**INTRODUCTION**

In 1978, nine years after McMaster University first admitted medical students, “Selection of Medical Students at McMaster University” was published in the Journal of the Royal College of Physicians of London. Since that time, striking changes have occurred, yielding dramatic influences on recent admission policies and philosophy. There have been three primary sources of change: (1) changes in Canadian society in general have irrevocably altered post-secondary education; (2) the objectives of achieving competence as a Canadian physician have been redefined on a national level; and (3) within McMaster University, old perspectives have been reshaped by changes in philosophy.

On a primary level, the admissions must reflect those influences. The corresponding adjustments to the admissions process may meet the needs of the time, however, in a more protracted view, the needs of a given time are, by definition, ephemeral. What is increasingly required is a dynamic admissions office; this paper will describe those three sets of influencing factors, and the rapidly changing face of McMaster University Undergraduate Medical Program to address the requirement of dynamism.

**INFLUENCE ONE – CANADIAN SOCIETAL CHANGES**

Historical and philosophical differences have led to a contrast between Canadian society and its American counterpart. The old worldview that “cream rises to the top” that produced heterogeneity in American institutional collectives (for example, post-secondary institutions), stands in contrast to the Canadian system which is distinguished by its relative country-wide uniformity. In contradistinction, American institutions such as Yale, Stanford University and Dartmouth College are easily distinguishable from far less august counterparts simply on the basis of reputation, wealth of endowments, and academic production.

Over the last quarter-century, however, Canada’s relative national uniformity has steadily eroded. In 1965, the Honourable William Davis, Minister of Education, introduced a bill to establish a system of College of Applied Arts and Technology for Ontario. In 1967 nineteen Colleges opened their doors in Ontario, and similar institutions began appearing in other provinces. As some of Canada’s 175 community colleges endeavored to enhance their comparative institutional standing, and as universities moved to reflect the broader interests of their student bodies, connections have increasingly developed between the once dis-
parate institutional blocks. More recently, university colleges (institutions devoted solely to distance education), and an amalgam of more loosely defined programs have further blurred the lines demarcating the borders of post-secondary educational institutions. The Association of Universities and Colleges of Canada presently catalogues these 93 public and private not-for-profit universities and university-degree level colleges across Canada, but its mandate does not extend to accreditation. For medical school admissions, the results have been twofold. Firstly, a small minority of courses or even programs described in university undergraduate calendars may not meet a sufficient level of rigor to make their students acceptable for medical school. More insidiously, and ultimately more corrupting, is the diluting effect on the university Grade Point Average (GPA). While still retaining much of its traditional strong reliability and predictive validity, the Grade Point Average risks becoming slowly degraded for critical endpoints such as the national licensing examination, the Licentiate of the Medical Council of Canada (LMCC) parts I and II. This worsening limitation is a more acute concern for those medical schools, like McMaster, that have traditionally eschewed the use of aptitude tests, such as the Medical College Admissions Test (MCAT). Despite its ability to predict LMCC outcome, concerns remain regarding financial cost to the applicant, advantages held by students with science vs. arts degrees, and the specter of correlations with rising socioeconomic status. The preference of medical school admissions offices would be to continue to derive reliable and valid cognitive data on applicants in a resource-cheap fashion, a preference less tenable over time if predicated purely on the GPA.

A second societal pressure impacting significantly on admissions has been the growing population, particularly with respect to an ever-expanding applicant pool. The general applicant pool for McMaster University Undergraduate Medical Program was approximately 2000 students vying for 100 available seats in 1990, 3000 students for 100 seats in 2000, 4150 students for 138 seats in 2004, and is projected at greater than 6000 in 2006, taking into account the “double cohort” effect on Ontario university undergraduate registration (the double cohort being the simultaneous high school graduation from grades 12 and 13 in 2000). The number of applicants, large compared to its Ontario counterparts, was driven by a lower minimal GPA of 3.00 for eligibility to apply, in addition to the lack of specific course prerequisites or the MCAT. Even ignoring fiduciary costs, the number of rater-hours of human resources required, utilizing the previously documented McMaster admissions system would be, respectively, 5000, 6500, 8200 and projected at 11,000. The lion’s share of rater-hours is devoted by review of an Autobiographical Submission provided by each applicant, as independently read by raters representing faculty, student body and the community. Similar triumvirates of raters evaluate the 384 applicants invited for personal interview and simulated tutorial, these processes described in previous McMaster admissions article. The numbers of applicants interviewed was predicated on resource limitations, considering the approximately four hours of rater time per applicant for these processes.

