

REPORT ON INTERNATIONAL COMPARISONS
U. S. ENVIRONMENT



JAY ROSENFELD, MD
ANGELA TOWLE, PHD

NOVEMBER 2008

1. Introduction to the US Comparison

1.1 Purpose

We were charged to undertake consultations in the US environment to generate:

- An overview of the current landscape in US medical education;
- Current issues / trends that impact upon or should impact upon medical education;
- How / if undergraduate medical school programs are engaging / responding to these societal shifts;
- Examples of innovation in US medical education.

1.2 Conduct of the study

Key stakeholder interviews were arranged with medical education leaders at the Liaison Committee on Medical Education (LCME), Association of American Medical Colleges (AAMC), American Medical Association (AMA) and The Carnegie Foundation for the Advancement of Teaching (Preparation for the Profession of Medicine Study). A number of schools were highlighted as having innovative and future-looking programs and we were able to arrange visits to six of these schools. During these visits we met with a variety of educational leaders to get an overview of different aspects of the programs, and with students. See Appendix 1 for a list of the people we met.

We reviewed a number of key reports in preparation for the visit and followed up on information provided during our meetings through accessing the relevant websites (see Appendix 2).

1.3 Outline of the report

The report is based on notes taken during our interviews and meetings, as well as our background reading. It is not intended to be a comprehensive review of medical education in the US but rather to highlight some high level themes that we found to be recurring and that seemed to be most relevant to the Future of Medical Education in Canada project. The report is divided into the following sections:

- A brief description of the organization of medical education in the US;
- An overview of current and future issues in US medical education;
- A description of some important and notable features of the programs at six medical schools of particular relevance to the Future of Medical Education in Canada project;
- A discussion of some key issues in US medical education organized into the same 5 cluster themes used in the environmental scan;
- A summary of key points.

2. Organization of medical education in the US

Medical education in the US is structurally very similar to Canada, most typically consisting of a 4-year program of basic medical education (undergraduate medical education, UME) in one of the 130 MD granting medical schools, followed by several years of specialist residency training (graduate medical education, GME).

The Liaison Committee on Medical Education (LCME) is the nationally recognized accrediting authority for medical education programs leading to the MD degree in both the US and Canada. Accreditation is required for schools to receive federal grants for medical education and to participate in federal loan programs. State boards of licensure require that US schools be accredited by LCME as a condition for licensure of their graduates. The LCME is sponsored by the Association of American Medical Colleges (AAMC) and the Council on Medical Education of the American Medical Association (AMA).

Each state medical board sets its own rules and regulations and requires passing an examination that demonstrates qualification for licensure. All states accept the United States Medical Licensing

Examination (USMLE) which is sponsored by the Federation of State Medical Boards of the United States (FSMB) and the National Board of Medical Examiners (NBME). The USMLE comprises three steps: Step 1 assesses whether students can apply important concepts of the sciences basic to the practice of medicine and is normally taken at the end of second year; Step 2 includes clinical knowledge and clinical skills examinations usually taken early during the fourth year; Step 3 is taken during the first year of residency.

Graduate programs are accredited by the Accreditation Council for Graduate Medical Education (ACGME). In 2006-7 there were over 8,000 ACGME accredited residency programs in 126 specialties and subspecialties (there are 26 recognized specialties). The ‘Outcome Project’ is a long-term initiative by which the ACGME is increasing emphasis on educational outcomes in the accreditation of residency education. In 1999 the ACGME endorsed six general competencies for residents: patient care; medical knowledge; professionalism; systems-based practice; practice-based learning and improvement; interpersonal and communication skills. Sub competencies in each of these domains were approved by the ACGME in 2007.

The American Board of Medical Specialties is the umbrella organization for the 24 approved medical specialty boards in the US. Each medical board certifies physicians who practice in that specialty (e.g. American Board of Family Medicine, American Board of Surgery).

Funding for undergraduate medical education comes from a complex mixture of public and private sources, including research, clinical practice, universities, tuition, state and federal governments, hospitals, and gifts and endowments.

There are large numbers of stakeholders responsible for different parts of the medical education continuum leading to fragmentation and an inability to respond nimbly to the need for change. Vested interests and different financing mechanisms make reaching consensus difficult.

3. Overview of current and future issues in US medical education

Recent calls for reform in medical education in the US can be traced back to the seminal reports from the Institute of Medicine that called attention to the problem of preventable medical error, patient safety and the need to improve the quality of care. The IOM reports identified deficiencies in health professions’ education and the need for doctors and other health professionals to deliver patient-centred care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches and informatics. Particular attention was focused on changes that might be required of the institutional sponsors of the education programs and of the various credentialing and accrediting bodies. Similar themes appeared in other blue ribbon panel reports at that time. In response to these growing concerns about the quality of medical education, in 2002 the Association of American Medical Colleges established the Institute for Improving Medical Education (IIME) which appointed an ad hoc committee of deans to develop a vision for medical education in the US. Because the trigger was quality of care, the recommendations for reforms have focused more on GME since it is during residency training that doctors learn perform the complex integrative tasks that are required to provide high quality care. However, the recommendations have also highlighted the need to address shortcomings in the current model of undergraduate clinical education, noting that major curriculum change has largely been confined to the first two years of medical school.

The AMA’s Initiative to Transform Medical Education (ITME) is designed to “reform the medical education and training system to ensure that physicians are prepared for practice in the evolving health care system”. It spans all levels of medical education from pre-admissions through to continuing professional development. The recommendations include new medical school curriculum requirements in core competencies such as teamwork, information acquisition, communication, self assessment,

professionalism, functionality within various health care systems and community service. Humanism, ethics and professionalism should be integrated into the curriculum. The first area selected for attention is the learning environment for medical students and residents.

