

Throughout the history of medical education, there have been major changes in how we as paediatricians are trained and, hopefully, in how we provide care to children. In the early 1900s, Flexner (1) reported on his survey of all the medical schools in the United States and Canada, and recommended that medical schools no longer be independent, but associated with universities with sophisticated laboratories and a curriculum solidly based in science and the humanities. High national standards and examinations were developed through the Medical Council of Canada and the Royal College of Physicians and Surgeons of Canada (RCPSC). In the 1970s, Barrows and Tamblyn (2) proposed a curriculum that was student-centred – based on students independently solving and researching specific clinical problems. In the 1980s, it was recognized that teaching cannot be simply experiential and anecdotal, but must be based on evidence in the medical research literature (3). In the 1990s, a project named ‘Educating Future Physicians of Ontario’ and subsequently the Royal College of Physicians and Surgeons of Canada, Canadian Medical Education

Directives for Specialists (CanMEDS) project surveyed physicians and the lay public to find out society’s expectations of physicians, recognizing that the physician specialist is more than just a medical expert, but also a communicator, collaborator, manager, health advocate, scholar and professional (4,5). In the 21st century, medical schools and medical education programs recognize that we have a responsibility not only to create new knowledge and transfer knowledge to students and medical residents but also a social responsibility. The present paper will report on some of these new developments in undergraduate and postgraduate medical education, and some of the new innovations in medical education, especially linked to the north or rural areas.

Robert Hilliard MD EdD FRCPC
 Guest Editor, Paediatrics & Child Health
 Division of Paediatric Medicine
 The Hospital for Sick Children
 Toronto, Ontario

Paediatric medical education: Challenges and new developments

Susan L Bannister MD MEd FRCPC¹, Harish Amin MB BS MRCP(UK) FRCPC FAAP², Burke Baird MD FRCPC³

Undergraduate medical education

Susan L Bannister MD MEd FRCPC

Canadian medical schools have a social accountability to ensure that the knowledge, skills and attitudes acquired by medical students meet the needs of patients and communities (6). This was a key theme of the symposium: “Child health in the 21st century: The role of the paediatrician in an inter-professional environment” (7). Some of its recommendations are aimed at undergraduate medical education programs to ensure that additional subject areas (Table 1) are covered in the curriculum. While the educational recommendations are not intended to displace other areas of the current curriculum, a deliberate coordinated approach is needed to ensure that this does not occur.

CURRICULUM CONTENT

Paediatric undergraduate educators are committed to a curriculum that enables medical students to be comfortable in interacting with child and youth patients, to be aware of the range of normal child and youth development, and to be able to detect and act on abnormal variations. The Paediatric Undergraduate Program Directors of Canada is committed to creating a comprehensive curriculum that is endorsed by our members, outcome based, flexible, supported by educational resources, grounded in the CanMEDS roles (5), and addresses the symposium topics as well as other essential aspects of child and youth health. Given that the symposium topics are relevant to other medical specialties, interdisciplinary collaborations (eg, with psychiatry) on child and youth mental health and with family medicine on health promotion and well-child care are key. Part of this process will be the identification of areas paediatricians are

¹Chair of the Paediatric Undergraduate Program Directors of Canada, Department of Paediatrics, University of Calgary, Alberta Children’s Hospital; ²Chair of the Royal College of Physicians and Surgeons of Canada’s Paediatric Specialty Committee, Department of Paediatrics, Alberta Children’s Hospital, Calgary, Alberta; ³Northern Ontario School of Medicine, Paediatrics, Laurentian University, Sudbury, Ontario

Correspondence: Dr Robert Hilliard, Division of Paediatric Medicine, The Hospital for Sick Children, 555 University Avenue, Toronto, Ontario M5G 1X8. Telephone 416-813-5793, fax 416-813-5663, e-mail robert.hilliard@sickkids.ca

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TABLE 1
Symposium recommendations – topics for inclusion in core paediatric undergraduate education

Needs of vulnerable populations (including impoverished, immigrant, disabled and maltreated children and youth)

Aboriginal health

Healthy active living

Obesity

Public health

Community paediatrics

Early childhood development

Injury and maltreatment prevention

Social determinants of health (physical, mental, emotional)

Mental health

Emotional/social health

Advocacy

Interdisciplinary care

best suited to teach – such as childhood leukemia and an approach to childhood metabolic diseases.

