UNIVERSITY OF TORONTO

**Proposal for a
Graduate Program**

Master of Health Informatics Program

in
Graduate Department of Health Policy, Management and
Evaluation
Faculty of Medicine

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Appendix A – Summary of Statement from Chief Librarian

1   Executive Summary

Health Informatics is a discipline that deals with the collection, storage, retrieval, communication and optimal use of health related data, information and knowledge. It recognizes the role of citizens in their own health care as well as the information handling roles of the healthcare professionals, and is now considered a critically essential and pervasive element in sustainable health care delivery. There is a recognized need for the advancement and teaching of knowledge about the application of information and communication technologies to healthcare - the place where health, information and computer sciences, psychology, epidemiology and engineering intersect.

A Master of Health Informatics (MHI) is proposed as a full-time professional graduate degree program to be offered by the Graduate Department of Health Policy, Management and Evaluation in the Faculty of Medicine (HPME) with faculty members cross-appointed from the Faculty of Information Studies (FIS) at the University of Toronto. The MHI vision is to more comprehensively integrate the broad spectrum of Health Informatics domains in a world-class graduate level program. The MHI is intended for health sciences practitioners, health professionals and computer or information technologists who share an interest in converging their strengths and skills in the application of clinical, information and communication technologies for solving problems and driving change in health care systems to improve health outcomes. The academic goal is to produce clinically and technically savvy solution architects capable of bridging the knowledge and cultural gaps that are pervasive in the clinical and health care delivery sectors.

The full-time class-room learning program will require the completion of 10 FCE courses, including a 600 hour practicum. The program will be 16 months in duration over four consecutive sessions. Expected total enrolment the first year will be 20 students with an anticipated increase of 5 students per year to a maximum of 40 students. Since it is a unique program with few competitors, the program is expected to attract students from across Canada and internationally.

The program was included as a key initiative in the most recent (2004-10) HPME Departmental Academic Plan. It responds to the values and mission articulated in the University's *Stepping Up* Academic Plan as well as the Faculty of Medicine Academic Plan and its development was supported by the Academic Initiative Fund (AIF) in 2006. HPME views the MHI as complementary to current academic programs such the M.Sc. Health Administration and MHSc Health Administration. The proposed MHI differs substantially from these existing HPME programs in its emphasis and content, intended audience, and inter-faculty design.

2   Academic

2.1   Description and rationale for the proposal

2.1.1 Description of proposed program

The Master of Health Informatics (MHI) is designed to address the critical and recognized need for a defined cohort of professionals in a new and unique discipline of Health Informatics for the health care delivery sector.

The program is intended for health sciences practitioners, health professionals and computer or information technologists who share an interest in converging their strengths and skills in the application of clinical, information and communication technologies for solving problems and driving change in health care systems to improve health outcomes. The MHI vision is to produce graduates who are both clinically and technically savvy solution architects capable of bridging the knowledge and cultural gaps that are pervasive in the clinical and health care delivery sectors.

2.1.2   Rationale for proposal

Health Informatics has been defined as "a scientific discipline that deals with the collection, storage, retrieval, communication and optimal use of health related data, information and knowledge. The discipline utilizes the methods and technologies of the information sciences for the purpose of problem solving, decision making and assuring the highest quality of health care in all basic and applied areas of the biomedical sciences" (Health Informatics Society of Australia, 1994). From a more applied perspective, it can be best understood as the understanding, skills and tools that enable the sharing and use of information to deliver healthcare and promote health. It reflects a widespread concern to define an information agenda for health services which recognizes the role of citizens as agents in their own care, as well as the major information-handling roles of healthcare professionals.   Health informatics is thus an essential and pervasive element in all healthcare activity. As a result there is a recognized need for the advancement and teaching of knowledge about the application of information and communication technologies to healthcare - the place where health, information and computer sciences, psychology, epidemiology and engineering intersect (UK Health Informatics Society, 2007).

Professional information skills are fundamental to the future of Canadian health care. Rapid development of information and communication technologies (ICTs) is revolutionizing information-intensive practices throughout society - nowhere more than in the health sector. Burgeoning databases, global networks, point-of-delivery systems, digital records, reconfigured socio-technical practices, e-health technologies, and myriad other developments challenge decision-makers across the sector.

In North America, Europe and Australia there are a number of well regarded Health Informatics, Medical or Biomedical Informatics graduate programs with a clinical and/or health informatics component identified as exemplary by academics and other stakeholders currently in the field. These programs are found at Columbia, Dalhousie, Erasmus (Netherlands), Grand Valley State (Michigan), Oregon Health Sciences University, Stanford, University of Alabama at Birmingham, University of Athens (Greece), University of California at Davis, University of Missouri – Columbia, University of New South Wales (Australia), University of Utah, University of Victoria and Vanderbilt. However, with only two programs in all of Canada both of which are in coastal communities, Canadian HI training is severely limited. There is no graduate program in central Canada, particularly in Ontario which represents the largest health care delivery system in North America.

The MHI will educate *health informatics professionals*; and, more broadly, facilitate and coordinate health informatics activities found in the current areas of specialization and related units at both universities including: health and social services, health information and public policy; e-learning; e-health; information management and system development.

