



EDUCATION FOR HEALTH

ORIGINAL RESEARCH PAPER

The Northern Ontario School of Medicine: Responding to the Needs of the People and Communities of Northern Ontario

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Published: 19 December 2008

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Education for Health, Volume 20, issue 3, 2008

Available from: <http://www.educationforhealth.net/>

A B S T R A C T

Introduction: Northern Ontario, like many rural and remote regions around the world, has a chronic shortage of health professionals. Recognizing that medical graduates who have grown up in rural areas are more likely to practice in rural settings, the Government of Ontario, Canada established a new medical school with a social accountability mandate to contribute to improving the health of the peoples and communities of Northern Ontario.

Background: The Northern Ontario School of Medicine (NOSM) is a joint initiative of Laurentian University in Sudbury and Lakehead University in Thunder Bay, cities one thousand kilometers apart. The NOSM model of medical education is built on several recent educational developments including rural-based medical education, social accountability of medical education and electronic distance education. This paper describes these developments as background to presenting the Northern Ontario School of Medicine as a socially accountable, geographically distributed rural-based medical school.

NOSM MD Program: The school actively seeks to recruit students for the MD program from Northern Ontario or similar northern, rural, remote, Aboriginal, and Francophone backgrounds. The holistic, cohesive curriculum is grounded in Northern Ontario and relies heavily on broadband electronic communications to support distributed, community engaged learning. Students, both in classroom and clinical settings, explore cases as if they were physicians in Northern Ontario communities. Clinical education takes place in a wide range of community and health service settings so that students can experience the diversity of communities and cultures in Northern Ontario.



Conclusion: Although NOSM is still in the early stages of development, there are encouraging signs that the school's evidence-based model of medical education will be successful in developing a sustainable, community responsive health workforce for Northern Ontario.

Keywords: Medical education, social accountability, distributed learning, community-based education, rural medical education, health workforce

Introduction

Northern Ontario has a chronic shortage of doctors and other health care providers. In Canada, 21.1% of the population live in rural and remote areas served by only 9.4% of the nation's doctors (2.4% of specialists and 16% of family physicians) (Pong & Pitblado, 2005). In the province of Ontario, 14% of family physicians and 2.5% of specialists practise in rural areas, which have 20% of the population (these figures include the urban areas of Northern Ontario) (Tepper *et al.*, 2006)

Northern Ontario, a sub-region of the province, is geographically vast at over 800,000 sq km, about the size of Germany and France combined; nevertheless, it has a relatively small population of only 840,000. Sixty percent of the population lives in rural and remote communities within diverse communities and cultures including Aboriginal, Francophone (French-speaking) and English-speaking peoples. Thirty percent of the Northern Ontario population lives in the two larger urban centres of Thunder Bay (120,000) and Sudbury (150,000), which are over 1,000 kilometers apart. With mining, forestry and tourism as the major local industries, there are peaks and troughs in the economy; unemployment rates are usually higher than in the remainder of Ontario and Canada (Ontario Ministry of Northern Development and Mines, 2004). Further, morbidity and mortality rates are generally higher than the rest of the province and the nation (Bains *et al.*, 2004a; Bains *et al.*, 2004b).

Producing more physicians in the cities and expecting the excess to spill over from urban to rural areas has not solved rural medical workforce shortages (Rosenman & Batman, 1992). There is, in fact, no single solution to the rural medical workforce crisis. Improvement does come through a series of linked initiatives, each having an incremental effect and together they yield substantial change (Barer & Stoddart, 1992). One key series of initiatives that has been shown to be effective is rural-based medical education (Rosenblatt *et al.*, 1992; Rourke *et al.*, 2003; Tesson *et al.*, 2006).

Studies in different countries have shown that the three factors most strongly associated with entering rural practice are: (1) a rural background; (2) positive clinical and educational experiences in rural settings as part of undergraduate medical education; and (3) targeted training for rural practice at the postgraduate level (Brooks *et al.*, 2002; Chan *et al.*, 2005; Dunbabin & Levitt, 2003; Easterbrook *et al.*, 1999; Rourke *et al.*, 2005; Wilkinson *et al.*, 2003). In addition, there is evidence that academic involvement (teaching and research) are factors in the retention and recruitment of rural physicians (Curran & Rourke, 2004; Hartley *et al.*, 1999; Tesson *et al.*, 2006).

The Northern Ontario School of Medicine (NOSM) is the first medical school in Canada designed for the 21st century. The NOSM medical education model is built on several key educational developments of the last decade of the 20th century. These developments include rural-based medical education, social accountability in medical education and electronic distance education. This paper describes these developments as background to presenting the Northern Ontario School of Medicine as a socially accountable, distributed rural-based medical school.