All Canadian medical schools are accredited by the Liaison Committee on Medical Education and the Committee on the Accreditation of Canadian Medical Schools. A recent accreditation standard (ED-2; “There must be a system with central oversight to assure that the faculty define the types of patients and clinical conditions that students must encounter, the appropriate clinical setting for the educational experiences, and the expected level of student responsibility” [8]) requires all medical schools to identify essential clinical exposures for each rotation, and to provide an alternate experience (such as an online case) for students who do not encounter a required patient. As a result, all Canadian paediatric clerkships are tracking students’ patient encounters (either online or with paper log books) so that those failing to see required patient scenarios can be identified for alternate learning experiences. Most schools currently use the Computer-assisted Learning In Paediatrics Program cases (9). These are online interactive cases developed by the Council on Medical Student Education in Pediatrics and for which each school pays a fee (US\$50 per student). Undergraduate medical education program directors can monitor what cases the students access and when and for how long. The Paediatric Undergraduate Program Directors of Canada is also working to develop educational resources with our own online cases, such as those developed at the University of Alberta (Edmonton, Alberta), that are freely accessible and supplement students’ clinical experiences (10).

CURRICULUM AND FACULTY DEVELOPMENT

The reorganization of many undergraduate medical education curricula into a ‘systems-based’ structure has posed a particular challenge for paediatric educators. In ‘traditional’ curricula, paediatrics existed as a separate course; in systems-based curricula, content is arranged according to the various body systems. A ‘cardiovascular’ course, for instance, would include relevant paediatric

cardiovascular topics. In essence, this approach sprinkles paediatric topics throughout the curriculum. While appealing in that the exposure to child and youth health topics have the potential to be regularly reinforced, it is a true challenge to coordinate paediatric teaching and to ensure that critical topics in paediatrics are, indeed, taught and examined.

Every Canadian medical school is undergoing an expansion in class size, and the Northern Ontario School of Medicine (Sudbury, Thunder Bay, Ontario) has been created. Expansion results in major challenges for paediatric undergraduate educators, such as finding appropriate clinical experiences, and recruiting and training more teachers for small group case and clinical skills teaching. More capacity needs to be developed for clinical clerkship and elective teaching placements, particularly in enhancing exposure to children and youth outside of hospital wards. Teachers need to be trained to deliver lectures via videoconferencing, and networks of educators need to be developed to effectively create a paediatric presence in the distributed campuses and academies that have been developed.

CURRICULUM DELIVERY

A further challenge of increasing class sizes is ensuring students get substantial interactions with real patients. Alternatives used in many centres are standardized parents and standardized patients from whom students learn to take histories, and dolls or mannequins on which they learn neonatal physical examination skills. No longer do students at a given medical school experience the exact same clerkship experience. One student, for instance, may spend most of his or her clerkship at a regional site working in a paediatrician’s office, assisting with neonatal resuscitation, assessing children in the emergency department and caring for children admitted to a general hospital. His or her classmate may spend, in contrast, time on a clinical teaching unit at a tertiary care hospital, in a dedicated children’s emergency department, and in paediatric subspecialty clinics.

Some students at the Universities of British Columbia, Alberta and Calgary complete an ‘integrated clerkship’. At the Northern Ontario School of Medicine, all student clerkships are structured this way. Most of their time is spent with a family physician group (typically rural) over a prolonged period of time (many months), and during this time, the students branch out from this base to specialty experiences. Some clerkships include a dedicated paediatrics rotation in addition to the integrated period. The challenge posed by this model is primarily logistical in arranging key learning experiences to ensure that these students have child and youth education experiences equivalent to students in traditional rotation-based clerkships.

STUDENT ASSESSMENT

As part of the evaluation of medical students, most centres use a competency-based in-training evaluation report usually in CanMEDS format and an evaluation of

professionalism. Recently, many schools have adopted online mechanisms for completing these evaluation forms, leading to concerns that this will decrease face-to-face feedback. Some schools use a '360 degree' type of in-training evaluation report in which residents, nurses, student colleagues, allied health professionals and patients may all contribute to student assessment, particularly in areas of communication, collaboration and professionalism. Summative (ie, final) assessments also include written and objective structured clinical examinations, or structured oral examinations. Some centres use the National Board of Medical Examiners paediatrics examination at a cost of US\$36 per student per examination.

