

UNIVERSITY OF BRITISH COLUMBIA MD/PHD PROGRAM

AN INTEGRATED PROGRAM FOR THE TRAINING OF CLINICIAN SCIENTISTS

Final Report of the MD/PhD Implementation Committee *

(Revised October 30, 1994)

- A. INTRODUCTION: The future of academic medicine, health care delivery, and economic prosperity of the biomedical and pharmaceutical industry in Canada depends on highly qualified "clinician scientists", a rare breed of individuals who excel both in clinical medicine and basic sciences, and can provide the essential link between the bedside and the research laboratory. Unfortunately, the traditional approach for the training of such physicians through 3 to 4 years of post-specialty research fellowships has been relatively ineffective, and the clinician scientist has become "an endangered species" [1]. By the time most MD's have completed their clinical apprenticeship, economic and other distractions are so great that it is often considered by the candidates to be too late and too difficult to begin a serious commitment to research training and to pursue a successful academic career [2]. More recently, Canadian medical schools have increasingly recognized the importance of MD/PhD programs as an effective mechanism for the training of future clinician scientists. In contrast to Canada, US medical schools have long recognized such programs as the single most effective vehicle for training and retaining clinician-scientists, and nearly every medical school in the US offers a dual-degree program [3]. The track record of such programs, established in the US since 1982, has been spectacular: the drop out rate among top schools is less than 2%, and over 95% of the graduates have remained in academic or institutional research [4].

UBC is fortunate in that it is among only a few medical schools in Canada that have an MD/PhD program in existence for nearly 10 years. The UBC MD/PhD program was reviewed recently by the Institutional Self Study Subcommittee. A number of deficiencies were identified, the most important being the fragmentation of basic science and clinical components of the program, and lack of infrastructure and administrative support (see Self Study Report in Appendix 1). Based on this review and the recommendations outlined in the Self Study Report, the Dean of Medicine in conjunction with the Dean of Graduate Studies has established an MD/PhD Implementation Committee to develop a proposal for a renewed and integrated MD/PhD Program, to identify the financial and other requirements, and to outline the critical path for its implementation. The following is the report of the MD/PhD Implementation Committee, developed after wide consultation from both within the University community and from students and program directors of similar MD/PhD programs in Canada and the US.

{PRIVATE }* Members of the UBC MD/PhD Implementation Committee include: Anthony W. Chow, MD (Chair); Donald Brooks, PhD; Allan Eaves, MD, PhD; Brett Finlay, PhD; James Hogg, MD, PhD; Grant Mauk, MD, PhD; Ross MacGillivray, PhD; David Ostrow, MD; Gary Quamme, PhD; David Randall, PhD; Sam Sheps, MD, PhD; David Speert, MD; and Mr. Zeid Mohamedeli (MD/PhD student).

B. OBJECTIVES: The overall goal is to attract, develop, and nurture future Clinician Scientists through an innovative and rigorous MD/PhD program at UBC. This program will specifically address not only the needs and deficiencies of clinician scientists within B.C., but the nation as a whole, in order to better prepare for the highly biotechnology-based health care and new economy of the 21st Century.

Specific Aims include:

1. to establish an integrated MD/PhD program within the Faculty of Medicine in conjunction with the Faculty of Graduate Studies, specifically aimed at developing clinician scientists;
2. to champion the cause of MD/PhD students at UBC through sponsorship of scientific and social functions, newsletters, and linkages with other MD/PhD programs in Canada and the US, and with student or governmental organizations that foster the training and advancement of clinician scientists;
3. to establish formal linkages with existing multidisciplinary biomedical research groups within different healthcare institutions, University departments, research foundations, National Centers of Excellence Program, biotechnology/pharmaceutical industry, etc., who will actively contribute to and benefit from the training of MD/PhD students within their clinical and research environments; and
4. to lobby the federal and provincial funding agencies, private foundations, and the pharmaceutical/biotechnology industry for infrastructure and scholarship support of the MD/PhD Program.

C. JUSTIFICATION:

1. There is a Critical Shortage of Clinician Scientists in Canada: Only a small proportion of the full-time faculty of Canadian medical schools have both MD and PhD degrees. According to a survey in 1986-1987 conducted by the Association of Canadian Medical Colleges, 67% of academic faculty members from 16 Canadian medical schools have MD degrees only, 24% hold a PhD degree only, and only 7% have both MD and PhD degrees (2.9% in basic sciences and 3.7% in clinical sciences departments) [5]. In the US, MD/PhD graduates are actively pursued by research-oriented medical schools, and by the bio-technology and pharmaceutical industry. There is a critical need for clinician scientists in the health sector, especially in health services research, health promotion and disease prevention, outcome evaluation, and cost-effectiveness research of interventions.
2. Canadian Schools Lag Behind in Developing MD/PhD Programs: As part of the Institutional Self Study Report, a survey of all Canadian medical schools was conducted requesting information concerning current or planned MD/PhD programs. Among the 12 schools that responded, only Toronto and McGill appeared to have well established MD/PhD programs, although several others indicated their intent to establish such programs in the near future (Table 1). Only the Toronto program appeared to be flexible and relatively well integrated between the basic science and clinical components.