Another major set of issues that impact medical education relate to human health resource planning. In June 2006 the AAMC recommended that enrollment in US medical schools be increased 30% by 2015, with an expansion of GME positions to accommodate this growth. These recommendations were based on recent studies pointing to an impending shortage of physicians, as well as a recognition of factors likely to influence future physician supply and demand, such as the ageing of the US population and the physician workforce. As a consequence the US has seen a major expansion in medical class enrollment through a variety of approaches including distributed regional campuses and new medical schools. These increases impact resources, especially community-based faculty, outside the Academic Health Centre (AHC).

The most recent projections from the AAMC confirm a shortage of physicians which will grow over time, so that even a robust expansion of GME capacity would only reduce the projected shortage in 2025 by 43%. Future demand for physicians would be significantly reduced if physician assistants and nurse practitioners played a larger role and more coordinated role in patient care. Under these circumstances the future roles of physicians in relation to other health care providers will undoubtedly become a focus of discussion, for example physicians as leaders or investigators versus practitioners. The costs of producing a physician will also create a “market” for “cheaper” types of health professionals, especially to deliver primary care.

Nor will increasing the numbers of physicians alone address the major health disparities in the US. Despite initiatives to increase the numbers of graduates going into primary care, there may never be enough doctors in underserved areas and primary care, or in disciplines that are required as the population changes (e.g. geriatrics). Students choose “ROAD” careers in specialties that are generally considered “lifestyle” specialties because they offer good pay with scheduled work hours, low patient loads, above average working conditions, and typically low on-call time. Historically, the ROAD specialties are **R**adiology, **O**phthalmology, **A**nesthesiology, and **D**ermatology. More recently, the mnemonic has been revised to **E-ROAD** or **ADORE** to include **E**mergency Medicine.

Related to physician supply are concerns about the costs of the health care system and medical education, with a focus on increasing efficiency and accountability, as well as quality and safety. With spiraling costs on the one hand, and 46 million Americans without health insurance on the other, reform of medical education is clearly in the context of a severely dysfunctional health care system. Financial pressures are creating a drive for efficiency in AHCs and pressure to deliver service and research which threaten the educational mission, for which there is insufficient dedicated funding. Education of students outside the AHC which is both desirable for educational reasons and necessary to meet the needs of expanding class sizes, is currently done by community preceptors who rarely get paid for teaching, although other kinds of supports may be in place. Indeed the system runs on altruism and could not afford to pay all of the volunteer faculty.

The costs of education are stimulating debate about the length of training. In order to contain costs and manage the explosion of medical knowledge education needs to be efficient with a more seamless transition between undergraduate and graduate medical education. There are proposals to shorten specialty training in internal medicine and surgery, through a foundational (core) program plus specialty model, but there is some resistance to these changes by the American Boards. The move to competency based education at GME, which is catching on at UME, has the potential to link learning across the continuum and create a more flexible system. For example, the AAMC is attempting to facilitate linkage through the Medical School Objectives Project (MSOP), identifying thematic areas that can run

throughout the continuum (e.g. health literacy) to provide bridging through themes and levels of competency rather than programs.

Societal concerns have had less direct impact on medical education than in some countries, but recent LCME accreditation standards reflect contemporary issues such as diversity, cultural competence and service learning. Admissions processes are being changed to bring in a more diverse cohort of students (especially those from a lower socioeconomic background) and create pipeline programs for minority students. Many schools have service learning components targeted at addressing health disparities in their local populations. Professionalism issues continue to be a major concern, most recently with a focus on the influence of industry funding, especially of continuing medical education (see June 2008 report from AAMC).

The USMLE Step 1 basic science examination at the end of second year has tended to perpetuate the curriculum divide between preclinical (basic sciences) and clinical. Following a study by the Committee to Evaluate the USMLE Program (CEUP) in 2008, the USMLE has endorsed a recommendation to move to two assessment points: at the interface between undergraduate and graduate medical education (supervised practice) and at the beginning of independent (unsupervised practice). A second supported recommendation is that the USMLE adopt a general competencies schema for the design and scoring of the examination using a model consistent with national standards such as the ACGME general competencies. Implementation of these recommendations would create a single competency-based examination in year 4 in which basic science is truly integrated in a clinical context. In theory this will give schools more flexibility in how they structure the curriculum and facilitate longitudinal integration of the basic sciences.

A major influence on the future of medical education in the US, and likely beyond, will be The Carnegie Foundation for the Advancement of Teaching study on the Professional Preparation of Physicians. Designed to coincide with the centenary of the Flexner Report, published by the Carnegie Foundation in 1910, and which has influenced the shape of medical education ever since, the report from the study is due to be published in 2009. Recommendations will focus on the professional development of physicians-in-training and relate to themes of integration, individualization and standardization, insistence on excellence and professional identify formation.

4. Examples of innovations at six medical schools

4.1 Indiana University School of Medicine

www.medicine.iu.edu

Founded in 1903, Indiana University School of Medicine is the only medical school in the state, and educates the second largest medical student body in the US (294 students per class). It is set to expand further to 364 students by 2012. The medical school is located at nine sites throughout Indiana. Eight sites offer the first two years of medical school and are in Bloomington, Evansville, Fort Wayne, Gary, Muncie, South Bend, Terre Haute and West Lafayette. Most distributed sites have 16-24 students. All students are in Indianapolis for the final two years which focus on clinical rotations in six affiliated hospitals. The distributed model has been in operation for more than 40 years; there is a new initiative to develop clerkships in the distributed sites.

The mission of the school is to “link education, research and patient care in innovative ways that will produce qualified and compassionate physicians, improve the health of the community, reduce health care costs and ensure the excellence of these endeavours”. The school states as its core values: excellence, respect, integrity, diversity and co-operation. In addition the school emphasizes and measures professionalism by including it as one of the core competencies.

The curriculum is competency based (since 1996) and organized around nine core competency areas, which students master at three progressive levels in order to graduate. The competencies are accompanied by a set of core values and guiding principles related to professional conduct. Each competency has a Competency Director, a significant supported faculty position with remuneration from the university. Clerkship and course directors negotiate with each other and the competency directors as to the competency and level of competency taught or evaluated in their course or clerkship. Students accumulate points towards each competency – thus the rate of progress of students may differ significantly. Opportunities exist in the fourth year for students to attain a level 4 competency in areas they wish to excel in. Students get both a grade and competency transcript.