Objectives of the program

The MHI program represents a complementary training program for future health information specialists, while also building on a significant existing platform or collaborative work to further evolve academic and professional relationships. Broadly, the MHI program is intended to:

- Attract graduate students from across Canada and around the world interested in a uniquely multidisciplinary approach to the field of health informatics and allow entry of students from diverse disciplinary backgrounds
- Enhance the student experience at both the University of Toronto by providing a focal point for an emerging professional discipline;
- Enhance interdisciplinary and interdepartmental collaborations;
- Connect the University with the broader community in terms of clinical care, public policy & outreach by providing a mechanism for involving affiliated hospital partners, government and other stakeholder groups at many levels (service, teaching, practica opportunities, advisory committees, public education fora, etc.).
- Position the University of Toronto at the forefront of a movement that is critical to the Canadian health system, which has been identified as one of the most important issues in the Ontario Ministry of Health & Long-term Care's long range plans to restructure the health care system.

Specifically, MHI graduates will be prepared to pursue careers as health systems managers and information specialists developing strategy, creating policy and performing high level decision making (requiring the greatest breadth); providing system analysis, assessment, solution architecture and project management (requiring breadth and depth); or develop, implement and manage technological applications and change (requiring the greatest depth) across the full spectrum of the organizational, clinical and technology structures of the health and health care delivery system. Further, MHI graduates will be enabled to comfortably function across a broad spectrum of health care domains (clinical, medical, community, technological, etc.) in terms of language/jargon, culture, policies, psychosocial and organizational systems.

Graduates of the MHI program will first understand, internalize and integrate theoretical foundations of Health Informatics component domains and technologies including: health information systems and technology; health care delivery and clinical systems; computer applications, data processing, health enterprise architectures and systems; knowledge management; decision support; human-computer interface; change management, organizational behaviour and leadership. Secondly, they will demonstrate a working knowledge of the interrelated complexity, methods, tools, standard practice and implementation of those technologies. Finally they will exhibit the capacity to generalize those skills in novel and context-specific ways to improvise or create innovative and custom solutions to health care system problems. Operationally, graduates of this program will demonstrate the following learning outcomes:

- the required knowledge and specialist skills to be able to understand and improve the way in which health care delivery and patient outcomes are enhanced through the effective use and exchange of information.

- the knowledge and skills needed to contribute to the development of point-of-care informatics applications, electronic health records and other ICT infrastructure supporting health care.

- the ability to facilitate the design and implementation of effective and efficient tools for gathering and storing data.

- the ability to analyze data and produce information that meets the needs of clinicians, managers and policy makers.

- knowledge of and sensitivity to the protection of patient confidentiality.

- appropriate models for evaluating information systems, classification systems, health ICT systems and the quality of health information services.

- the ability to analyze the organizational and cultural issues associated with the implementation of health informatics initiatives in a range of different settings[1].

The program's academic objectives will be achieved by providing a comprehensive menu of course offerings including health science and management content through HPME and health information science and technology through a collaborative arrangement with FIS. Courses will include lectures, seminars, case studies, computer labs, literature reviews, web-based and on-line learning, as well as individual and group assignments. A practicum experience will provide the students with opportunities to apply then critically evaluate and reflect upon their new skills. The program will be offered in a full-time classroom-based delivery model. It will use existing facilities and current faculty within HPME and FIS.

2.2   Pedagogical and other academic issues, including expected benefits of the proposed program

The pedagogical challenge in developing professional health informaticians is to identify the complementary skill sets among the diverse health informatics recruits, converge them within a singular cohort to develop the Health Informatics professional identity, then expand on the specialized skills required in specific Health Informatics roles and functions that occur across the full spectrum of the organizational, clinical and technology structures of the health and health care delivery systems. Initially, the program will introduce the theoretical and practical knowledge of HI domains in which students are weakest. Then in broad survey as well as practice and experiential based courses, the program will expand and strengthen theoretical and practical knowledge relevant to key curricular domains in the Health Informatics discipline; thus establishing a coherent professional identify within the student cohort. Finally, through domain-specific elective courses and in consideration of their interests, strengths and dynamic market demand, students will uniquely re-diversify their academic program, either more broadly or more in depth,

The University of Toronto enjoys an international reputation in the fields of health sciences and health administration from HPME as well as information technology in FIS. The MHI degree program will be offered by HPME. However, under terms of a Memorandum of Agreement between HPME and FIS, MHI students will benefit from access to courses offered in the Master of Information Studies (MISt) at FIS, as well as faculty who hold a joint appointment. The cooperation between HPME and FIS ensures that the very best expertise available at each participating faculty and department is integrated into a MHI program that a) provides the most comprehensive menu of course offerings, and b) encompasses the broad spectrum of Health Informatics domains that unites health sciences and computer/information technologies. Additionally, this collaborative feature will ensure the collective resources of cooperative faculties and health care delivery stakeholders are leveraged to provide participants access to a world class program of Health Informatics technology, expertise and experience.

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1 University of Sydney, Master of Health Informatics Program, 2007

During the intense on-campus or virtual class experiences, the students will have in-depth face to face interaction with the faculty and each other. They will work in small groups to enhance their communication, scholarship, presentation, team-building and leadership skills. Students will also complete assignments, with the added benefit of routine contact electronically, by telephone or informal meetings with other student group members, and with instructors. Students and faculty are expected to communicate about course materials, resources and assignments on a regular basis.