The heightened level of competition attendant with the rise in applicant pool population has been expressed in increasingly negative terms. The temptation for fraud has increased commensurately; this has become most evident on the autobiographical submission, a measure whose control lay largely outside the hands of the admissions office. Further, there has been an increased predilection for prospective applicants to seek representation through legal counsel, steps that are well within their rights but are also reflective of the changing times. Such action has been further accelerated by differing interpretations of laws, like the Ontario Disability Act and the Personal Information Protection and Electronic Documents Act, which are so recent that clarification through case law is still pending.

Finally, the reduction in transfer payments from the Canadian federal government to provincial governments has necessitated seismic changes in the methods of funding of provincial health and education. The resultant increases in tuition payments have forced medical school applicants to be shrewder purchasers. Ever vital endpoints such as likelihood of successful completion of LMCC parts I and II and placement in the residency program of choice assume an even greater relevance when the financial outlay for medical school has increased. In turn, the medical schools must become better recruiters, in hopes of ensuring that the admitted class has a high chance of success for those endpoints, a factor of self-interest well-described elsewhere. The need to "sell" the medical school, the university, and the city of Hamilton has prompted the Undergraduate Medical Program at McMaster University into significant upgrades of its recruitment efforts on interview dates. Examples of such endeavours include provision of greater interactions between present medical students and interviewed applicants, and familiarizing those applicants with the pervasive atmosphere of innovation in the medical program.

INFLUENCE TWO –
THE CHANGING CANADIAN PHYSICIAN

From 1989 to 1998, the Government of Ontario, in conjunction with the Associated Medical Service and the five medical schools in the province, embarked on a project entitled “Educating Future Physicians of Ontario” (EFPO). One of the ensuing products became CanMEDS 2000, in which the Canadian physician would fit seven attributes – medical expert, communicator, collaborator, health care advocate, manager, scholar and professional. By January of 2003, these attributes were to be incorporated into all specialty training programs accredited by the Royal College of Physicians and Surgeons of Canada. As a result of these changes, the CanMEDS roles have now been applied to both the curriculum and the evaluation of all Canadian residency program trainees, with accreditation success of the programs
dependent upon their compliance with CanMEDS goals. All emerging Canadian physicians will be judged according to that paradigm. Similar efforts in the United States by the American Board of Medical Specialties (ABMS) and by the Accreditation Council for Graduate Medical Education (ACGME) have prompted suggestions to use similar personal quality attributes in an integrative fashion for medical school admission. There is a certain appeal to the idea of transplanting assessment of personal qualities commensurate with long-term societal expectations of the physician to that pre-admission assessment of applicants. Nevertheless, a significant detractor of this nascent deliberation is the need to account for the differing curriculum and style of learning unique to each medical school; McMaster’s problem-based learning (PBL) undergraduate program nicely underscores this point.

INFLUENCE THREE - McMaster University's Changes in Philosophy

Decisions are made based on some balance of evidence and faith. That balance was irrevocably altered at McMaster by the introduction of the concept of Evidence-Based Medicine (EBM) in 1992. Increasingly, the milieu of McMaster University has encouraged not only the more reactive assessment of evidence but the more proactive generation of evidence on which to predicate decisions. Where evidence is lacking, faith may yet rule decision-making, however, given the palpable aura of EBM at McMaster, there is a much decreased level of acceptability toward the conditions of “lack of evidence” when a more proactive approach is possible.