In 2003 the faculty introduced a Relationship-Centred Care Initiative to transform the social environment (the informal curriculum) of the medical school in order to provide a social environment that reflects and reinforces the moral, ethical and humane values expressed in the school's formal curriculum. The initiative used an Appreciative Inquiry process to bring about change, develop leaders and improve relationships between faculty and students. Some results have been improved interprofessional communication in the faculty, an honour code for faculty, students and staff, students brought into key committees, and improved student satisfaction.

Some notable features of the medical school

- Competency-based curriculum and assessment.
- Opportunities for senior students to develop high level of competency in areas of choice.
- Competency transcripts.
- Distributed model of education with large number of sites.
- Integration of competencies into courses and clerkships at all sites.
- Relationship-Centred Care initiative to improve the learning environment.
- E-curriculum and medical informatics program (electronic competency infrastructure).

4.2 Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

www.clevelandclinic.org/cclcm

The Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (the College Program) was created as a distinct program (separate educational track) within the Case School of Medicine and admitted its first students in 2004 (will graduate in 2009). The stated goal of the program is to “foster a passion for scientific enquiry and skills for critical thinking coupled with broad-based clinical expertise to optimally position the MD graduate to pursue a career as a physician investigator”. It is a five-year program to allow adequate time for a substantive research project and students graduate with an MD degree with Special Qualification in Biomedical Research. One third of students are getting a concurrent Masters degree. Students are mainly focused on clinical research but some do projects in social sciences or public health.

The first two years are devoted to core basic sciences and clinical learning objectives (with longitudinal clinical experiences from the beginning), as well as courses in basic and translational research (year 1) and clinical research (year 2); the last 3 years are flexible and are individualized based on the student's research, clinical competency and professional goals. With only 32 students per class, there is a high faculty to student ratio and each student has a physician adviser and a research advisor throughout their time in the program. The school provides a “graduate education in medicine”: faculty work in partnership with students to support a student-centred learning experience. The medical school is seen as adding value to the clinical work of the Cleveland Clinic.

The curriculum is competency based (nine domains). There are limited formal scheduled hours during the first two years (20 hours/week) and few lectures. Students in the College Program have the same clinical

requirements in Years 3-5 as students in the University Program at Case, but also participate in half-day seminars related to advanced topics in research and have dedicated time for their research project.

Student progress is determined by competency assessments; there are no grades or class rankings, and no formal marks on the transcript. Students have frequent formative assessments, including essays (concept appraisal questions that test integration and application of knowledge), MCQs, exams, OSCEs and feedback by faculty, peers and self assessments. Students document achievement of competency and learning plans through an e-portfolio, with summative self assessments required at the end of year 1, 2 and 5 (in order to graduate). There is good student buy-in to the portfolio system, although they find it challenging to begin with; they find the learning plans especially useful. The key to success includes extensive faculty and student instruction on the use of portfolios, learning plans, and that the portfolios are not an add-on. There has been a focus on faculty development for high quality assessments, the lever being that students need good evidence for their portfolio, and for the change in role from lecturer to facilitator. Students are given time to study for the USMLE step 1; it has a steering effect but the fact that students do so well also reassures basic science faculty who are concerned about not having grades.

There is full tuition support for students, including the research thesis year. Applicants have to demonstrate a fit with the College (learning style), ability to deal with a problematic peer, and ability to self assess. The College is working to increase the diversity of the class through a number of strategies to interest students from minority schools and to support diversity students through the admissions process and during the program.

Some notable features of the medical school

- Addresses the need for physician scientists through broad foundation in research (in contrast to narrow research focus of MD/PhD). Students do not necessarily become researchers but “research to make me a better doctor”.
- Five-year program with a significant degree of flexibility.
- Integration of basic sciences, clinical sciences and research through 5 years.
- Competency-based assessment linked to an exceptionally well developed and successful portfolio system.
- There are no grades. Tests, exams and evaluations are formative.
- Creation of a graduate experience / professional environment – students are motivated to learn and portfolio allows students to guide their own path rather than faculty directing.
- Faculty role as facilitator and advisor not provider of information. Longitudinal mentorship relationships.
- Culture of innovation, students respected and play integral role in development of curriculum; students seen as colleagues of faculty.

4.3 Harvard Medical School

<http://hms.harvard.edu/hms/home.asp>

The mission of the Harvard Medical School (HMS) is “to create and nurture a diverse community of the best people committed to leadership in alleviating human suffering caused by disease”. The HMS Program in Medical Education is the organizational structure housing all educational programs leading to the MD degree. Each year about 18% of students choose to extend the scope of their medical education by pursuing a joint degree in the many disciplines offered at HMS, Harvard and their institutional affiliates, including MD/PhD, MD/MBA, MD/MPH and MD/MPP degrees. HMS collaborates with the Massachusetts Institute of Technology Division of Health Sciences and Technology (HST) to deliver the HST MD program designed to produce physician scientists who will become leaders in interdisciplinary medical research. Only 30 students are admitted into the HST program each year.

Since 2002 faculty at HMS have been engaged in a multi-phase initiative to revise the 4-year program with the following goals: i) develop a new model of clinical education that is based on the educational and developmental needs of the student and which offers continuity for patient experience, faculty mentoring and student evaluation; ii) engage the faculty, including the most senior faculty, as teachers, mentors and guides for medical students; iii) increase the rigour of teaching of science (basic, social and population) and truly integrate the teaching of science and clinical medicine throughout the entire student experience; vi) provide opportunities for all medical students to acquire in-depth knowledge in one area of inquiry and produce a scholarly product in their area under the guidance of an expert faculty member.