The delivery of the program will draw upon faculty with national and international expertise at HPME and FIS. Through their classes, seminars and field experiences students in the MHI are provided the most current up-to-date information on Canada's changing health system and health information technology and computing practices, as well as exposure to leading practitioners, computer scientists, information technologists and health services organizations in Ontario and across Canada. In addition, students are offered opportunities to be actively involved in UT Departmental committees, as well health information or health technology stakeholder organizations and businesses that are active in Southern Ontario.

Additional features of note include:

- Participation in a Canadian Health System and Policy course offered by HPME for those students who come from a computer science and/or information technology background. The course deliberately mixes students from different programs and fields at the University of Toronto and promotes a sharing of expertise and ideologies.

- Participation in a Computer Applications and Programming in Health Care Systems and Health Care Enterprise Architectures and Technology courses, specifically designed for health sciences practitioners and professionals with little background in computer and information technology. These strategic courses will be developed and implemented by faculty and lecturers currently professionally involved in the health care delivery sector.

- Practicum placements and other fieldwork options that are specifically tailored to individual student needs, given their past/current work experience and their specific learning and career objectives.

2.3   Projected student demand

Education in Health and Medical Informatics has been a global concern since the 1980's. Over the past 15 years, the International Medical Informatics Association (IMIA) has raised international awareness with respect to the importance of developing a unique Health Informatics profession and academic discipline, define its competencies and curriculum, and prepare its professionals. In the United States the American Medical Informatics Association (AMIA) identified that for health care systems to be "safe, efficient, timely, patient-centered, equitable, and effective", a significant investment in technology, education and HI training of health care professionals and/or other individuals is critical. The AMIA 10x10 Program's goal is to train 10,000 health care professionals in applied health and medical informatics by the year 2010 and conduct certificate training in a wide range of settings across the United States in collaboration with a number of academic partners in the informatics education community. In Canada, applications for graduate programs at the University of Victoria and Dalhousie University routinely exceed spaces available for admission and they report that the uptake of graduates for satisfying employment exceeds 90%. Future trends identified in program reviews from the University of Victoria show that demand and development of new health informatics

programs is continually growing. With an increasing awareness of health informatics as a discipline, there is a strong job market for graduates with the right blend of education and experience. Through interviews conducted in a recent MHI graduate market assessment (2007) all participating stakeholders indicated that there is a significant unmet demand for graduates from a professional MHI program in Ontario.

2.4   Impact on the Department's and Division's program of study, including impact on other divisions

The MHI program was included as a key initiative in the 2004-10 HPME Departmental Academic Plan. It responds to the values and mission articulated in the University of Toronto *Stepping Up* Academic Plan and its development was supported by the Academic Initiative Fund (AIF) in 2006. The proposed program fits squarely within the Faculty of Medicine Academic Plan that articulated the need to "Advance our scientific and professional training platform for the 21st century" as a major objective.

HPME currently offers several graduate degree programs in the Health Sciences:
- MSc and PhD with two fields:
    1. Health Services Research
    2. Clinical Epidemiology and Health Care Research
- A new field in the MSc program (Health Technology Management) is awaiting OCGS approval.
- MHSc, MHSc/MSW Combined Degree and the MHSc/Nursing Combined Degree
- MMI degree

HPME and FIS view the MHI as complementary to current academic programs such as the MSc and MHSc (HPME) and MISt (FIS). The majority of students in the MSc (HPME) are relatively recent graduates from a wide range of undergraduate health disciplines. Students in the MHSc or MMI professional programs are already career tracked. They all seek sound, and often initial, academic grounding and practical experience, which will enable them to pursue or enhance a career in health policy, administration, practice or research. Similarly, students in the MISt at FIS seek professional development in information technology and computer science. However, as indicated in the program rationale, there are students from both these disciplines and programs who wish to pursue careers in Health Informatics and have very specific academic career development requirements.

The **proposed new MHI** program is designed to meet their needs and the similar needs of a broader range of experienced health and technology practitioners more effectively and efficiently. The program will differ substantially from existing HPME and FIS programs in its *emphasis and content* (divergent co-requisites with a convergent core focusing on both breadth and depth)*, intended audience* (health sciences AND technology practitioners) *and delivery model* (academic partnership between HPME and FIS)*.* The MHI Program will make use of the research and content expertise of a few key and joint faculty members from both HPME and FIS and relevant courses from the M.Sc. and MISt. program will be offered as electives where appropriate.   Otherwise, the proposed MHI program will have no effect on the existing graduate programs in Health Sciences or the Faculty of Information Studies.

2.5   Evidence of consultation with other affected divisions

At various stages, a variety of internal stakeholders have contributed to the development of the MHI Program curriculum and program design including members from the Faculty of Nursing,

Rotman School of Management, Faculty of Pharmacy, Department of Public Health Sciences, Knowledge Translation Program, Bell University Laboratories, Donald R. Wilson Centre for Research in Education, and the Adaptive Technology Resource Centre.