Background

Rural-Based Education

In the U.S., the WWAMI network originated in 1970. Initially involving the states of Washington, Alaska, Montana and Idaho, then later adding Wyoming, this network linked some of the most rural of American states. WWAMI medical students undertake the first year of their four-year medical education in their home states and then complete the second year at the University of Washington in Seattle. Years three and four are undertaken in a range of locations, including prolonged clinical attachments in rural primary care settings. In addition, WWAMI has a network of residency programs with particular emphasis on primary care and rural practice. WWAMI graduates return to practice in rural and underserved areas in significantly higher rates than graduates of most other state medical schools in the U.S. (Ramsey *et al.*, 2001).

Since the 1970s, other medical schools in the U.S. have incorporated “rural tracks”. These usually involve a select group of rural-origin students undertaking some or all of their clinical training in rural locations, and include the Rural Physician Associates Program (RPAP) of the University of Minnesota (Verby, 1988), the Physician Shortage Area Program (PSAP) of Jefferson Medical College in Pennsylvania (Rabinowitz *et al.*, 2001) and the Upper Peninsula Program in Michigan (Brazeau, Potts & Hickner, 1990). In general, these programs report recruitment rates in rural and underserved areas that are four to five times above the national average and they also report favorable retention. In addition to urban-based medical schools providing rural clinical rotations, there is a growing list of medical schools established outside the large cities that focus on recruiting students from surrounding rural and remote areas. The University of Tromsø Medical School in northern Norway, founded in 1968, has been successful in graduating doctors who practise in that area: 82% of Tromsø graduates who grew up in northern Norway continue to practise in that region (Magnus & Tollan, 1993). The Jichi Medical School, established in 1972, has been similarly successful, with the vast majority of its graduates practising in rural and remote parts of Japan (Inoue, Hirayama & Igarashi, 1997) even beyond the nine-year return-of-service period. The Zamboanga Medical School in the Philippines opened in 1994 as a community-based medical school whose graduates are prepared to practise on Mindanao Island and other rural parts of the Philippines (Zamboanga Medical School Foundation, 2006). James Cook University School of Medicine in Townsville, Australia, was established in 1999 with a specific focus on rural, remote, and Aboriginal health (Hays, Stokes & Veitch, 2003).

In the mid-1990s, Flinders University in South Australia pioneered rural community-based medical education, with students completing their core clinical training based in rural family practice settings. Through the Parallel Rural Community Curriculum (PRCC) students undertake the third year of a four-year medical program based in family practice offices and live in a single rural community for the whole year (Worley *et al.*, 2000b). The learning objectives for this third year are the same as for third-year students in the metropolitan teaching hospital. The year covers the major clinical disciplines (internal medicine, surgery, pediatrics, etc.), but rather than studying these disciplines in sequential blocks (“clerkships rotations”), students learn all clinical disciplines in parallel over the whole year. The PRCC was found to provide learning experiences that are equivalent to, if not better than, clinical learning in the metropolitan teaching hospital (Worley *et al.*, 2004b). Specifically, PRCC students consistently outperform their city colleagues in end-of-year examinations (Worley *et al.*, 2004a). PRCC students also have been found to be more confident and competent in a broader range of clinical skills than their metropolitan counterparts (Worley *et al.*, 2004c).

Since the mid-1980s, research evidence has been accumulating about the specific range of knowledge and skills required by rural practitioners. Compared to urban physicians, rural practitioners provide a wider range of services and have greater clinical responsibility related to their relative professional isolation (Hogenbirk *et al.*, 2004). These findings have led to the inclusion of



specific curriculum content on rural health and rural practice within undergraduate medical programs and rural-based family medicine residency programs (Hays & Gupta, 2003; Strasser, 2001; Working Group, 1999).

In addition, evaluation of rural clinical attachments demonstrates that the rural setting provides a high-quality clinical learning environment that can be valuable to all medical students (Worley *et al.*, 2000a). Specifically, rural clinical education provides greater hands-on experience for students exposing them to a wider range of common health problems and developing greater procedural competence. This is consistent with the findings that PRCC students achieve better examination results than their colleagues in the metropolitan teaching hospital setting.