Table 1. MD/PhD programs within Canadian Schools of Medicine (1992)

University	Year	No./yr	Description	Funding
UBC	1984	4	7 yrs, unintegrated	grant-supported during PhD, 4/7 yrs
Toronto	1984	3	7 yrs, integrated	extramural & internal \$18,000/yr, 6/7 yrs
McGill	1987	4	7 yrs, unintegrated	grant-supported during PhD, 4/7 yrs \$6,000 tuition suppl
Dalhousie	1992	?	7 yrs, unintegrated	\$5000-10,000/yr for 1st 2 yrs, extramural
Western	1992	?	7 yrs, unintegrated	unknown
Montreal	?	?	7 yrs, unintegrated	unknown

University of Calgary is currently developing an integrated MD/PhD program. Formal combined programs are not yet in existence at: Queens, Manitoba, McMaster, Memorial, Ottawa, Saskatchewan, Sherbrooke. Most universities do have the option for medical students to interrupt their MD studies in order to pursue a PhD program, but this is generally viewed to be unsatisfactory.

3. UBC Should Assume a Leadership Role in Training Clinician-Scientists: UBC is recognized for its excellence in both clinical and basic sciences, based on student performance and total biomedical research funding. It has the aspiration and essential ingredients to assume a leadership role in training clinician-scientists within Canada. Establishment of an innovative, renewed and well-integrated MD/PhD program at UBC is an excellent vehicle to achieve this goal. Such a program has the added attraction in that it harmonizes precisely with two concurrent national initiatives to improve the training of clinician scientists in Canada: a) the MRC Clinician-Scientist Support Program; and b) the Royal College Clinician-Investigator Training Program (CITP). The latter is designed for MDs during their residency training, while the former is specifically for MDs after their residency and subspecialty fellowships. Neither of these address the critical formative years in the early development of the aspiring clinician-scientist. The development of a well-conceived and fine-tuned MD/PhD program will be a major step towards attaining and sustaining these much-acclaimed national initiatives.

- D. PROGRAM DESCRIPTION: The UBC MD/PhD Program is intended for the exceptional student who is contemplating an academic career in the Biomedical Sciences, Clinical Investigation, or Healthcare Policy and Outcome Research, and who is prepared to pursue a six- to seven-year program. The MD/PhD Program has several additional unique characteristics which distinguish itself from existing, traditional MD or PhD programs:
- a) Clear Mission to Train Clinician-Scientists - The MD/PhD Program has a clear and primary mission to train and nurture future clinician scientists. This sets the program apart from the traditional MD and PhD programs. Students in the program will be registered separately as an MD/PhD student, not as a MD student on leave of absence from PhD studies or vice versa.
 - b) Integration of Basic and Clinical Sciences - In addition to fulfilling the requirements of the regular undergraduate MD curriculum (which is undergoing extensive revision through strategic planning), MD/PhD students will also undertake graduate level coursework as required and customized according to their chosen field of research pursuits. Curriculum planning, course work and research training will be closely integrated and coordinated between the basic sciences and clinical disciplines. This will ensure a smooth transition between basic science training and clinical rotations, and between academic coursework and research.
 - c) Committee-Based Mentorship - Each MD/PhD student will be guided by a Supervisory Committee that consists of at least 3 faculty members: a clinician and a basic scientist mentor (both in a related medical discipline of research interest chosen by the student, and one of whom also serves as the immediate research supervisor), and a third faculty advisor designated by the MD/PhD Program Director.
 - d) Career Counselling and Promotion through Linkages with the Royal College Clinician-Investigator Training Program, and the MRC Clinician-Scientist Program - Until recently, Canadian universities lack effective vehicles to provide postgraduate training to specifically support and nurture budding clinician-investigators. This is about to undergo radical change, however. The Royal College has recently approved in principle the establishment of a "Clinician-Investigator Training Program (CITP) to assist in the career development of clinician-investigators in Canada. These programs are intended not only to meet the existing clinical training requirements of the Royal College, but in addition, to provide two or more years of research training for the residents. The CITP will also encourage participating universities to recruit successful graduates of this program into faculty positions (see Appendix 3). This proposed Royal College program will greatly facilitate the entry of MD/PhD graduates to enter a combined clinical/research training stream, and to ultimately increase their career opportunities as clinician investigators.