The proposal was also discussed extensively at the following meetings:
- Strategic Planning Retreat, Department of Health Policy and Evaluation, Faculty of Medicine held on February 9th, 2007.
- The HI Curriculum Working Group, which met monthly from April to July, 2007
- The Health Informatics Curriculum Working Group Web Portal site which contains all documentation, notices, and a discussion board accessible to all members.

2.6   Appropriateness of the name and designation of the new program

The new degree name, Master of Health Informatics (MHI), signifies the professional nature of the degree and is consistent with the format used by other professional graduate programs at the University of Toronto. MHI is emerging as a common name for professional graduate programs in this area, and this is the same degree name as is used in Canada (Dalhousie University), the United States (University of California Davis, University of Missouri at Columbia, University of Tennessee, etc.), Australia (University of New South Wales, University of Sydney) and Europe (University of Athens), to name only a few.

The designation also signifies (and legitimizes) the recognition of information, computer, and organizational sciences as fundamental components of effective medical and health care practice and denotes Health Informatics as a unique discipline and professional identity. The proposed MHI is quite different from the existing MHSc at UT, not only in its degree requirements, but also that it is intended for a much more restricted audience—established health sciences professionals AND technology professionals seeking formal professional development through graduate studies.

2.7   Program description and requirements, course titles/numbers, and faculty members

2.7.1   Program description and requirements

Admission requirements
Students entering the MHI program will register in the Graduate Department of Health Policy, Management, and Evaluation within the Faculty of Medicine. Candidates will be admitted to the MHI under the general regulations of the School of Graduate Studies. Required background includes an appropriate four year undergraduate degree, or its equivalent, from a recognized university, and demonstrated English language proficiency. For the MHI program specifically, eligible undergraduate degrees include those in a Health Sciences or Social Sciences specialty, Regulated Health Professions in Ontario, or a computer Science or Information Science Speciality with the equivalent of a minimum "mid B" average in the last academic year. Successful candidates will normally have relevant professional experience as a health services professional (e.g., manager or administrator) or health sciences/clinical practitioner with demonstrated basic literacy and/or programming skills in computer applications relevant to the health sector, or, a computer or information technician within a health care setting or health software vendor.

Program requirements
The MHI is a coursework only program which requires the completion of 10.0 full course equivalents (FCE). Initially, students will be required to complete a minimum of 1.5 FCE chosen

from a menu of Level One half courses representing introductory health informatics knowledge in which they are assessed to be weakest (e.g., introductory computer sciences for health practitioners and/or introductory health/clinical systems and policy for technologists). All students will then converge as a single cohort in a core module to complete one full introductory Health Informatics course and eight half courses representing key curricular domains of Health Informatics such as health and clinical systems; information processing; eHealth technologies and systems; measurement, decision analysis and evaluation; project management; knowledge management and decision support (5.0 FCE). A supervised field placement or practicum (2 FCE) and three elective half courses (1.5 FCE) round out the program. There is no thesis requirement. (See Table 2)

Table 2: Program Requirements

Course Number	Course Name	Faculty	Institution/ Faculty or Department
LEVEL ONE (1.5 FCE)			
a) Students with a health sciences background require the following 3 half courses:			
MHI1001H*	Introduction to Computer Applications and Programming in Health Care Systems	J. Cafazzo	HPME
MHI1002H*	Health Care Enterprise Architectures and Technology	G. Eysenbach	HPME
FIS1340H	Introduction to Information Systems	S. Hockema	FIS
b) Students with a computer or information technology background require the following 3 half courses:			
HAD5010H	Canada's Health System and Health Policy I	P. Williams	HPME
HAD5020H	Canada's Health System and Health Policy II	P. Williams	HPME
MHI1003H*	Fundamentals of Clinical Care	L. Nagle	HPME
CORE COURSES (7.0 FCE)			
MHI2001H*	Health Informatics I	A. Shachak	HPME
MHI2002H*	Health Informatics II	A. Shachak	HPME
MHI2003H*	Health and Clinical Information Systems	K. Leonard	HPME
FIS1343H	Introduction to Database Management and Design	S. Hockema	FIS
MHI2004H*	Networks, The Web and EHealth	G. Eysenbach	HPME
MHI2005H*	Statistics and Decision Analysis in Health Informatics	K. Leonard	HPME
MHI2006H*	Measurement and Evaluation in Health Informatics	TBA	HPME
FIS2301H	Project Management	K. Lyons	FIS
FIS2183H	Knowledge Management and Systems	E. Yu	FIS
HAD5728H	Performance Measurement in Health Care	P. Lindsay	HPME
MHI2007H*	Required Practicum	Coordinator	HPME
ELECTIVE COURSES (1.5 FCE) See Section 4.2.4 Below			

Legend:
HPME = Graduate Department of Health Policy, Management and Evaluation, University of Toronto
FIS= Faculty of Information Studies, University of Toronto
MIE = Department of Mechanical and Industrial Engineering, University of Toronto

Course Number	Course Name	Faculty	Institution/ Faculty or Department

* New MHI courses that are in development

Table 3: Expected Progress

Fall Term 1	2.5 FCE	5 Half Courses
Winter Term 1	2.5 FCE	5 Half Courses
Spring-Summer 1	2.5 FCE	1 Half Course and Practicum
Fall Term 2	2.5 FCE	5 Half Courses
Total	**10 FCE**	

A full time student would need to commit to a total of 4 consecutive sessions of full time attendance, including 600 hours of supervised field work in order to complete the MHI. Students will complete the program in 16 months.