These goals are being translated into a number of specific changes that culminated in the rolling implementation of a new curriculum beginning in August 2006. These include: increasing integration throughout the curriculum at all levels; longitudinal courses that address social medicine and population health; increased opportunities for scholarly activities and a better structure and expectations for fifth year including graduate degree; increased faculty involvement in mentoring; increased emphasis on public and global health and “social medicine”

HMS has pioneered an urban integrated longitudinal clerkship at the Cambridge Health Alliance. Students follow a panel of 70 patients representing a spectrum of disease throughout all phases of diagnosis and treatment, all services, through any hospitalizations and including follow up after discharge. In preparation for the new Principal Clinical Experience, pilots have been underway at the large teaching hospitals to meld the traditional core rotations with a year-long program that includes a multidisciplinary curriculum, faculty guidance and mentoring, assessment and the primary care clerkship, a longitudinal ambulatory clinic experience. The longitudinal component requires students to spend a half day away from their rotation each week, plus an end of day multidisciplinary conference. Students will be at the same hospital with the same preceptor for the year.

The Gilbert Program in Medical Simulation <http://www.hmsgilbert.com/> is a resource for all students and faculty that bridges basic and clinical science in an integrated learning lab. Each lab is equipped with a mannequin simulator, a seminar table with whiteboard, and a web-connected plasma display. The mission is to “bring to life” good teaching cases for medical students at all levels, using high fidelity patient simulation to foster experiential learning in a safe environment. The simulation lab is used in 10-15 different courses over the 4-year program and is also available to students on demand. It is a unique approach to simulation in which the mannequin is used as a quasi patient, and in taking care of the patient the students are motivated to learn about underlying concepts (e.g. pathophysiology) which are explored during the conference which follows the simulation exercise.

Some notable features of the medical school

- New curriculum embracing emerging themes in medical education (integration of clinical, social and population sciences throughout curriculum; longitudinal clerkship experiences to promote continuity of care and mentorship; in-depth scholarly projects).
- Cambridge Integrated Clerkship.
- Principal Clinical Experience: longitudinal curriculum and primary care clerkship engrafted onto traditional immersion clerkships.
- Rich variety of dual degree programs.
- HST MD program to develop leading physician scientists.
- Simulation lab that provides a medical education service with fellows on call to assist students. Low tech simulations with skilled faculty that integrate into courses to teach basic science concepts through simulated patient care.

4.4 University of California, San Francisco (UCSF)

www.medschool.ucsf.edu

The UCSF School of Medicine is one of five medical schools in the University of California system but is the only one that occupies a campus dedicated exclusively to the science and teaching of health care. The campus is shared with the schools of dentistry, nursing and pharmacy. The school “strives to advance human health through a four-fold mission of education, research, patient care and public service”.

The medical school admitted 152 students in 2008.

The current curriculum was implemented in 2000. Students commence with the 18-month Essential Core, a series of 7 interdisciplinary blocks courses complemented by the longitudinal Foundations of Patient Care course. The preclinical curriculum consists of 20 hours scheduled time per week plus half a day for clinical experiences. Students do a variety of activities in the “free” time – extended lab time, electives in the community, peer study groups, etc. The diversity of students is accommodated by a large array of self-study modules, some written by students. All curriculum content is publicly available.

Over the past several years a number of experiments in core clinical learning have taken place in the form of innovative pilot programs (Model Fresno, Model SFGH, VALOR, PICES). These programs are designed to address some of the limitations of traditional clerkships and are based on the same guiding principles, namely: continuity with patients/populations; continuity of site / health care system; relevant core curriculum; continuity with peer cohort; continuity with faculty and mentoring; experience with ‘undifferentiated patients’. The different models are designed to take advantage of the various strengths of the different teaching sites. For example the 6-month VALOR program (VA-based LOngitudinal Rotation) is based at the Veteran’s Administration hospital which has a patient population with complex medical and psychological problems; students can track their personal patient panel through the well developed electronic medical record system. PICES (the Parnassus Integrated Student Clinical ExperienceS) is a one-year longitudinal fully integrated clerkship at the university academic centre.

Pathways to Discovery is an elective program introduced in 2007 to replace the Areas of Scholarly Concentration program. The goal is to foster the pursuit of discovery, inquiry and innovation as part of the career of every health professional trained at UCSF. Trainees are provided with opportunities for in-depth study and experience in one of several areas of enquiry that go beyond the routine practice of health care. These include: clinical and translational research; global health; health and society; health professions education; molecular medicine. The general format for each pathway includes coursework, a mentored project and a product that provides something of lasting value to the UCSF community and / or to health and health care at large. The Pathways program is available to students from all four professional schools (medicine, dentistry, nursing and pharmacy), to residents and clinical fellows and is designed to be flexible with multiple entry and exit points, and with the potential to lead to a Masters degree.

The Pathways program is one example of interprofessional education initiatives that the deans of the four schools are working on together. In addition to some symbolic activities led by the deans that demonstrate commitment to interprofessional teamwork, there is a task force to look at ways that individual program calendars can be coordinated to permit formal interprofessional activities.

The Program in Medical Education for the Urban Underserved (PRIME-US) is a new initiative that offers medical students an opportunity to pursue their interest in working with urban underserved populations at the individual and community level. Run in conjunction with the Joint Medical Program at UC Berkeley, it comprises an immersion experience in the summer before starting medical school; a core seminar series; clinical immersion experiences; a community engagement program; a masters degree (e.g. public health or policy) between third and fourth year; mentorship and support. PRIME-US is part of a program at all University of California schools funded by the state government: each campus has designated a

specific areas of focus based on its expertise, e.g. rural medicine (UC Davis); Latino health (UC Irvine), urban underserved and future leaders (UCLA); health disparities (UC San Diego).