CONCLUSION

The convergence of the symposium recommendations, the Liaison Committee on Medical Education ED-2 criteria, reorganization of medical school curricula, expanding class sizes, the collaborations of paediatrics with other medical specialties, and the increasing expenses of medical education provides undergraduate paediatric education leaders with a powerful set of challenges to manage all at once. The time has come for paediatrics to renew its focus in undergraduate medical education, in a deliberate evidence-based collaborative approach within a Canadian context (11).

Postgraduate medical education and training in paediatrics

Harish Amin MB BS MRCP(UK) FRCPC FAAP

Paediatricians in Canada play a wide range of roles. These include generalists, subspecialists, community-based paediatricians, hospital-based general paediatricians and academic paediatricians and researchers. Children and youth make up approximately 25% of Canada's population. Because children and youth do not vote, they have little influence over government and public health care priorities. At the 'Child Health in the 21st Century' workshop and symposium in November 2006 (7), it was repeatedly stressed that there will be a necessity for paediatricians to meet the needs of not only their individual patients, but also society at large. Paediatric and family medicine resident education requires more focus on mental health, child development and vulnerable populations (eg, children with life-altering conditions, children living in rural and remote areas and Aboriginal children). Education needs to include interdisciplinary models of care, public health, cultural diversity, social determinants of health, advocacy and prevention. An increased number and appropriate distribution of paediatricians and other health care providers who focus on child health are needed. Solutions to these pressing needs have to include improving postgraduate medical education (PGME), improving access to child and youth health services, developing new interdisciplinary shared care models, enhancing the skills of other providers, working with communities

to support their programs and ideas, providing alternate funding models, and working with national organizations, governments and other institutions (7).

POSTGRADUATE PAEDIATRIC MEDICAL EDUCATION

Families want all physicians who care for their children to have excellent diagnostic skills, be familiar with current research and protocols, be aware of their limitations, and be ready and able to refer their child to someone more appropriate, when necessary. They also want physicians who can provide perspective, guidance and advice; can engage them and their children; can partner with children and families in leading and developing care plans; can prepare them and their children for the future; and can share information openly. Families also want physicians who have an idea of their lives and their children's lives (7). All these qualities are embodied in the seven CanMEDS roles: medical expert knowledge-based competencies and procedural skills competencies, communicator, collaborator, manager, health advocate, scholar and professional (12). PGME plays a vital role in the preparation of the health care workforce. PGME policy decisions that impact this essential health care endeavour must be informed by the best available data, and numerous inter-related issues and stakeholders must be taken into consideration (13).

The RCPSC is the standard setting body for PGME and the accreditation of training programs. The specialty committees established by the RCPSC advise the college in matters related to the specialty and are involved in setting standards and accreditation of training programs – a process that seeks to ensure that standards for residency education are being maintained in all programs, and that all necessary resources are available and utilized efficiently and effectively to enable residents to meet the training requirements of the specialty (14). The specialty committees advise the credentials committee on matters relating to the training standards necessary to adequately train a paediatrician. This is accomplished through the development of the following documents: objectives of training (OTR) in paediatrics (15) and specialty training requirements (STR) in paediatrics (16). As part of an ongoing review of the formal paediatric curriculum and education objectives with the incorporation of new content, the OTR and the STR in paediatrics were revised in 2008 (15,16). The new OTR in paediatrics incorporates several of the educational issues identified at the 'Child Health in the 21st Century' workshop and symposium in November 2006 (an example of new content is the section on child maltreatment and neglect) (7,15,16). The intent of the revised OTR and the STR was to assist individual residency training programs in organizing their curriculum so that it optimally met the needs of residents and paediatricians, as well as the health care needs of children and youth. Training programs must ensure that training occurs in both inpatient and ambulatory services, including community-based child health services. The RCPSC CanMEDS roles are not only

used to guide and direct training, but are also used to evaluate performance both by individual programs and by the RCPSC examination board for paediatrics. Paediatric residency training programs are responding by revising their sequence of training, adapting to additions and changes in the OTR/STR, and by ensuring that residents are trained in appropriate learning environments. Training experiences include core general paediatrics, child development, the various paediatric subspecialties, comprehensive care of children with chronic conditions and complex needs, physical and psychosocial challenges and mental health. Residents also work in collaboration with others in interdisciplinary teams. Advocacy efforts are being advanced through residency training program initiatives. In all Canadian paediatric residency training programs, community and rural exposure is being increasingly emphasized as well as cultural sensitivity, development of self-directed, life-long learning skills and an ability to critically appraise one's practice as well as the practice of paediatrics (12,14). At completion of training and certification in paediatrics, the resident will be prepared for independent practice and will be capable of assuming the role of a consultant paediatrician embodying all CanMEDS roles.