The Practicum

The required practicum will provide an opportunity to apply the theory and knowledge gained in course work directly in a health care-related organization. Students are required to spend a minimum of 600 hours involved in appropriate, supervised field practice for 2.0 FCE. While it cannot be guaranteed to students, the professional status of the MHI is recognized within the industry and the Program Coordinator will endeavour to seek practicum arrangements that offer paid positions. Some examples of positions that may be available in a Health Informatics practicum include Health Information Analysts, Technical Specialists, Technical Architects, Program Coordinators, Project Managers, Special Projects and Team Participants. Examples of HI skills that would be practiced include knowledge of computer and technical applications in health care, pharmaceutical, finance, human resources and telecommunications; problem solving in software engineering, change management or project management, corporate strategizing, facilitation, resolution and crisis management; management skills such as facilitating team effectiveness; leadership through participation and contribution on project teams or committees; communication skills; and writing and/or reporting skills. All practicum placements require the approval of the MHI Program Committee. Throughout the practicum the students are expected to record and reflect upon their experiences and to engage in regular discussion with their practicum supervisor. The practicum evaluation consists of four components: the student's interim and final performance evaluation provided by the preceptor; an analytical and reflective report drawing on the experience, and a presentation to their classmates. Each of these components is graded on a pass/fail basis. In consultation with the practicum preceptor and coordinator, the MHI Program Director will be responsible for the final evaluation and assignment of grades.

Elective Courses
Students are required to complete 1.5 FCE in elective courses. These may be selected from courses offered in other graduate programs offered at HPME or FIS, or developed specifically for the MHI program (see Table 3). As established in the Memorandum of Agreement between the MHI program in HPME and the Faculty of Information Studies (FIS), MHI students will be given preference to enrol in FIS courses.

There is also a wealth of courses relevant to a broad scope of Health Informatics curricular domains that are offered in other graduate programs at the University of Toronto (e.g., Nursing,

Biomedical Engineering, Mechanical and Industrial Engineering, Pharmacy, Knowledge Media Design, Public Health, Adult Education, etc.), or at other Ontario universities through the Ontario Visiting Graduate Student Program.

Table 3: Examples of Elective Courses

Health Information:
FIS2135: Health Sciences Information Resources
HAD5714: Strategic Uses of Health Information I & II
HAD5726: EHealth Innovation and Information
FIS1341: Analyzing Information Systems
FIS1342: Designing Information Systems

FIS2168: Information Retrieval Systems
FIS2176: Information Management in Organizations
FIS2304: Information Security
FIS2142: Theories of Classification and Knowledge Organization
FIS2150: Advanced Management of Information Organizations

Health Care Systems:
HAD5730: Economic Evaluation Methods for Health Service Research

HAD5760: Advanced Health Economics and Policy analysis

Technology I: Computer Applications And Data Processing:
FIS1343: Database Techniques for Managing Structured Documents

FIS2302: XML for communicating on the Web

Technology II: Health Enterprise Architectures And Systems:
FIS2177h: Architecting Information, systems and Organizations

FIS2166: Telecommunications for Information Systems

Knowledge Management:
FIS2183: Knowledge Management and Systems

HAD5727: Knowledge Transfer and Exchange

Decision Support:
FIS2306: Evidence Based Health Care for Information Professionals

Human-Computer Interface:
FIS2179: Interacting with Information Systems

MHIXXXX: Human-Computer Interface in Health Informatics (Shachuk)

Cognitive Science: (Change Management, Organizational Behaviour and Leadership)

MHIXXXX: Change Management and Leadership in Health Informatics (Shachak)

Note: Elective course offerings are subject to change.

Program Administration

The MHI program will operate under the aegis of HPME and comply with the academic and administrative policies of the department. All academic decisions relating to the MHI are subject to the approval of the HPME Curriculum Committee. HPME will be the home base for a full-time Program Director. The Program Director will have overall responsibility for the program and its development, and report to the Program Committee.

A MHI Program Committee chaired by the Program Director and with representatives from all its academic partners and stakeholders will guide program development and approve specific

practicum placements and supervisions. Faculty representing other cooperating academic units may be invited to join the committee. For example, for at least the first year of the program the Chair of the Faculty of Information Studies (FIS) will be included as the Faculty has agreed to have several of its courses listed as required and elective courses for MHI students.

2.7.2 Course titles/numbers

The required courses for the proposed program are listed in Table 4 below. The majority of the courses are in the process of being developed. Elective courses currently exist within other HPME or FIS programs or other institutions, faculties and departments.