The Haile T. Debas Academy of Medical Educators was established to create an environment that enhances the status of teachers of medical students at UCSF, promotes and rewards teaching excellence, fosters curricular innovation, and encourages scholarship in medical education. Academy programs include the matched endowed chair program, the innovations funding program and the peer observation Teaching Improvement Program and Teaching Observation Program (TIP/TOP program) which supports all teachers, members and non-members, of medical students,

A new curriculum is being planned stimulated by the Carnegie Foundation project (the project team are based at UCSF), the proposed abolition of the step 1 USMLE and the next school LCME accreditation scheduled for 2011. Features of the new curriculum are a 3-year basic science and clinical curriculum that begins in the first year with early clinical immersion, is structured around an ambulatory clinical care backbone and includes the Pathways to Discovery. It will take a competency-based approach linked to the ACGME competencies. There is a commitment to get students through the curriculum in three years to allow an additional year for the pursuit of an area of scholarly concentration or additional time to increase competency. The Pathways program is created as a UME/GME pathway and there are planned linkages across the continuum in other areas.

Some notable features of the medical school

- Continuity as an organizing principle, including the continuum of education.
- A variety of clerkship models to provide longitudinal and integrated continuity experiences.
- Integration throughout the curriculum, including clerkship intersessions.
- Flexible and personalized curriculum, e.g. Pathways to Discovery program; limited scheduled curriculum time; independent learning modules.
- Social accountability initiatives, e.g. program for urban underserved.
- Recognition for scholarship of education through the Academy of Medical Educators.
- Office of Medical Education that spans the continuum of education and provides educational leadership (model: “do something and then make it scholarly”).
- Proposed new competency-based curriculum based on educational principles emerging from Carnegie Foundation project.

4.5 Stanford University School of Medicine

<http://med.stanford.edu>

The school’s mission is “to be a premier research-intensive medical school that improves health through leadership and collaborative discoveries and innovation in patient care, education and research”. There is a commitment to foster the capacity of future physicians to make discoveries and lead innovation in the science and practice of medicine. Key goals of the curriculum are the melding of 21st century laboratory and medical sciences, and helping each student build in-depth expertise in an area of personal, scholarly interest.

The school admits 86 students a year. Admissions criteria include evidence of sustained leadership and scholarly activity in any field of endeavour. Diversity goals have been hard to achieve and more students from lower socioeconomic groups are desirable. The program is 4 years but students routinely take an extra year, usually between second and third year.

A new curriculum was introduced in 2003. The curriculum integrates basic science and clinical experience with in-depth study and independent research throughout. Lectures were reduced from 30

hours per week to 12-22 hours, with no classes on Wednesdays. There are new integrated courses in the first two years: Foundations of Medicine, Human Health and Disease, and Practice of Medicine. The grading system is completely Pass/Fail and there is no ranking system. The hallmark of the new curriculum is the Scholarly Concentration (analogous to a major), that is designed to provide students with independent, creative scholarly experiences in areas of personal interest and promote integration of biomedical science, clinical medicine and applied investigation. The program builds on and provides more structure to the previous optional Medical Scholar's program. The Scholarly Concentration program offers 13 areas of study, including seven Foundation areas (Bioengineering; Biomedical Ethics and Medical Humanities; Clinical Research; Community Health; Health Services and Policy Research; Molecular Basis of Medicine) and six Application areas (Cancer Biology; Cardiovascular Pulmonary; Immunology; International Health; Neuroscience, Behaviour and Cognition; Women's Health). Students choose their SC programs during year 1 and complete at least 12 units of coursework plus at least one quarter working full time on a research / scholarly project. The clerkship program is extremely flexible and individualized.

A recent feature introduced into the curriculum is the Doctoring with CARE (= Compassion, Advocacy, Responsibility and Empathy) program, a learning community that aims to achieve more consistency of teaching and identify and remediate problems with clinical skills. CARE is run by 15 specially selected and trained physician educators who stay with the same group of students throughout the program. Other curriculum innovations include a leadership course (in collaboration with the business school), a Translating Discoveries course to reintegrate basic and social sciences into the clinical years and reconnect students with their CARE mentors, and increased use of sophisticated educational technology such as simulation and virtual reality in a new Centre for Learning and Knowledge.

Some notable features of the medical school

- Mission to produce leaders of tomorrow.
- Scholarly Concentrations program to integrate research in area of personal interest. Dual degrees encouraged.
- Doctoring with CARE program (learning communities).
- Highly flexible program. Features that permit flexibility include limited number of scheduled hours; recording of lectures (for over 30 years); Wednesdays off; flexible clerkships.
- New Centre for Learning and Knowledge – use of educational technology.

4.6 University of Minnesota Medical School

www.meded.umn.edu

The University of Minnesota Medical School is the only public medical school in the state. It comprises two campuses: the main campus of the Twin Cities (Minneapolis / St Paul) and a two year campus at Duluth campus 150 miles to the north. Duluth was previously accredited as a stand alone 2-year school and maintains its special focus on educating graduates who will enter rural practice, primary care and / or serve in American Indian communities. The students at Duluth (60 per year) transfer to the Twin Cities at the end of their second year. The four-year program at the Twin Cities admits about 170 students each year and offers a wide range of options, including dual degree programs and the Flexible MD (3.5 to 6 years). The cost-of-degree policy fixes annual tuition at matriculation; students pay tuition for 11 semesters but may study for up to six years to complete their MD. This encourages students to take 6 months or longer out of their study to complete dual degrees, international health experiences or other enrichment opportunities.

The medical school is part of the Centre for Interprofessional Education established in 2007 by the Academic Health Centre Dean's Council following a leadership retreat at which each of the six schools and colleges made a commitment to support interprofessional education and to embed it into their

educational programs. The Centre works collaboratively with the schools and colleges to identify, promote, implement and evaluate interprofesional educational activities for health professions students and health professionals. Initial activities focus on two priority areas: “common ground” projects such as leadership and teambuilding, health care ethics and health informatics; and “new models of care delivery” projects such as development of models for chronic care, inpatient critical care and health promotion.