Social Accountability of Medical Education

In 1994 the World Health Organization (WHO) and Wonca (the World Organization of Family Doctors) co-sponsored a conference at the University of Western Ontario in London, Ontario, that focused on developing medical education to meet community needs. The WHO subsequently promoted the social accountability of medical schools as “the obligation to direct their education, research and service activities towards addressing the priority health concerns of the community, region and the nation that they have a mandate to serve” (Boelen, 1995). In 2001 the medical schools of Canada and Health Canada made a joint commitment to social accountability in the publication *Social Accountability: A Vision for Canadian Medical Schools* (Health Canada, 2001). When NOSM was incorporated in 2002, it became the first medical school in Canada established with a social accountability mandate to be responsive to the needs of the people and communities of Northern Ontario.

Electronic Distance Education

Although distance education began in the 18th century, it was the development of the printing press and low cost postal services in the 19th century that saw distance education expand to involve mass-produced learning materials distributed to large numbers of learners at multiple locations. In the 20th century, communication technologies like film, radio and television, and most recently the Internet added to the range, scope, complexity and flexibility of distance education (Jeffries, 2008). For people in rural and remote areas, distance education provides access to educational opportunities that otherwise would be unavailable to them.

Combining electronic communications with distance education has been shown to enhance flexible learning and improve opportunities for distributed medical education. With access to digital library resources and a growing range of educational resources available through the Worldwide Web, medical students are able to pursue core learning while geographically dispersed. Through electronic distance education, there is the potential for medical students to have the same access to curriculum materials, educational resources, specialist teachers and other information they would have if they were in a large city teaching hospital (Ruiz, 2006).

Mission, Structure and Curriculum of the Northern Ontario School of Medicine

The Northern Ontario School of Medicine (NOSM) functions as the Faculty of Medicine of Lakehead University in Thunder Bay and Laurentian University in Sudbury. It is registered as a not-for-profit corporation. In the Letters Patent establishing the corporation, the Objects set out the School’s social accountability mandate as: “providing undergraduate and postgraduate medical education programs that are innovative and responsive to the individual needs of students and to the health care needs of the people



of Northern Ontario". The 35 NOSM Board members are drawn from the universities, schools, and community groups and organizations from across Northern Ontario.

Consistent with its mandate, the NOSM Board approved the following Vision and Mission: "The Northern Ontario School of Medicine is a pioneering faculty of medicine working to the highest international standards. Its overall mission is to educate skilled physicians and undertake health research suited to community needs. In fulfilling this mission NOSM will become a cornerstone of community health care in Northern Ontario." The NOSM Academic Council has identified six key academic principles that determine the development and delivery of all NOSM academic programs, which are: interprofessional, integration, community-oriented, distributed community- engaged learning, generalism, and diversity.

Recognizing the three factors most strongly associated with entering rural practice after training, NOSM views its education and training programs as spanning the life cycle of the physician in Northern Ontario. This begins with programs that encourage Northern Ontario high school students to envision themselves as future doctors and therefore motivate them to work hard to achieve the academic requirements to enter university and medical school in Northern Ontario. The NOSM selection and admissions process favors applicants from Northern Ontario or targeted ethnic and remote backgrounds. Once admitted, students undertake an undergraduate medical program with a strong emphasis on learning medicine within the Northern Ontario community context. Postgraduate programs provide residency training targeted to practising in Northern Ontario and similar rural and remote areas. Once in practice, the school provides continuing education and professional development to support and maintain Northern Ontario physicians.

The selection and admissions process accepts applicants with diverse academic backgrounds in both the sciences and humanities, and favors applicants who meet the academic standards and come from northern, rural, remote, Aboriginal or Francophone backgrounds. The Medical College Admission Test (MCAT) is not required for admission to NOSM; all applicants with a grade point average (GPA) of 3.0 or above on a 4.0 scale are considered. Each applicant's questionnaire is assessed by two independent raters and applicants are given a context score that is highest for applicants from Northern Ontario and other targeted backgrounds. Based on the combination of GPA, application score and context score, the top 400 applicants are invited for interviews. NOSM uses the Multiple Mini Interviews (MMI) consisting of 10 one question interviews developed originally by McMaster University (Eva *et al.*, 2004).

NOSM medical students undertake a holistic curriculum organized around five themes: Northern and Rural Health; Personal and Professional Aspects of Medical Practice; Social and Population Health; Foundations of Medicine; and Clinical Skills in Health Care. Classroom learning is mostly in small group, patient-centred, case-based learning, complemented by whole group sessions and clinical learning from the beginning of year one. Clinical placements occur in a diverse range of communities and clinical settings supported by high quality electronic communications in the virtual learning environment. With such a geographically vast area to cover, the school is heavily reliant on broadband communication information technology such that any space is seen as a teaching/learning space. Students are provided with a leased laptop computer and personal digital assistant (PDA) and, wherever they are, they have the same access to information and educational resources they would have in an urban teaching hospital. During Integrated Community Experiences in first and second year and the Comprehensive Community Clerkship in third year, students continue their case-based small group learning while connected electronically.