Table 4: Required Courses in the MHI Program

Course	Session	FCE	Faculty	Type	Course Number
Introduction to Computer Applications and Programming in Health Care Systems	Fall 08	0.5	J. Cafazzo	Level One	MHI1001H*
Health Care Enterprise Architectures and Technology	Fall 08	0.5	G. Eysenbach	Level One	MHI1002H*
Introduction to Information Systems	Fall 08	0.5	S. Hockema	Level One	FIS1340H
Canada's Health system and Health Policy I	Fall 08	0.5	P. Williams	Level One	HAD5010H
Canada's Health System and Health Policy II	Fall 08	0.5	P. Williams	Level One	HAD5020H
Fundamentals of Clinical Care	Fall 08	0.5	L. Nagle	Level One	MHI1003H*
Health Informatics I	Fall 08	0.5	A. Shachak	Core	MHI2001H*
Health and Clinical Information Systems	Fall 08	0.5	K. Leonard	Core	MHI2003H*
Health Informatics II	Winter 09	0.5	A. Shachak	Core	MHI2002H*
Introduction to Database Management and Design	Winter 09	0.5	S. Hockema	Core	FIS1343H
Networks, The Web, and EHealth	Winter 09	0.5	G. Eysenbach	Core	MHI2004H*
Statistics and Decision Analysis in Health Informatics	Winter 09	0.5	K. Leonard	Core	MHI2005H*
Measurement and Evaluation in Health Informatics	Winter 09	0.5	TBA	Core	MHI2006H*
Project Management	Summer 09	0.5	K. Lyons	Core	FIS2301H
PRACTICUM	Summer 09	2.0	Coordinator	Core	MHI2007H*
Knowledge Management and Systems	Fall 09	0.5	E. Yu	Core	FIS2183H
Performance Measurement in Health Care	Fall 09	0.5	P. Lindsay	Core	HAD5728H

* Courses currently under development

Faculty members

The MHI program draws upon HPME and FIS faculty already affiliated with their respective existing research and professional graduate programs (Table 5). None of the HPME or FIS faculty is associated with undergraduate teaching in the usual sense. There is no undergraduate program in either academic unit, and faculty are largely only involved in graduate teaching. There are three tenured or tenure track faculty or faculty positions involved exclusively with Health Informatics. One Category 1 position at FIS is currently vacant due to a recent resignation of a faculty member involved in Health Informatics. The Category 2 position for the Practicum Coordinator has been approved by the Faculty of Medicine and a search will commence once the program is approved. The Category 6 appointments are lecturers with PhD credentials and professional positions in the Health Informatics field. They either already deliver courses in other HPME graduate programs (Lindsay) or will develop and deliver a course in the MHI program (Cafazzo). Table 5 lists the faculty members involved in the MHI program.

Table 5: Faculty Members

Faculty Name & Rank	M/F	Home Unit [1]	Supervisory Privileges [2]
Category 1			
Leonard, Kevin- Associate	M	HPME	Full
Shachak, Aviv-Assistant	M	HPME/FIS	Masters
Position to be Filled	M/F	FIS	TBA
Category 2			
Practicum Coordinator (TBA)	M/F	HPME	None
Category 3			
Hockema, Steve -Associate	M	FIS	Full
Williams, Paul - Professor	M	HPME`	Full
Yu, Eric-Associate	M	FIS	Full
Lyons, Kelly - Associate	F	FIS	Master's
Category 4			
Eysenbach, Gunther – Associate	M	HPME	Full
Jadad, Alex - Professor	M	HPME	Full
Category 5			
Nagle, Lynnn – Assistant Professor	F	HPME	None
Category 6			
Cafazzo, Joseph – Lecturer	M	HPME	None
Lindsay, Patrice – Lecturer	F	HPME	None

Category 1:   tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review. For this purpose the master's and doctoral streams of a program are considered as a single program. Membership in the graduate program, not the home unit, is the defining issue.

Category 2:   non-tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review.

Category 3:   tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

Category 4:   non-tenure track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

Category 5:   other core faculty: this category may include emeritus professors with supervisory privileges and persons appointed from government laboratories or industry as adjunct professors. Please explain who would fall into this category at your institution.

Category 6:   non-core faculty who participate in the teaching of graduate courses.

3   Students

3.1   Student affairs and services
All the usual facilities and services provided to professional master's students in HPME and FIS will be available to students in this program.

3.2   Student conduct and discipline
Standard university guidelines and policy for student conduct will govern in the MHI program.

3.3   Student registration and information systems
All standard SGS registration and enrolment procedures will apply for University of Toronto students in this program.

REPORT ON LIBRARY RESOURCES FOR THE PROPOSED MASTERS OF HEALTH INFORMATICS PROGRAM

BACKGROUND

The University of Toronto libraries provide a rich resource for the support of graduate study in the field of medical informatics. While there is a specific literature that focuses on medical informatics which we collect extensively, the research collection in this area is enhanced by its location in a university library system which through its collections and acquisitions policy supports research and teaching in all areas of the health, social and behavioural sciences and the humanities. The increasingly cross-disciplinary nature of much of the research in the health professions means that it is extremely difficult to draw firm boundaries around an area or speciality. Researchers in medical informatics draws on literature that is broadly based and diverse, from health, computer and information sciences.

I. DESCRIPTION OF THE COLLECTION

Monographs

The Library's holdings related to medical informatics specifically, and the health sciences more generally, have been built up in a systematic way since 1966 when Dealer Selection Orders were established and librarians employed to monitor the plans and to actively and systematically select research materials that fall outside the plans.