In addition to this Royal College initiative, the MRC has a well-established Clinician-Scientist program for individuals who have already completed their medical specialty training, and who have demonstrated clear potential for an academic career as a clinician-scientist.

The UBC MD/PhD program will develop strong linkages with both of these initiatives in order to maximize the ultimate success of her graduates in their pursuit of clinical investigation as a viable and longterm career goal.

The Essential Components of the MD/PhD Program are as follows:

1. Admission:

- a. Eligibility - To be eligible for admission, the student must have completed a B.Sc. degree with FIRST CLASS STANDING (or equivalent), and have fulfilled all the requirements of acceptance into the four-year medical curriculum of the Faculty of Medicine and the Faculty of Graduate Studies (see 1993/94 UBC Calendar). Students with a M.Sc., or who has completed first or second year Medicine with high standing are also eligible for the MD/PhD program, provided they also meet the admission standards of the Faculty of Graduate Studies. All candidates are required to take the Medical College Admission Test (MCAT), but the Graduate Record Examination (GRE) is optional. A separate but concurrent application and selection process for MD/PhD students will be implemented in conjunction with the regular MD admissions procedure.
- b. Application and Selection Procedure - A separate information brochure and application form will be used; the latter should be completed and submitted together with the regular application for admission to the four-year medical curriculum of the Faculty of Medicine (see an example of the information brochure and MD/PhD application form, detachable from the regular application form, from McGill University in Appendix 2). All applications, along with official transcripts, MCAT scores, and letters of reference must be submitted as early as possible to the Dean's Office, Faculty of Medicine.

Potential candidates will be interviewed separately and independently by an MD/PhD Advisory Committee following initial screening by the Faculty of Medicine Admissions Committee. Membership of the MD/PhD Advisory Committee responsible for student selection shall include a representative from the Faculty of Medicine Admissions Committee, the Faculty of Graduate Studies, an MD/PhD student, a basic scientist and a clinician. The interview process will be standardized, and the criteria for evaluating MD/PhD candidates will be predetermined by the Advisory Committee. These criteria, which generally overlap those of the Admissions Committee of the Faculty of Medicine and the Faculty of Graduate Studies (see 1993/94 UBC Calendar), will be continually reviewed and updated. The MD/PhD Program Director will present the list of successful candidates to the Associate Dean of Admissions in the Faculty of Medicine for final approval and notification of acceptance.

2. Registration and Financial Aid - Successful MD/PhD students will be registered in a formalized MD/PhD Program, distinct from the traditional MD and PhD programs. The definition of an MD/PhD student with separate registration also complies more aptly with potential extramural funding agencies, and encourages

social, financial and moral support for the student throughout the entire program. It should be noted that in addition to registration in the Faculty of Medicine, the MD/PhD student will also be considered a graduate student throughout the entire duration of the MD/PhD program. Thus, MD/PhD students have full access to all the amenities available to the registered graduate student, including eligibility to apply for University Graduate Fellowships, etc.

The availability of financial aid which relieves the MD/PhD student of the considerable economic burden inherent in such a long training program is critical to the viability and long-term success of the MD/PhD Program. Accordingly, successful candidates admitted to the MD/PhD Program will receive an annual MD/PhD graduate student stipend (equivalent in value to the current MRC graduate studentship rate), and a tuition scholarship (or at the very least, the tuition fee is deducted from their annual graduate student stipend) until completion of their MD/PhD degrees.

3. Curriculum:

- a. Program of Study - The program is designed such that students can receive the dual MD/PhD degrees after six to seven years of enrolment. The curriculum is built upon the standard undergraduate MD curriculum (currently undergoing extensive revision through the strategic planning process), but is further "customized" and "integrated" to meet the unique career goals of each student. Thus, in addition to the regular four-year undergraduate medical curriculum, the MD/PhD student is expected to obtain more advanced and in-depth knowledge of biological processes and scientific methods, and the necessary research skills and experience in a chosen medical field of expertise. Thus, the graduates of the MD/PhD Program are trained as competent physicians as well as skilled scientists who can sustain a successful and competitive clinical investigative career.
- b. Required Coursework and Research Training - The required coursework over and above that of the regular MD curriculum for each MD/PhD student will in part be determined by the nature of the prior undergraduate degree or graduate studies, and identity of the host department or discipline of desired research training. The program of graduate study is intentionally flexible in that there are no specific minimum number of credits required, and that the courses required will be defined by the students and their respective supervisory committees with final approval by the MD/PhD Program director. The selected coursework and research training will be totally integrated with the standard undergraduate curriculum on an individual basis. The impending introduction of the new medical school curriculum has provided a unique opportunity to achieve this integration such that each MD/PhD student will be able to spend relative large blocks of each year in Medical School, with the remainder on graduate study and research training. An example of this integrated approach to the MD/PhD curriculum is give below (not necessarily in temporal order):