Clinical learning takes place in over 70 communities and builds on a long track record of students undertaking clinical rotations in Northern Ontario. With the intent of raising students' interest in a future in rural practice, these attachments employed the



preceptor model whereby the student shadowed a single clinician, usually for a month-long rotation. This approach to medical education formed the basis of successful family medicine residency programs which began in Northern Ontario in the early 1990s (Heng *et al.*, 2007).

Similar to the curriculum of Flinders PRCC, the third year in the NOSM MD program involves a "Comprehensive Community Clerkship" (CCC). All students undertake the whole of third year living and learning in a large rural or small urban community outside Sudbury and Thunder Bay. During the CCC, students are based in family practice where they meet patients and follow them, including into specialist and/or hospital care. Supervised clinical experience is complemented by direct teaching from local and visiting specialists and family physicians as well as distance education.

The NOSM model of distributed community-engaged learning is also rural-based medical education, which relies heavily on electronic distance education and community engagement. Development of the NOSM MD program curriculum began in January 2003 with a three-day curriculum workshop attended by over 300 participants drawn from across the sectors in all parts of Northern Ontario. Specific workshops involving Aboriginal people were held in 2003 and 2006, and symposia involving Francophones in Northern Ontario were held in 2005 and 2007. In addition, community members are involved with NOSM through the selection and admissions process for the MD program, as simulated patients, in hosting students during their Integrated Community Experience attachments, and in fundraising for student financial aid.

Through community engagement, community members are actively involved in hosting students and contributing to their educative experience. Community engagement for NOSM is consistent with the school's social accountability mandate and has a particular focus on collaborative relationships with the area's ethnic and remote communities and organizations, as well as with the larger urban centres of Northern Ontario. For NOSM, community engagement involves the development of interdependent partnerships where the communities, through Local NOSM Groups (LNGs), are as much a part of the School of Medicine as the main campuses in Thunder Bay and Sudbury. These relationships are fostered through the Aboriginal Reference Group, the Francophone Reference Group, Local NOSM Groups, and a vast network of formal affiliation agreements and memoranda of understanding. The Aboriginal Reference Group and the Francophone Reference Group are advisory committees to the Dean, each with members who bring perspectives of different organizations and communities. The LNGs act as the steering committee for all NOSM activities in the large rural or small urban communities that host third-year medical students. LNG members include local clinical faculty members, hospital leaders, local government nominees, members of the physician recruitment committee and representatives of local post-secondary institutions in these communities.

Early Entry Classes of the NOSM

The Northern Ontario School of Medicine, having accepted its first class of students in 2005 and looking forward to its first graduation in 2009, is still in its early stages of development. Consistent with its social accountability mandate, NOSM set itself the target of reflecting the population distribution of Northern Ontario in each medical school class.

The first entering class began their studies in September 2005. Selected from 2,098 applicants, 80% of its 56 students had grown up in Northern Ontario, 11% were Aboriginal and 18% Francophone. Subsequent entry classes have maintained a similar pattern of around 2000 applications each year for 56 places. Around 90% of each class has been from Northern Ontario, with 40 to 50% from rural and remote areas, and continuing substantial inclusion of Aboriginal and Francophone students (see figure 1). The class mean



grade point average (GPA) of matriculants each year has remained approximately 3.7 on a four-point scale, indicating that the academic standard for matriculants is comparable to that of other Canadian medical schools.