Research material supporting the proposed medical informatics program comes from a wide range of subject areas across the sciences. In the sciences, as in other areas of the collection, it is the policy of the Library to acquire a single copy of all books published in English that are considered to be of research value. This includes the proceedings of conferences and symposia, technical handbooks and reference tools in addition to research monographs. The cross-disciplinary nature of research in medical informatics makes a simple evaluation of the Library's holdings difficult. However, the 2001 edition of the North American Title Count [1] can be useful in comparing the University of

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[1] *North American Title Count, 2001.* Chicago: American Library Association.

Toronto's holdings with that of other similar institutions. Books relating directly to medical informatics are classed by the Library of Congress within the call number range *R 690 – R 920*. In a count of all the books held in this range, the University of Toronto Library ranked second of the fifty-two libraries in this section of the survey. As the Library of Congress took the top spot in the survey, when measured against only academic libraries, the University of Toronto Library would rank first. It should be noted that as there is no equivalent National Library of Medicine classification in the survey, libraries using the NLM system could not be included in this ranking.

Books relating directly to health planning are classed by the Library of Congress throughout the call number range *RA 3 – RA 420*. In a count of the number of books held in this range, the University of Toronto Library ranked fifth of the fifty-five libraries in this part of the survey. When measured against academic libraries alone, the Library would rank fourth. Again it should be noted that there is no equivalent National Library of Medicine classification, libraries using the NLM system could not be included in this ranking.

Books relating directly to hospital and health facility administration are classed by the Library of Congress at *RA 960 – RA 1000.5*. The University of Toronto Library ranked fourth of the fifty-three libraries in this section. Among academic libraries only, the Library would rank third. As there is no equivalent National Library of Medicine classification in the survey, libraries using the NLM system could not be included in this ranking.

Books discussing information theory are classed by the Library of Congress at *Q 300 – Q 385*. In a count of all the titles in this range, the University of Toronto Library placed sixth of fifty-four libraries in this part of the survey. As the first and third positions in the survey were taken by the Canada Institute for Scientific and Technical Information (CISTI) and the Library of Congress respectively, when compared only to other academic libraries, the University of Toronto Library would rank fourth.

Books discussing computer science are classed by the Library of Congress within the range *QA 75 – QA 76*. In this section of the survey, the University of Toronto Library ranked eighth of fifty-four libraries. As the first and and fifth positions were taken by the Library of Congress and CISTI, the University of Toronto Library would take the sixth position when compared only to other academic libraries.

The currency of the collection is also important. There have been ongoing improvements in the library's ability to get English language materials to the shelves quickly, and at present there is not a backlog for books in the health sciences.

Journals

The journal holdings of the University of Toronto Library are substantial. However, like all North American libraries we are experiencing great difficulty in keeping up with the rising cost of serial subscriptions. From 1986 until the past few years we were able to buy few new titles. During the 1990's the Library, in consultation with faculty, actually cancelled subscriptions equal in cost to approximately 10% of the total serials budget. However the situation has improved significantly during the past several years due to the Library's holdings of electronic journals. At the present time over 33,000 such journals are available to students and staff at the university. Many of these are new to the Library's holdings. In most cases electronic journal articles are available directly through the Library's catalogue, through a separate list of electronic journal holdings or via abstracts and indexes where SFX or full-text links are in place.

The most recent statistics compiled by the Library show the total number of journal subscriptions currently held in the life and health sciences is 3,140; in the Humanities and Social Sciences 13,181.[2] A check of the ISI journal citation reports (2006)[3] can give some indication of the Library's holdings as they relate to medical informatics. In the subject area *Medical Informatics* the University of Toronto Library holds eighteen of twenty journals. Of these eighteen journals, seventeen are available online to all staff and students at the University.

In the subject category *Health Care Sciences and Services* the Library holds twenty-two of the top twenty-five journals as ranked by Impact Factor. Twenty of these journals are available online for staff and students.

In the subject category *Computer Science, Information Systems* the University of Toronto Library holds subscriptions to twenty-three of the top twenty-five journals as ranked by Impact Factor. Twenty-two of these are available to staff and students online.

Electronic Resources

Electronic information services at the University of Toronto Library have been evolving since 1987, when the first online catalogue was mounted.[4] Within a year the online

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[2] University of Toronto Library. Annual statistics, May1, 2004 – April 30, 2005. Toronto: The Library, 2005

[3] *Science Citation Index Journal Citation Reports, 2006.* Philadelphia: Institute for Scientific Information, 2007.

[4] Clinton, Peter. From Felix to the digital library and beyond. UTLibrary news, winter 1997/98, p. 2-3.

catalogue was available in all the campus libraries, and dial-in access was introduced with a small number of lines. Abstracts and indexes had been computerised since the early 1970's and up until the 1980's were searched by trained intermediaries. Beginning in the late 1980's CD-ROM's and networked databases widened the access of electronic databases to the end-user to perform his or her own searches. In 1991 the Library added seven H.W. Wilson periodical index databases to its electronic network. Today the Library offers over 350 periodical index databases through a variety of information systems to all members of the University of Toronto community. Some of these indexes allow users to search and retrieve citations to journal articles and then to display the full text of that article electronically. Specialists in medical informatics will find the following databases of interest: MEDLINE; EMBASE; INTERNATIONAL PHARMACEUTICAL ABSTRACTS; WEB OF KNOWLEDGE including SCIENCE CITATION INDEX; SCOPUS; TOXLINE; TOXICOLOGY ABSTRACTS; COCHRANE LIBRARY; MEDICINE AND PHARMACEUTICAL BIOTECNOLOGY ABSTRACTS; CHEMICAL ABSTRACTS; COMPUTER & INFORMATION SYSTEMS ABSTRACTS; COMPUTER ABSTRACTS INTERNATIONAL; ACM DIGITAL LIBRARY SEARCH; ISI CONFERENCE PROCEEDINGS; PROQUEST COMPUTING and PROQUEST DIGITAL DISSERTATIONS.