The Rural Physician Associate Program (RPAP) places more than 40 students each year in 9-month clinical immersion experiences in rural areas across Minnesota. It was established in 1971 through support from the state legislature to address a shortage of primary care physicians in rural Minnesota. Since that time 1127 students have completed the program in 110 communities that range in population from 1000 to 30,000. The program attracts students from both the Duluth and Twin Cities campuses and provides a long term primary care experience that allows students to experience the continuity of care and work closely with a rural preceptor over several months. 79% of former RPAP students currently practice primary care and 67% specifically family practice; 50% practice in a rural setting.

The medical school is beginning intensive planning for a new approach to student assessment, curriculum and advising that involves both campuses and will start with the students entering in summer 2010. Med 2010 is designed to provide learner-centred, competency-based education. There are seven domains of competency that align with the ACGME core competencies. The program design principles include: progression determined by achieving competencies in all domains, not by time; flexible curriculum that supports a range of pathways through medical school (including ability to complete MD degree in 3 years); assigned faculty advisor from matriculation to graduation (to assist students with the competency curriculum and career planning); integration of clinical sciences and scientific foundations throughout the program; learning environment that encourages and assesses critical thinking and reflective practice (e.g. through a longitudinal series of ‘Critical Thinking Cases’ that will knit together scientific foundations and clinical science experiences). Assessment will be through institutional assessments such as progress tests and a portfolio system.

Some notable features of the medical school

- Flex MD providing options for shorter as well as longer training.
- Social accountability initiatives to address needs for physicians to serve underserved populations (rural, immigrant ethnic minorities, Native Americans), e.g. the Rural Physician Associate Program (RPAP), Duluth campus mission.
- Interprofessional education in all health professions programs (commitment from all the Health Sciences Deans).
- New admissions criteria – depth, evidence of commitment to “improving the human condition”.
- Med 2010 curriculum embracing many of the emerging themes in medical education (variable length of training; competency based curriculum; integration; critical thinking cases; institutional competency based assessment; learning communities with advisors and reflection).

5. Cluster themes

5.1 Curriculum content (new, difficult to teach or assess, undervalued and or otherwise challenging)

Joint LCME / CaCMS accreditation standards means that the basic medical school curriculum framework in the US is similar to current curricula in Canadian medical schools.

There is no pressure for major changes in content, although there is a trend towards increasing focus on the humanities and social sciences in medicine.

Recognition that problems with curriculum overload threaten the amount of unscheduled, flexible time when this is seen to be increasingly desirable (see below).

The use of technology to decrease curriculum load (“hold it in your head or look it up”)?

There is interest in global health opportunities for students. Global / international health is recognized as increasingly important but there are many facets and they are not articulated in a coherent way.

5.2 Pedagogical issues affecting the medical education system (e.g. curricular design, IPE, simulation, community-based learning, distributed models, physician wellness, faculty development, assessment)

Flexible curricula that allow students to take a step out to pursue a dual degree or scholarly project, work overseas or take time to make career choice.

Opportunities for students to pursue scholarly work in an area of interest and develop additional skills (e.g. leadership, health policy).

Limited scheduled hours to allow students to be self directed and also pursue their passions requires education to be efficient.

Continuity as an organizing principle (continuity of preceptors, patients, location, peers)

Integration of basic sciences throughout the curriculum in clinical context (although there are specific challenges with anatomy education). Integration of clinical education (integrated clerkships, more longitudinal and ambulatory patient experiences). The proposed abolition of USMLE part 1 will facilitate blurring of preclinical / clinical divide. Integration of research and scholarly products.

Shift from teaching to learning - need for curricula that continually emphasizes active learning, (e.g., simulation lab, tutorials facilitated by content expert, frequent self assessment opportunities etc).

Adoption of competency-based curricula – schools have tended to define their own competency domains rather than use ACGME (seen as too vague). Schools with competency-based programs tend to have Pass/Fail system to assess competency and increase collaboration and teamwork – but this creates problems with postgraduate program directors who want grades and rankings.

Definition of core curriculum requirements. Optional enrichment programs and dual degrees (MBA, PhD, MPH) to promote personal development. More cross faculty alliances. Need for integrated graduate programs, not just two concurrent degrees. Increased length of training to accommodate broader physician roles and student interests.

Learning portfolios to assess competency lend themselves to tracking learning through the continuum (projects to examine interoperability to facilitate movement of data from undergraduate to graduate programs).

<http://www.nbme.org/publications/index.html#efolio>

Interprofessional Education (IPE) lacks the profile it has in Canada (which is seen to be a leader), but some schools are demonstrating commitment to IPE at the level of school deans and it is already appearing as an accreditation standard for some programs (e.g. Pharmacy). Scheduling of IPE will require more flexibility and / or time freed up in curricula.

Increasing use of educational technology (e.g. e-curricula, on-line modules, simulation, podcasts, e-portfolios) responding to the different generation of students. It puts more control in the hands of the

learner but also impacts the role of the teacher (e.g. what is the future for lectures given so many schools are now recording lectures for students to watch in their own time?). Educational technology and peer reviewed shared resources such as the AAMC's MedEdPORTAL™ allow faculty to assemble curriculum rather than create *de novo* and to spend time creating the learning experience rather than the material.

5.3 The culture of medicine and medical education (governance, culture of medicine, hidden curriculum)

There are a variety of initiatives to create learning communities that feature long term relationships between small numbers of faculty and students. Faculty are usually personal mentors and advisors and assist students to be self reflective.

There are also specific initiatives to improve the learning environment and informal / hidden curriculum at the institutional level e.g. Relationship Centred Care (the entire medical school) and ITME project to focus on professionalism in GME with hope for impact on medical students.

Professionalism and relationships with industry are a key focal point at present.

5.4 External issues affecting the medical education system (issues in society at large, e.g. human resources, social accountability, patient-centredness, increasing enrolment, student recruitment, influence of science / evidence on medical education)

Increasing enrollment called for by AAMC - existing schools are responding and new schools are being created but may not be the solution to the problem of shortage of doctors (no increase in residency; increasing numbers alone will not result in more going into primary care).

