training and that the clinician-scientist career pathway is actively promoted within admissions processes.

- 5.1.1.2 Development of a stream where IPSTP students can get simultaneous admission into both the Undergraduate Medical School and the School of Graduate Studies.
- 5.1.1.3 UME should review, acknowledge and give credit for program components or competencies achieved prior to entry into the IPSTP. Furthermore, students should be granted the opportunity to add to existing knowledge with modules or components (as opposed to full courses) that could result in meeting required standards in a competency-based assessment framework.
- 5.1.1.4 Students who have completed the minimum of 130 weeks of medical school and are deemed competent, or have met all eligibility requirements for the awarding of the MD degree should be able to obtain that degree and move more quickly into PGME training.
- 5.1.1.5 Students who move onto PGME training but who may wish to continue their graduate training started during their undergraduate medical program phase be able to continue that graduate training through to residency. This will require new policies within CaRMS to allow students to match within a pathway at the University of Toronto.
- 5.1.1.6 Physician scientist trainees be able to opt-out of the IPSTP and re-enter regular stream programs without penalty

## **5.1.2 Integration between clinical and research training**

*The Task Force recommends:*

- 5.1.2.1 The IPSTP should be a separate educational track consisting of an enhanced curriculum that permits learners to select from a menu of courses (existing, if relevant, and newly created) that span fundamental disciplines to the full breadth of translational medicine. Such a curriculum would require considerable changes to the presentation of the curriculum in the preclerkship, relation of undergraduate medical and/or postgraduate medical curriculum to graduate-level curriculum, and the delivery, timing and length of clinical experiences throughout the IPSTP.
- 5.1.2.2 Curricular leaders move to eliminate course duplication, material repetition or gaps in curriculum within the IPSTP.
- 5.1.2.3 Curriculum be delivered at an appropriate level suitable for IPSTP trainees while achieving undergraduate, postgraduate and graduate-specific objectives.
- 5.1.2.4 Increased emphasis on translational research in the IPSTP curriculum.

- 5.1.2.5 Existing CIP-oriented programs, such as in Medicine and Surgery be encouraged to develop competency-based tracks within the IPSTP. These pilot programs would serve as models for the development of further competency-based programs in medical education. Such models should account for competencies demonstrated within the Undergraduate Medical Education phase of the IPSTP permitting for early entry into postgraduate training with sufficient transition periods.

### **5.1.3 Integration of learner goals into curriculum development**

*The Task Force recommends:*

- 5.1.3.1 The IPSTP curriculum be student-centred with strong attention to individualized curriculum.
- 5.1.3.2 Acceleration through those portions of the IPSTP that are dependent on attainment of accepted standards of excellence.

### **5.2 The Faculty of Medicine should provide opportunities for interested learners to integrate greater scientific content into their curriculum.**

The Task Force strongly believes that there should be increased availability of a variety of science-based opportunities for learners, particularly in light of the threat of a declining focus on the biomedical sciences within some undergraduate medical curricula. Along with the aforementioned HHMI report which highlights this threat, recommendation 3 of the FMEC-UG report reads: “Build on the Scientific-Basis of Medicine - Given that medicine is rooted in fundamental scientific principles, both human and biological sciences must be learned in relevant and immediate clinical contexts throughout the MD education experience. In addition, as scientific inquiry provides the basis for advancing health care, research interests and skills must be developed to foster a new generation of health researchers”. The Task Force strongly advocates for the pursuit of this recommendation and feels that the University of Toronto is extraordinarily well positioned to lead in this task at a national level. While the Task Force does not recommend a specific amount of science in the curriculum, it does recommend that an expert panel consider the role of science and potentially develop pathways that allow learners to achieve expertise in science at levels consistent with their interests. The Task Force believes that such a strategy would encourage students to pursue careers in the sciences and nurture interest in the IPSTP.

### **5.3 The Faculty of Medicine should develop a greater breadth of graduate level training opportunities for its learners, including the establishment of new joint programs with partners outside of the Faculty of Medicine or existing ‘traditional’ programs in the life sciences and medical sciences areas.**

The Task Force recommends that the Faculty of Medicine build across existing divisions to enhance the breadth of opportunities across a wide range of sciences that relate to Medicine. Specifically, an Integrated Physician Scientist Pathway, further described below, should enable interested trainees to pursue a joint program relevant to medical sciences or its application, with any graduate unit in the University of Toronto. In particular, new joint programs with Faculties/Schools including, but not limited to, Engineering, Public Health, Business, and Arts and Science are an immediate priority.

**5.4 The Faculty of Medicine should establish a mentorship program aimed at supporting successful physician scientist careers.**

The Task Force recommends that the Faculty of Medicine and its partners develop mentorship, role modeling and other guidance programs so IPSTP-interested applicants and IPSTP-trainees to help guide trainees through the complexities of a developing career as a physician scientist. This program should encompass the initial decision to enter into the IPSTP program through to providing support for a graduate's transition to employment. Mentorship should include, but not be limited to the following areas, transitions, job seeking, academic or career choices, work-life balance, integration of clinical and research roles, etc. Present discussions in the field of physician scientist training indicate that mentorship is vital to the viability of this career path. Corresponding Faculty Development programs should likewise be created in order to support the growing mentorship responsibilities and capabilities of our faculty membership.

**5.5 The Faculty of Medicine should facilitate the development and alignment of physician scientist career development and retention strategies across the Faculty, its academic departments, hospitals and research institutes.**

The Task Force cautions that salary support for physician scientists at the 'mid' and 'senior' levels of career development is generally lacking and at present, is highly variable across departments. This disparity generates great uncertainty among trainees and stakeholders as to the sustainability of the physician scientist career. The Task Force understands that this is a difficult problem to resolve, and suggests that partners in the training of physician scientists including hospitals, practice plans, the University of Toronto and government should collaborate to identify an approach to coordinate supportive strategies for career development and retention.

**5.6 The Faculty of Medicine should engage with its partners in the AFMC, ACAHO, and the RCPSC on the establishment of a national model of training that embraces the various potential careers of physician scientists.**

The Task Force recommends that the Faculty of Medicine take a national leadership role in the development of the IPSTP as an innovative training pathway at the University of Toronto. Further, the Task Force recommends that the Faculty work with the strategic implementation committee of the Future of Medical Education Project (FMEC) to address its key transformative



action of developing a “national plan to address the training and sustainability of the clinician scientist career”. We suggest that the development of the IPSTP in Toronto could serve as a model at the national level.

**5.7 The Faculty of Medicine should establish an implementation committee to act on the recommendations of the Task Force.**

The Task Force recommends that the Faculty of Medicine establish a committee, resourced with administrative support, to act on these recommendations by delineating partnerships within the Faculty and between University Divisions and Departments, and developing curricula and operational plans across the domains of clinical education and research in the continuum of undergraduate and postgraduate medicine. This should be accomplished with a goal to implement the IPSTP in 2014.

DRAFT REPORT