As mentioned earlier the Library also offers links to 33,000 electronic journals to the University of Toronto community via the Library's web pages. Some 60% of these journals have the full text of their articles available for viewing, printing, and in some cases emailing, by University of Toronto staff and students.

The Library is also committed to building a collection of electronic books in appropriate subject areas and recently purchased a package of 207 online medical textbooks published by the Lippincott Williams, and Wilkins company. These books are available online to all staff and students at the University.

SUPPORTING COLLECTIONS

Although the main health sciences collection is housed in the Gerstein Science Information Centre, graduate students in medical informatics can also make use of health related materials in the libraries of the Health Science Information Consortium of Toronto. Comprising over 30 teaching and community hospitals and health institutions, the Consortium members cooperate to share resources and so expand the base of research support for their parent institutions. Material on many of aspects of the field will also be found in Faculty of Information Studies Library, the Engineering & Computer Science Library and the Robarts Library (Humanities & Social Science collections).

II. LIBRARY SERVICES

a. RESEARCH and REFERENCE SERVICES

Given the cross-disciplinary nature of much of the research in the health sciences, and the increasing importance of electronic resources, including the World Wide Web, it is important to recognise that the reference and instructional services offered by the Library play a key role both in making our own collections accessible and in facilitating access to the national and international information networks. The Library is increasingly playing an important role in the linking of teaching and research in the university.

Reference services offered at the Gerstein Science Information Centre can be accessed in person, via a suite of electronic services called Ask Gerstein which includes ask.gerstein@utoronto.ca, the library's email reference service, instant messaging and virtual reference. It includes help in searching the collection, the verification of citations, the searching of online and print union list files to locate materials not available on campus, and the handling of interlibrary loans (See II.c. Resource Sharing). Students may also arrange 30-60 minute consultation appointments with a librarian who will assist them with research on their topics in particular tools and databases.

Reference Service is available Monday – Friday from 10:00 am to 6 p.m. and on the weekends from noon until 5 p.m.

b. INSTRUCTION SERVICES and INFORMATION LITERACY

Faculty are encouraged to and frequently do request that the Gerstein librarians provide in-depth in class instruction for graduate and undergraduate students in their courses. Some faculties also ask that sessions about library resources be given to their TAs. Faculty may also request update/refresher courses for groups of faculty. Search strategy formulation, databases appropriate to the subject field and use of literature such as conference proceedings, dissertations and/or special microform collections are discussed, often in relation to a particular assignment. When appropriate and upon request, the process of extracting evidence-based information and/or preparing systematic reviews is also covered as is discussion of electronic and print sources and how to find them. In addition, instruction in the use of bibliographic citation management tools to store references and to prepare papers/reports following prescribed formatting styles (Vancouver, APA, MLA, etc.) for footnotes is discussed. RefWorks, EndNote and Reference Manager instruction is provided either in class or as separate stand alone classes. RefWorks is made available via Ontario College & University Library's (OCUL) Scholars Portal to all university students in Ontario and is the software covered in classes in the most detail.

Groups of five or more students may also request instruction sessions from the library.

c. RESOURCE SHARING SERVICES

Students, particularly graduate students, are encouraged to reach beyond the resources of the University library to collections of other institutions for important documents in their field which the University of Toronto Library does not own. Books are borrowed free from anywhere in the world on their behalf. Copies of articles, whether electronic or in print, are acquired on the students' behalf by the library's Resource Sharing departments for a fee of $5.00 CAN per article. Interlibrary loan requests may be submitted online via the OCUL RACER system or in print at most libraries. For some locations, e.g. the Canada Institute for Scientific and Technical Information (CISTI) and the U.S. National Library of Medicine (NLM-Docline), it is now possible to process transactions electronically thereby decreasing the time required to fill requests. Students may also request books from the University's suburban campuses, University of Toronto at Mississauga and University of Toronto at Scarborough College, via the RACER system.

d. STUDY SPACE

The Gerstein Science Information Centre provides more than 800 study spaces for students who wish to work on campus. The library is open 89.5 hours per week. In the next year, additional space for graduate and group study will be made available at Gerstein. Other libraries on campus, including the Engineering & Computer Science Library, also have study space available.

III. BUDGET and COMMITMENT

The strength of the Library's financial commitment to purchasing material over the next five to seven years depends upon University policy and government funding. To date it has been the University of Toronto's stated policy to protect, as far as possible, the Library's acquisitions budget from rising costs and to maintain this protected status. This present financial policy allows the Library to maintain its current purchasing levels for publications relevant to medical informatics and ensures continued support for the programme.

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