The incident that first argued for a more proactive approach occurred in 1989. The subsequent chain of events occurred simultaneously, and seemingly independently, with the rise of EBM at McMaster. A failure rate nearly four times higher than the national average on the LMCC part I occurred simultaneously, and seemingly independently, with the rise of EBM at McMaster. A failure rate nearly four times higher than the national average on the LMCC part I led to the institution of the Personal Progress Index (PPI), a times higher than the national average on the LMCC part I success. Further, there was a subsequent rise in LMCC part I success to exceed the national average in recent years, as students adjusted their learning approach based upon the feedback provided. The obvious improvement in the LMCC endpoint facilitated the movement toward the installation and validation of further reliable evaluation tools for McMaster medical students. These have included the Objective Structured Clinical Examination (OSCE) to assess clinical skills, the Critical Reasoning Exercise (CRE) to assess higher taxonomic cognitive abilities, clinical encounter cards to assess clerks level skills, and most recently, Minimal Observations Often (MOO) to test performance in tutorial. Each has demonstrated reliability, with predictive validity in large part pending.

These changes did not occur in a vacuum; they occurred with the sequential Chairmanship of the Undergraduate Medical Program by Assistant Deans of the time, in partnership with the Program for Educational Development and its later incarnation, the Program for Educational Research and Development. Such alliances are not unique; similar collaborations applying the pursuits of psychology and psychometry to the betterment of medical school education occur elsewhere; rather, the uniqueness of said alliance at McMaster has been the extent and rapidity with which it has brought on transformation of the medical program.

One area of potential transformation lay in the area of program admissions. The same psychometric principles used in evaluating medical school students could be used in evaluating medical school candidates. Indeed, data was slowly accumulating regarding the limitations of the evaluation instruments in place for admissions. A literature review by Salvatore (2001) demonstrated the paucity of evidence in support of any extant measure of personal qualities, conclusions largely seconded by a later, separate review. Using McMaster data, Kulatunga-Moruzi (2002) not only confirmed that only GPA and MCA T were predictive of success on LMCC parts I and II, but also that a McMaster-interviewed cohort deemed less strong than the admitted class was still sufficiently strong to do as well on the LMCC. The general literature on personal interviews provided concerns regarding reliability due to rater bias and content specificity. Save for two studies on tutorial evaluation, no reliable measures had been shown for tutorials conducted in problem-based learning medical schools. Significantly, both of these studies depended heavily on frequent repeat measures. This low level of confidence on the ability of the simulated tutorial to reproducibly distinguish between applicants was further evinced by an internal unpublished McMaster study, which illustrated a test-retest reliability in four separate domains on the simulated tutorial that ranged from 0.09 to 0.18. Inter-rater reliability of the autobiographical submission was reasonable for the full applicant pool at 0.6426, though this dropped to 0.45 for the interviewed pool. The lack of oversight of the autobiographical submission, given its provision by applicants outside of university controls, provided even greater concerns.

Approaching the spring of 2001, the challenges seemed immense. While students’ personal qualities are of vital concern for all medical schools, it represents an even a greater concern for a PBL-based program like McMaster. Yet, literature reviews conducted at McMaster and elsewhere demonstrated the lack of reliable and valid tools for assessment of personal qualities, a conclusion supported by internal McMaster data. Despite being the most popular assessment of personal qualities by medical schools, the personal interview was limited by inter-rater reliability and content specificity. Even on the cognitive side, ground was being lost by diluting effects on the GPA, compounded by the absence of another cognitive measure such as an aptitude test. Further, the increased numbers of applicants had made personal qualities assessment using resource-intensive autobiographical submission, personal
interview and simulated tutorial less sustainable, and concomitantly, increasing competition was raising concerns regarding the legitimacy of non-centrally controlled instruments (ABS). Interestingly, the growing size of the applicant pool not only generated part of the problem, but also contributed to the supernatant which was awaiting the nidus for change.