Admissions / diversity: are we taking in the right people (increasing level of debate), especially lack of socioeconomic diversity. Need for acceptable (reliable and valid) tools to assess non-academic qualities. Assessing leadership potential. Many pipeline / outreach programs.

Social accountability initiatives (e.g. PRIME-US initiative in California; RPAP in Minnesota).

5.5 Higher order constructs (medical education research and theory; knowledge translation; change management and leadership in medical education; continuum of education, maintenance of competence, lifelong learning)

Continuum of education – desire for better linkages between UME and GME but challenging in the complex US environment.

Beginning to see linkages by using similar competency framework. Although ACGME competencies not embraced so enthusiastically as CanMEDS at undergraduate level. (See also e-portfolio project above).

Residency programs still not aligned with higher education institutions.

GME: length of training. American Boards have mixed enthusiasm for moves to introduce more flexibility / shorten training. Moves to improve educational component resisted by hospitals because of likely reduction in service component.

Role of doctors of the future and relationship with other health professionals.

Initiatives to support and reward the scholarship of medical education (e.g. AAMC Medical Education Research Certificate (MERC) program <http://www.aamc.org/members/gea/merc.htm>; UCSF Academy of Medical Educators).

6. Key points

Although the schools we visited were very different, the following high level themes recurred consistently even though the schools had different models for addressing the issues. They were also recurring themes in the interviews.

Integration is the biggest educational theme. It includes horizontal and vertical integration between basic sciences and clinical throughout the first three years (will be facilitated by removal of Step 1 USMLE); tighter integration between clinic and classroom; integration of clinical disciplines to create integrated clerkships.

Flexibility: Increased flexibility in length of training. Flexible curriculum framework to allow students opportunities to pursue their passions (need to be more efficient in delivering core curriculum), and permit scheduling of scholarly concentrations, IPE activities, etc.

Competency-based (outcomes-based) curricula: trend seems to be for schools to develop their own rather than use ACGME competencies (too vague) – although there are obvious similarities between the two.

Competency-based assessment – role of portfolios (but need to make it meaningful for students not as add on). Pass / fail (but how to provide appropriate information in MSPE for selection into residency? Or is it the job of UGME to assist selection for residency?). Competency transcripts. Can set a high standard for Pass (rather than minimum competency).

Continuity as an organizing principle to counteract the increasingly fragmented nature of the educational process, with more students, preceptors and training sites and fewer opportunities for meaningful long term patient contact. Examples of continuity include: longitudinal and chronic care clerkships; learning communities (with fewer teachers doing more of the teaching in long term relationships with students); reflection groups and intersessions to bring students back together during the clerkships to maintain contact with peers.

Technology: Generation Y students use technology to find information, and expect it to be freely available. It has the potential to change the relationship between faculty and students, and between the students and the curriculum, putting control of learning in the hands of the individual student with faculty as facilitators, and personal advisors and mentors.

Future role of doctor: need to match education content and process to what the doctor of the future will be doing (e.g. dealing with uncertainty and complex situations, leadership, critical thinking, management). Future doctor is a *learning* person, rather than a *learned* person.

Admissions: move to go beyond academic achievement and look for breadth (sustained) and depth of other non-academic activities. Diversity still a challenge to achieve (and some competition between schools emerging as wealthy schools offer attractive financial incentives for minority students). Need to increase representation from lower socioeconomic groups.

Future of medical education: The recommendations from the Carnegie Foundation report, due in 2009, are likely to be very influential in shaping the future of medical education in the US.

Appendix 1: List of People Interviewed

Dr Dan Hunt, Secretary and Vice President, Division of Medical Education, Liaison Committee on Medical Education

Dr Barbara Barzansky, Director, Division of Undergraduate Medical Education, American Medical Association

Dr David Irby, Dr Molly Cooke, Dr Bridget O'Brien, Professional Preparation of Physicians Medical Education Study, Carnegie Foundation for the Advancement of Teaching (& University of California, San Francisco)

Dr Carol Aschenbrener, Executive Vice President, Association of American Medical Colleges

Indiana University School of Medicine

Dr Scott Engum, Clerkship Director, Surgery

Dr Aloysius "Butch" Humbert, Clerkship Director, Emergency Medicine

Dr Peter Marcus, Clerkship Director, Ob/Gyn

Dr Robert Vu, Clerkship Director, Medicine

Dr John Turner, Clerkship Director, Family Medicine

Dr Mitch Harris, Clerkship Director, Pediatrics

Dr James Brokaw, Assistant Dean for Medical Student Affairs

Dr Stephen Leapman, Executive Associate Dean for Educational Affairs

Dr Debra Litzelman, Associate Dean for Medical Education and Curricular Affairs

Paula Wales, Assistant Dean for Medical Education and Curricular Affairs

Robert Stump, Director of Admissions

Karen Smartt, Associate Director of Admissions

Dr Julie McGowan, Associate Dean for Information Resources & Educational Technology

Dr Patrick Bankston, Assistant Dean & Director of IUSM – Northwest

Dr Peter Nalin, Associate Dean for Graduate Medical Education

Nancy Baxter, Director for Graduate Medical Education

Cleveland Clinic Lerner College of Medicine

Dr Andrew Fishleder, Chairman Education Institute, Cleveland Clinic

Wilma Doyle, Administrator CCLCM

Dr Alan Hull, Associate Dean, Curricular Affairs

Dr Christine Taylor, Director, Faculty Development

Dr Beth Bierer, Director, Evaluation

Students: one Med 2, two Med 3, one Med 4, one Med 5

Harvard Medical School

Dr Jeffrey Flier, Dean of the Faculty of Medicine

Dr Jules Deinstag, Dean for Medical Education

Dr Thomas Michel, Dean for Education

Dr James Gordon, Director, Gilbert Program in Medical Simulation

Students: approximately 20 Med 2 students

University of California, San Francisco (UCSF)