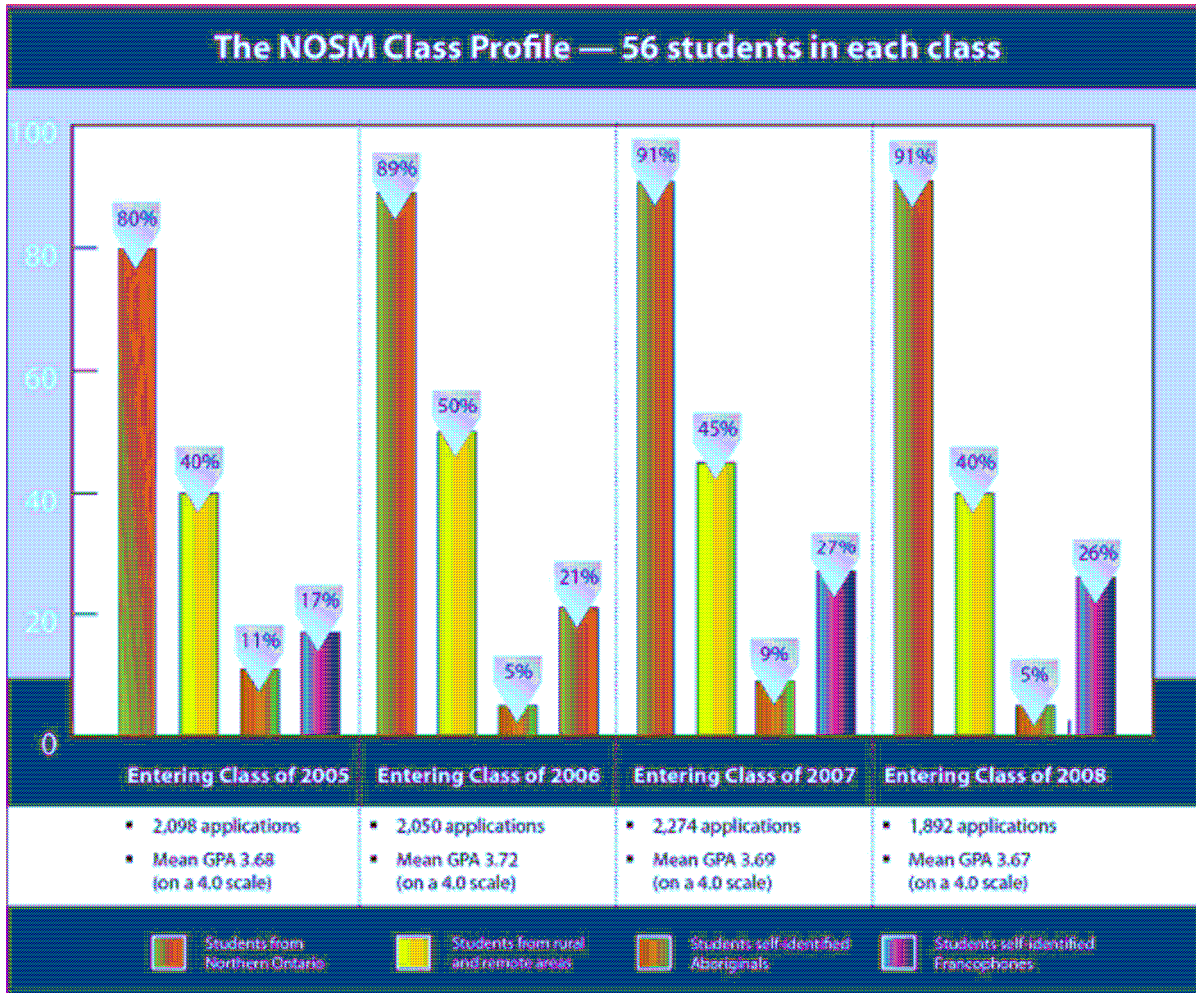


Figure 1: The NOSM Class Profile

Early Success and Future of the NOSM

It will be many years before conclusions can be drawn about the success of NOSM as an innovative model of medical education that relies heavily on electronic distance learning and is designed with a social accountability mandate. Early signs are encouraging in that the school has been successful in: fulfilling all MD program accreditation requirements; recruiting research scientists to be faculty members in the medical and human sciences and over 700 physicians and other health care providers as faculty members in the clinical sciences including physicians who have moved to Northern Ontario to be involved in the school; raising almost \$13 million in less than a year for student financial aid; developing residency programs in family medicine and the major generalist specialties; and introducing an extensive continuing health professional education program.



Some of the lessons learned from the early experience of NOSM include: the value of a curriculum blueprint that specifies educational program goals, values, principles and processes; the usefulness of piloting new curriculum formats; the requirement for flexibility within the broad curriculum framework given that each community is unique, and the loss or gain of one key individual affects local capacity; the importance of personal engagement and re-engagement with clinical teachers and community members in each distributed location; the value of expecting the best and preparing for the worst in relation to communication technology; and the challenge of encouraging large acute regional hospitals and their physicians to embrace the academic mission.

The Northern Ontario School of Medicine is a long-term strategy which is expected to ensure a sustainable community-responsive health workforce in Northern Ontario. NOSM graduates are being trained to be skilled physicians who are ready and able to undertake postgraduate training anywhere but will have a special affinity for, and comfort with, pursuing their medical careers in Northern Ontario or similar settings.

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