1) Module I (Basic Science Courses) - This component covers the basic science component of the required coursework (i.e. a combination of the regular Med I and Med II curriculum plus more advanced graduate coursework). Since highly qualified and very talented students are being recruited, some of whom may already have solid backgrounds in areas covered in these basic science courses (i.e. biochemistry, physiology, anatomy, microbiology, pathology, pharmacology, neuroscience, epidemiology, biostatistics, etc.), the MD/PhD student should have the option of taking the examination for these courses; if a suitable grade is achieved, the student may be exempted from having to take that course formally. This component normally requires 2 years to complete.

2) Module II (Dissertation Research) - The MD/PhD Program emphasizes research training in the sciences fundamental to medicine and healthcare delivery. The research training can be pursued in any department within the Faculty of Medicine or within the Faculty of Graduate Studies. It may be either basic or applied in nature, but must be of fundamental importance to the understanding of biologic processes or healthcare delivery, as opposed to purely descriptive research. This component includes a comprehensive examination in the proposed field of research training, the dissertation research, and the thesis defense. It normally requires 3 or more years to complete.

During the first calendar year and with the help of the MD/PhD Program Director, each student will identify a research supervisor while commencing required coursework. Towards the end of the second calendar year, a Student Supervisory Committee is identified, and a research proposal is formalized. Each student is expected to begin summer research in the laboratory of the immediate supervisor in the first year, and to continue this activity until the completion of his/her dissertation research.

3) Module III (Clinical Electives) - The clinical component of the MD/PhD Program consists essentially of clinical clerkships and elective rotations in physician offices, hospital wards, clinics, or rural practice settings (analogous to the regular Med III and Med IV curriculum). It normally requires 2 years to complete.

A comparison of the overlap as well as essential differences between the newly revised regular medical school curriculum (as presented by the Faculty of Medicine Strategic Planning Committee) and the proposed MD/PhD curriculum is illustrated below:

<u>Revised Medical School Curriculum</u>	<u>Med III:</u>	Phase III (Basic Clerkships)
<u>Med I & II:</u> Phase I (Orientation to Medical School);	<u>Med IV:</u>	Phase IV (Advanced Clerkships);
Phase II, Parts 1 & 2 (Foundations of Medicine)		Phase V (Return to Basics)

Proposed MD/PhD Curriculum

Module I: Phases I & II of the regular curriculum;
Graduate coursework required for

Module II: Dissertation research, comprehensive

Module III: Phases III, IV & V of the regular

- c. Seminar Series and Research Progress Evaluations - Each student will be required to regularly attend a designated research seminar series organized by the sponsoring research discipline of the student. In addition, mandatory attendance will be required of all MD/PhD students and their supervisory faculty advisors to participate in a quarterly, program-wide, MD/PhD Student Research Forum. These regular research days will provide uninterrupted time for students to present their work to a critical audience (research proposals, work-in-progress, critical reviews in major areas of recent scientific advances, etc.), and will also serve as a social gathering to promote a feeling of comradeire. Each student will be required to present a research update at least once a year, and satisfactory performance at this yearly assessment is required for continuation of program support.
4. Curricular Pathways: A more traditional curricular pathway is outlined below, but several other pathways are also possible depending on whether an early clinical or research emphasis is desired by the student:

Traditional Curricular Pathway

Year 1:	} Module I:	Basic science [Phases I & II (Part 1) of the Year 2 new curriculum] and graduate coursework; dissertation research
Year 3:	} Module I/II:	Basic science [Phase II (Part 2) of the new curriculum] and graduate coursework, comprehensive examination;
Year 4:	}	dissertation research; thesis defense
Year 5:	}	
Year 6:	} Module III:	Clinical clerkships and elective rotations
Year 7:	}	(Phases III, IV & V of the new curriculum)