Dr David Irby, Vice Dean for Education

Dr Helen Loeser, Associate Dean for Curriculum

Kevin Souza, Assistant Dean, Undergraduate Medical Education & Director Office of Educational Technology

Dr Susan Masters, Year 1 & 2 Coordinator

Dr Karen Hauer, Associate Professor of Medicine and Director of Student Assessment

THE ASSOCIATION OF FACULTIES OF MEDICINE OF CANADA

Dr Calvin Chou, Director of VALOR
Dr Anne Poncelet, Director of PISCES
Dr Margo Venor, Director of the San Francisco General Hospital Pilot Clerkships
Dr Mike Harper, Chair of Clinical Studies Steering Committee
Dr Josh Adler, Director of Pathways Program
Dr Dan Lowenstein, Director of Student Research
Dr Bobby Baron, Associate Dean for Graduate Medical Education and Continuing Medical Education
Dr Carrie Chen, Director of the Health Professions Education Pathway
Dr Alma Martinez, Executive Director of PRIME-US and Outreach
Dr Molly Cooke, Director, Haile T. Degas Academy of Medical Educators
Dr Arianne Teherani, Director of Program Evaluation, Office of Medical Education
Dr. Sam Hawgood, Interim Dean
Students: four Med 3 students

Stanford University School of Medicine

Dr Charles Prober, Senior Associate Dean for Medical Student Education
Dr Clarence Braddock, Associate Dean for Medical Education
Dr Gabriel Garcia, Associate Dean for Admissions
Cynthia Irvine, Assistant Dean for Medical Education
Jenn Stringer, Educational Technology Services Director
Brian Tobin, Curriculum Technology Manager
Dr Laurence Baker, Scholarly Concentrations Director
Dr Lars Osterberg, Educators for CARE Director
Dr Elizabeth Stuart, Medical Education Clerkship Director
Dr Donald Regula, HHD Course Director
Students: one Med 3, one Med 4 and one Med 5

University of Minnesota Medical School

Dr Lindsey Henson, Vice Dean for Education
Dr Linda Perkowski, Associate Dean for Curriculum & Evaluation
Dr Gwen Halaas, Director, Academic Health Centre Interprofessional Education Center
Dr Kathleen Watson, Associate Dean for Students and Student Learning
Dr Kathleen Brooks, Associate Dean for Primary Care and RPAP Director
Dr Patti Mulcahy, Associate Dean Academic Administration
Students: four MD/PhD students and three Flex MD students

Appendix 2: Background information: key documents, organizations and websites

Reports

To Err is Human. Building a Safer Health System. Institute of Medicine, 2000.

Crossing the Quality Chasm. A new Health System for the 21st Century. Institute of Medicine, 2001.

Health Professions Education: a Bridge to Quality. Institute of Medicine, 2003.

Training Tomorrow's Doctors. The Medical Education Mission of Academic Health Centers. Commonwealth Fund, 2002.

Reforming Medical Education: Urgent Priority for the Academic Health Center in the New Century. Blue Ridge Academic Health Group, 2003.

Educating Doctors to Provide High Quality Medical Care. A vision for medical education in the United States. Report of the Ad Hoc Committee of Deans. Association of American Medical Colleges, July 2004.

(https://services.aamc.org/Publications/index.cfm?fuseaction=Product.displayForm&prd_id=115&cfid=1&cftoken=6C0E7934-5D39-404F-87C1CB0523D0D3D3).

The Complexities of Physician Supply and Demand : Projections through 2025. Center for Workforce Studies. Association of American Medical Colleges, November 2008.

Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree. (www.lcme.org).

Bunton SA, Sabalis RF, Sabharwal RK, Candler C, Mallon WT. *Medical School Expansion: Challenges and Strategies.* AAMC, 2008

(https://services.aamc.org/Publications/index.cfm?fuseaction=Product.displayForm&prd_id=216&cfid=1&cftoken=6C0E7934-5D39-404F-87C1CB0523D0D3D3).

Initiative to Transform Medical Education. Recommendations for change in the system of medical education. American Medical Association, June 2007

<http://www.ama-assn.org/ama1/pub/upload/mm/377/finalitme.pdf>

Comprehensive Review of USMLE. Summary of the final report and recommendations. Committee to Evaluate the USMLE Program. June 2008

http://www.usmle.org/General_Information/CEUP-Summary-Report-June2008.PDF

Industry Funding of Medical Education Report of an AAMC Task Force. June 2008

https://services.aamc.org/Publications/showfile.cfm?file=version114.pdf&prd_id=232&prv_id=281&pdf_id=114

Organizations

Liaison Committee in Medical Education (LCME) www.lcme.org

American Medical Association (AMA) www.ama-assn.org

Association of American Medical Colleges www.aamc.org

Accreditation Council for Graduate Medical Education (ACGME) www.acgme.org

National Board of Medical Examiners (NBME) www.nbme.org

THE ASSOCIATION OF FACULTIES OF MEDICINE OF CANADA

Federation of State Medical Boards (FSMB) www.fsmb.org
United States Medical Licensing Examination (USMLE) www.usmle.org
American Board of Medical Specialties (ABMS) www.abms.org

Others

Common Program Requirements: General Competencies. Approved by the ACGME Board February 13, 2007 (<http://www.acgme.org/outcome/comp/GeneralCompetenciesStandards21307.pdf>)

Professional Preparation of Physicians Medical Education Study, Carnegie Foundation for the Advancement of Teaching <http://www.carnegiefoundation.org/programs/index.asp?key=1822>

Cooke M, Irby D, Sullivan W, Ludmerer KM. American medical education 100 years after the Flexner report. *New England Journal of Medicine* 2006; 355: 1339-1344.

Learning Communities Institute
<http://www.medicine.uiowa.edu/osac/Comminst/index.html>

MedEdPORTAL™ Providing Online Resources To Advance Learning in Medical Education
www.aamc.org/mededportal