THE NIDUS FOR CHANGE

In response to individual concerns regarding admissions across the program within the Faculty of Health Sciences, a faculty-wide retreat was arranged to address the issues at hand. In advance of that retreat, collaborative interaction occurred between members of the Admissions Committee, Evaluation Committee and PERD under the auspices of an OSCE research working group. An OSCE-style admissions process was theorized, with separate, sequential measures across a wide variety of domains, through many short interview stations. It would have the potential to address both concerns of inter-rater reliability and content specificity. Resource allocation worries were ameliorated, curiously, by the knowledge that a very large number of rater-hours were already being used for admissions, such that the “Multiple Mini-Interview” (MMI) would in fact be more efficient. From OSCE research working group to retreat, to the formation of an MMI working group, to preliminary study and larger studies, the potential process of MMI crystallized, with impressive study results that provided validation. Reliability results of the three completed MMI studies to date are robust, averaging 0.75,31,32 markedly superior to other measures of personal qualities. Early validity results demonstrated the ability of the MMI to predict for OSCE performance of medical students.33 Increased efficiency would allow a marked increase in the number of applicants who could be interviewed; exit surveys supported the acceptability of the process on the part of both applicants and raters.31b

Meanwhile, a separate phenomenon was noticed, one with a potentially dramatic impact. Of the 3600 applicants to McMaster in 2003, only the top third in overall GPA for the entire pool were admitted, despite the use of cognitive and personal quality scores in equal measure. Two factors contributed to this realization. First, for the 138 seats available, there are bound to be at least that many individuals superb in personal qualities in any randomly chosen group of 1200, no less so in the 1200 students with the highest GPAs. Regardless of how strong the personal qualities of applicant 1201 may be, there are sure to be at least 138 candidates with higher GPA and with equally strong personal qualities. Second, the lower reliability of pre-MMI measures of personal qualities was due to the greater contribution of error in those measurements. That random noise in those measures militated against their ability to hold their own against the more reliable cognitive measures. Apparently, the relatively unreliable personal quality measures, when added to reliable cognitive measures, had succeeded in somewhat diluting, but not counterbalancing, those reliable measures. Thus, despite any beliefs to the contrary, only those thousand or so applicants with the strongest cognitive records stood any real chance of medical school admission in the province. The only way to counterbalance the reliable cognitive measures would be with the implementation of reliable personal quality measures, to as large a proportion of the applicant pool as possible. Enter the Multiple Mini-Interview, and expansion of the interviewed pool to as great a number as this new, more resource-efficient measure could sustain.

CONCLUSION: THE ROLE OF DYNAMISM

As the significant changes in Canadian society, the Canadian physician, and McMaster philosophy illustrate, the admissions office has been forced to maintain responsiveness. This is no mean task. Ponderous administrative endeavours accumulate increasing momentum over time. Adjusting policies and procedures becomes difficult, and only became possible in the scenario described above because of the confluent, severe changes being brought to bear from external sources. Even with internal administrative facilitation, three years were required to move from identification of the challenges faced, through theorized solutions, research study completion, and administrative implementation. The challenges were forced to crisis proportions before radical action occurred. While responsiveness is creditable, a reactive policy will always be faced with a stiffer climb than a proactive policy. A relentless research agenda increases the likelihood that new options are theorized when challenges have not yet grown large, and reduce the lead-time between crisis identification and solution implementation. It may be sufficient to respond to the issues of the days -more laudable still to seize that day.

AUTHOR BIOGRAPHIES

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REFERENCES
MCMASTER UNIVERSITY
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We are a multidisciplinary department consisting of 51 full-time and 145 part-time MD and non-MD faculty working within a unique regional network of psychiatric services that integrates two general hospitals, a 24-hour psychiatric emergency service, a primary care mental health program, a community of psychiatric agencies, and outreach services for children, adults and the elderly. This rich array of resources has allowed us to develop and maintain a vigorous and integrated academic environment that spans multiple clinical teaching sites.

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