Comparison of Several Possible Curricular Pathways

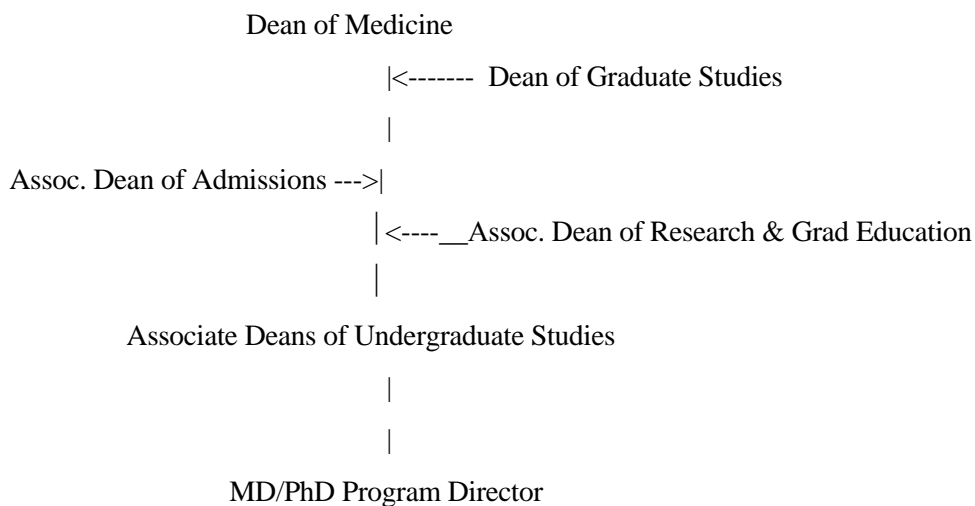
Year of Study	Traditional Pathway	Early Clinical Emphasis	Early Research Emphasis
Year 1	Module I	Module I	Module I/II
Year 2	Module I/II	Module I/III	Module I/II
Year 3	Module I/II	Module I/III	Module I/II
Year 4	Module II	Module II	Module I/II
Year 5	Module II	Module II	Module II
Year 6	Module III	Module II	Module III
Year 7	Module III	Module III	Module III

5. Examinations and Thesis - Students must demonstrate proficiency in all required coursework by examination. They must also successfully complete a comprehensive examination based on their proposed research, and defend their thesis by oral examination. Additionally, each student will be evaluated at least annually by the research supervisory committee and continued funding support is contingent upon satisfactory research progress.
6. Low Scholarship - A minimum average of 68% (B-) must be achieved in all coursework taken for credit. If a grade below the passing mark (60% in the Faculty of Medicine) is obtained for any required course, it may be repeated upon approval by the Dean of the Faculty of Medicine and the Faculty of Graduate Studies. A student who fails a required course on two occasions, or receives an average grade below 68% (B-), or has not demonstrated satisfactory research progress, will normally be required to withdraw from the MD/PhD Program, and the corresponding graduate stipend and tuition scholarship will be automatically discontinued. Whether such a student may remain in the regular four-year medical curriculum will be determined by the Dean of the Faculty of Medicine on an individual basis. Whether such a student may be awarded an MD/MSc degree will be jointly determined by the Dean of the Faculty of Medicine, and the Dean of the Faculty of Graduate Studies.
7. Conferment of the Dual Degrees of MD/PhD - The MD and PhD degrees will be conferred at the same time during convocation upon satisfactory completion of the entire Program.

E. PROGRAM IMPLEMENTATION:

1. Process - The revamped MD/PhD Program will be implemented after appropriate review and approval by the Faculty of Medicine, the Graduate Council, and the Senate, and following allocation of an adequate budget.
2. Governance - The MD/PhD program will be administered by the Faculty of Medicine through the Office

of the Associate Deans of Undergraduate Education (Curriculum and Student Affairs), with appropriate input from the Faculty of Graduate Studies. The interrelationship of the MD/PhD program within the existing administrative structure of the Faculty of Medicine and that of the Faculty of Graduate Studies is as follows:



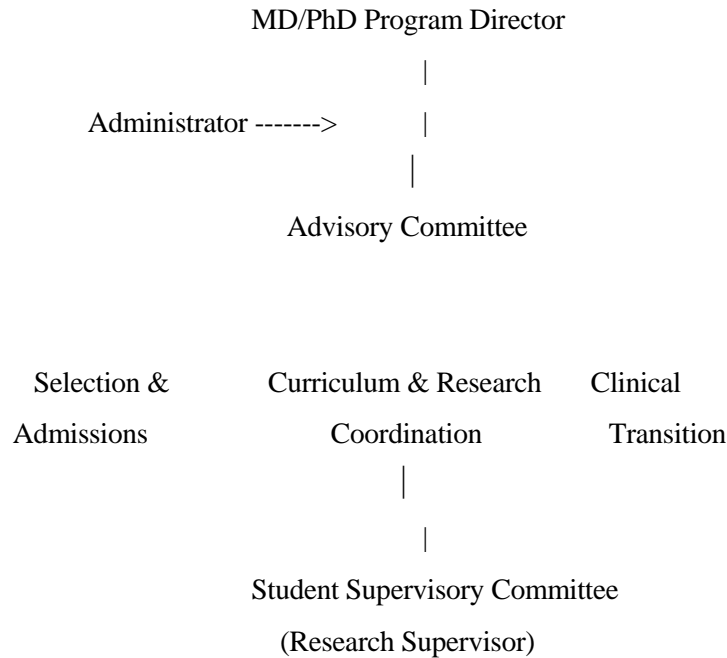
3. Infrastructure and Administration - A separate Office with appropriate administrative support will be established within the Dean's office distinct from the office of the Associate Dean for Admissions. A Director and a Program Administrator will be appointed. An MD/PhD Advisory Committee, composing of student and faculty representatives from participating departments and disciplines, will be established to oversee student selection, admissions, curriculum planning and coordination, and program evaluation. Core funding will be provided to support the salaries of the Director and Program Administrator, and to defray operational expenses.
 - a. Director - This individual, who should be a respected clinician scientist with a track record in research and in training graduate students and post-doctoral clinical or research fellows, is appointed by the Dean of the Faculty of Medicine with a five-year renewable term. The Director is charged with overseeing the entire operation of the MD/PhD Program as an extension within the existing administrative umbrella of the Associate Deans of Undergraduate Studies. These responsibilities include policy decisions regarding student selection and admissions, faculty recruitment, curriculum planning and coordination, program evaluation and promotion, finances and fund raising activities. The Director is aided in these policy decisions by an MD/PhD Advisory Committee (see composition and terms of reference below).
 - b. Program Administrator - This key individual assists the Director in the day-to-day operations of the MD/PhD Program. The Administrator should have strong administrative, interpersonal and organizational

skills. Proficiency in microcomputing is a prerequisite, while a teaching background is a definite asset. This individual must be knowledgeable about the workings of the University, particularly the Faculties of Medicine and Graduate Studies. Coordinating the fund-raising campaigns for the Program will also be a major area of responsibility for the Administrator. Although the actual number of students registered in the MD/PhD Program is relatively small particularly during the first few years of implementation, the demands of these students as well as the routine administrative needs of the Program are substantial. These include time-consuming problem-solving tasks associated with student application, selection and admission procedures, registration, curriculum coordination, student research days, meeting schedules and minutes, student and curriculum evaluations, information brochures, newsletters, course and calendar descriptions, interacting with potential supervisors and their departments, as well as submitting applications to extramural granting agencies for funding.

- c. MD/PhD Advisory Committee - This committee is constituted by the MD/PhD Program Director to assist in major policy decisions and their implementation. Membership of this committee will consist of representatives from the Faculty of Medicine Admissions Committee (1), the Faculty of Graduate Studies (1), the Associate Deans of Undergraduate Education (2), MD/PhD student research supervisors (3), additional basic science (1) and clinical (1) faculty, and an MD/PhD student (1). Each committee member is appointed for a 3 year term. The entire committee, chaired by the Program Director, will meet as a group at least quarterly. The MD/PhD Advisory Committee will assist the Program Director in fulfilling the following essential functions:
- 1) Student Selection and Admissions - conducts all interviews and finalizes the selection of successful MD/PhD student applicants. The MD/PhD Advisory Committee will work closely with the Associate Dean of Admissions in the Faculty of Medicine and in the Faculty of Graduate Studies in this regard, and will review and update the criteria for applicant evaluation and selection at least annually.
 - 2) Curriculum Planning and Research Coordination - approves and advises on prospective student research supervisors, student supervisory committees, required course work, and proposed dissertation research.
 - 3) Clinical Transition - oversees the smooth transition or reentry of MD/PhD students into clinical clerkships and elective rotations after extended periods in research or basic science course work. The committee will organize refresher or "linkage" courses for such students when they re-enter clinical training.
- d. Research Supervisor and the Basic Science and Clinical Faculty - Each student will be guided by a supervisory committee consisting of a basic scientist and a clinician in a related medical discipline, one of whom also serves as the immediate research supervisor. A third faculty member of the supervisory committee will be selected from an unrelated medical discipline. The basic science and clinical faculty

of the MD/PhD Program must have a primary appointment either in the Faculty of Medicine or the Faculty of Graduate Studies. Eligible research supervisors are recruited by the Program Director and the MD/PhD Advisory Committee in order to provide the best research environment most conducive to clinical investigation. Hospital-based clinician scientists are particularly important role models for the MD/PhD student.

e. Organizational Structure:



F. PROGRAM EVALUATION - The curriculum and overall performance of the MD/PhD Program will be formally evaluated through established University and Faculty procedures. Internally, the Program will be evaluated by the Director and MD/PhD Advisory Committee as a group in a retreat at least annually. The achievements and potential weaknesses of the program will be measured initially through regular meetings with students and participating faculty regarding their level of enthusiasm and response. Additional assessments of performance will be based on the quality and number of student applications and faculty participation, and the level of funding secured through peer-reviewed competition from government agencies and industry partners, and through fund-raising campaigns directed to the public sector. Ultimately, the overall effectiveness of the Program will be based on the quality of students graduated from the dual degree program, their eventual career development, and the significance of their contributions as clinician scientists to health care delivery, academic medicine, and the biotechnology and pharmaceutical industry.

An annual report detailing the progress of program development, student activities, milestones achieved, grants awarded, as well as other revenues and operating expenditures will be submitted to both the Dean of Medicine and the Dean of Graduate Studies on a regular and timely basis.

- G. Transition and Integration of the Existing MD/PhD Program - Implementation of the revamped MD/PhD program will coincide with the transfer of existing MD/PhD students into the new program, and phasing out of the old program. It is intended that while individual candidates can still apply separately to traditional MD and PhD programs directly, no students registered at UBC will be admitted concurrently into the MD and PhD programs except through the integrated MD/PhD program.

There are 6 students currently enrolled in the existing MD/PhD program:

<u>Student</u>	<u>Year entered (Degree)</u>	<u>Department</u>	<u>Supervisor</u>
L. Gatzke	1989 (1996)	Microbiology	F. Tufaro
Z. Mohamedali	1990 (1996)	Anatomy	N. Auersperg
R. Lanius	1990 (1996)	Ophthalmology	C. Shaw
P. Tang	1991 (1998)	Biotechnology	B. Finlay
S. Yip	1991 (1998)	Microbiology	J. Levy
D. Fredrikson	1994 (2001)	Psychiatry	L. Kopala/ W. G. Honer

Three of the above students have completed their PhD requirements and have re-entered clinical training with anticipated graduation in 1996. These students will be automatically registered in the new MD/PhD program. Assistance will be provided to facilitate their clinical transitions, and guidance offered in career counselling and development following graduation. The remaining 3 students are in various stages of their medical and research training with anticipated graduation not before 1998. These students will be required to present an integrated program of study and research through their respective student supervisory committees to the MD/PhD Advisory Committee for formal review and approval. Once approved, these students will automatically be registered in the new MD/PhD program, and will be subject to the governance of the new program.

All these students will be offered the opportunity to compete for MRC MD/PhD Studentship awards anticipated in the fall of 1995, and the regular University Graduate Fellowship awards offered annually.

- H. Funding and Resources: Revamping the MD/PhD program for the training of future clinician scientists will be costly, but it will be more cost-effective than existing approaches which have an unacceptably high attrition rate. In the end, the increased supply of clinician scientists through a successful MD/PhD program should prove to be a sound investment, since it is clear that technological innovation through biomedical and health services research is the key to a sound and competitive Canadian economy in the 21st Century [6]. The anticipated funding and resources required to support the UBC MD/PhD program are summarized below.

1. Annual Costs:

a) Core & Infrastructure Support

Personnel Salaries:

Program Director (0.25 FTE)	\$ 30,000
Administrator (0.5 FTE)	20,000

Capital (non-recurring) Costs:

Computing equipment & software	10,000
Office furniture & equipment	5,000

Operating (recurring) Costs:

Advertising, printing, etc.	2,000
Stationary, fax, telephone, communications	1,000
Travel, meetings, discretionary, etc.	5,000

Total infrastructure costs for year 1	\$ 73,000
Total recurring infrastructure costs/yr	\$ 58,000

b) Studentship Stipends or Scholarships

Stipend/student/yr (1994 MRC rates):	\$ 15,600
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Initially, 2-3 new students will be enrolled per year for the first 3 years of the Program: this will allow the attainment of a stable census of 6-9 students per year relatively quickly. Thereafter, 3-4 new students will be enrolled per year depending on the maturity of the program and availability of intramural and extramural funding. It should be noted that the number of new MD/PhD students enrolled each year is linked directly to the total number of students accepted into medicine for that year (e.g. acceptance of 3 MD/PhD students for a given year will result in the admission of 117 regular students for that year, given that a total of 120 students are accepted into medicine each year).

2. Other Potential Extramural Funding Sources - In addition to MRC MD/PhD studentships and UBC Graduate Studentships, the Program Director, together with the Dean of Medicine and the Associate Deans of Undergraduate Education, will actively seek extramural funding support for the MD/PhD Program through local and national granting agencies and foundations which have vested interests in continuing medical research and education in Canada. In particular, NSERC, PMAC, NCI, and the MRC/NSERC National Centres of Excellence Program all have well-established studentship awards which are especially suited for the MD/PhD Program.

Various other funding agencies and sponsors will also be actively pursued, including: Health

Canada, B.C. Science Council, SPARK, various non-profit Research Foundations, the biotechnology and pharmaceutical industry, as well as the public sector.

In addition to the fund-raising campaigns alluded to above, all MD/PhD students are expected to prepare and submit grant applications for summer and graduate studentship awards (an essential skill they must learn if they are to become successful clinician-scientists). However, the Faculty must be able to provide back-up funding for the students who are unsuccessful in these efforts.

H. Program Promotion:

1. A major function of the MD/PhD Program Office will be devoted to creating a cohesive group of students, with their own identity as trainees in a medical scientist program which is distinct from other medical or graduate students. In order to create a supportive and nurturing ambience, special seminars, social interactions, regular newsletters, and other communication devices will be implemented to promote a high morale among the students. This important esprit de corps will be more easily established once the total student enrolment has reached 10-15 per year.

2. The Program Office will undertake to increase the profile of the MD/PhD Program for both prospective and incoming students. These measures include: a) an information brochure outlining the goals, uniqueness and advantages of the program; b) the UBC Calendar; c) periodic newsletters and annual reports; d) mandatory participation by the MD/PhD students in local, regional and national medical student research forums, student research competitions and awards; and e) publicity of the program through career counselling by knowledgeable faculty to undergraduate basic science students and other prospective applicants.

3. Promotional and fund-raising campaigns will be launched to educate the University community, Government, Post-secondary institutions, Industry, and the Public Sector regarding the critical shortage of (and need for) clinician scientists, and the mission and uniqueness of the UBC MD/PhD program.

I. Timeline: The critical timeline for the completion of specific milestones in the implementation of the revamped MD/PhD Program over the next 2 years is envisioned as follows:

- October 1994:** a) completion of the MD/PhD Implementation Committee report and campus-wide consultation;
- January 1995:** a) approval from the Faculty Executive, Graduate Council and Senate, and allocation of infrastructure budget and resources;
b) fund raising campaign and applications to federal and provincial agencies, industry and the private sector for matching student stipend support;
- March 1995:** a) appointment of the MD/PhD Program Director and advertisement and hiring of the Program Administrator;
b) opening of the Program Office with administrative and computing linkages to campus Registration, Admissions, Academic Calendar, Graduate Studies, Student Affairs, and Financial Services;
- May 1995:** a) establishment of the MD/PhD Advisory Committee to oversee the selection of new MD/PhD students for admission in the fall of 1995, and finalization of curriculum planning and selection of prospective research supervisors from the basic science and clinical faculty;
b) advertising and distribution of MD/PhD program description, information brochures, and student application procedures;
- June 1995:** a) processing and interview of student applicants;
b) processing and selection of faculty supervisors;
- September 1995:** a) admission of the first class of MD/PhD students;
b) adjudication of MRC MD/PhD studentship awards;
c) implementation of regular evaluation of student and faculty performance;
- December 1995:** a) initiation of the quarterly MD/PhD Newsletter
- May 1996:** a) matching of faculty supervisors and research disciplines for the first class of MD/PhD students;
b) summer student research program for the first class of MD/PhD students;
- September 1996:** a) admission of the second class of MD/PhD students;
b) implementation of regular student research days, presentations, etc.

J. REFERENCES:

1. Watanabe M: How to attract candidates to academic medicine. Symposium - the future of academic medicine in Canada. Clin Invest Med 15:204-215, 1992.
2. Silverman M, McGugan S: Results of recent initiatives such as the MD/PhD program in the training of clinician-scientists. Clin Invest Med 15:224-228, 1992.
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4. Martin J: Training physician-scientists for the 1990s. Acad Med 66:123-129, 1991.
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6. Macklem PT: The influence of governmental decision-making on academic medicine - part II. Clin Invest Med 15:276-281, 1992.

K. LIST OF APPENDICES:

1. UBC MD/PHD Program Institutional Self Study Report (1992).
2. McGill University MD/PhD program information brochure and application form.
3. The Royal College of Physicians and Surgeons of Canada Clinician- Investigator Training Program Implementation Committee Proposal (Approved by Council on April 8, 1994).