CHALLENGES AND EVOLVING TRENDS

There is an increasing demand for residents to achieve higher levels of education (eg, MSc, PhD), especially when pursuing academic careers. There is an increased availability of paediatric subspecialty choices, with an increasing number of residents choosing to be academic based (17). A recent survey (18) showed a significant decrease in the number of residents planning to work in small communities. This study also found that planned weekly work hours of female paediatric residents were significantly less than those of male paediatric residents. Another major finding was that residents planned to spend a significantly lower proportion of their time in clinical activities. These findings, combined with an increasing proportion of women entering the paediatric workforce, may signify a trend toward additional decreases in the effective clinical workforce (18). These significant implications for future workforce planning will need monitoring, especially because the current PGME system in Canada produces too few paediatricians (general and subspecialty) (17). With country-wide increases in PGME training positions for paediatrics, the hope is for a more balanced mix of generalists and subspecialists graduating from our programs. It must, however, be noted that general and subspecialty paediatric practices should be considered to be a spectrum and not as two opposing dichotomies, with each uniquely contributing to the integrated delivery of paediatric health care. For optimal health care to be provided, a critical balance between generalism and specialization is needed. Neither can exist in isolation (19).

During residency training, the need to include more curriculum content and conduct more thorough evaluations to meet RCPSC requirements, together with changes in work hours and lifestyle choices, have led to an ongoing debate

on the core curriculum – should this be covered in four or more years versus three years?

There remains a pressing need to find innovative ways of tapping the teaching potential of community paediatricians and ensuring appropriate remuneration for educational endeavours.

How and where skills of international medical graduates can be upgraded and assessed to enable them to be integrated in the Canadian workforce requires a coordinated, resourced and collaborative approach.

Because there are not enough paediatricians to meet all child and youth needs in Canada, especially for meeting the needs of vulnerable populations, we (paediatricians) must work in collaboration with primary care and community care providers, nurse practitioners and others to help build capacity and networks to better serve our children and youth.

Trying to build a better paediatrician

Burke Baird MD FRCPC

Within 15 s of beginning the first consultation of my general paediatric practice, I realized that there were some enormous gaps in my residency training.

I was sitting across from a 10-year-old girl and her foster mom. The referral request contained only the cryptic rhetorical statement, "Query difficulty at school". It became immediately and abundantly clear, however, that difficulties at school were the least of this child's problems. She had an explosive behavioural disorder; she was smearing feces all over the walls of her bedroom when angry; she was attacking her foster siblings with various and sundry utensils on a daily basis; and she would occasionally urinate into the air ducts of her foster home. She also had asthma.

I had just completed my training in a fully accredited and excellent residency program. I could intubate, insert femoral catheters and describe Ebstein's anomaly, and I knew the underlying metabolic defect of metachromatic leukodystrophy. I even knew what a Mondini defect is. I had, however, absolutely no idea how to approach the problems that this child had presented me.

The main reason of course is that, with the exception of one month spent in a small, urban community, my entire residency was spent managing patients referred for services at a tertiary children's hospital. The overwhelming majority of patients that I saw had been assessed by other paediatricians or emergency physicians. Rarely did I encounter a child who had not already been assessed by another paediatric practitioner. Furthermore, I had no opportunity to assess children with problems that did not require tertiary paediatric assessment and care. I learned how to do developmental assessments only in the context of a child development centre, where we saw one to two patients per day and where psychologists, social workers and audiologists were available on site, without delay. As such, I began practice with a very

narrow view of paediatric service delivery, a view that was not the reality in most parts of the province.

Fortunately, while my training was ongoing, forces were beginning to stir both in the public and in the profession with respect to the training of physicians.

In the late 1980s, the Educating Future Physicians for Ontario (20) project consulted broadly with the public and profession, identifying eight important roles of a physician. The RCPSC adapted the results of this initiative into the CanMEDS framework (12), which forms the structural basis for specialty training in Canada. One of the important outcomes of this process was the determination that paediatric specialty training was over-focused in tertiary academic centres and failed to provide a complete and realistic view of paediatric medicine in Canada. It also pointed out that the nature of clinical encounters in such centres may not provide trainees with sufficient clinical problem-solving skills. Throughout the late 1990s, in response to these developments, extra funding was made available to postgraduate education programs to fund training opportunities outside of what was offered at traditional tertiary academic health science centres. In northern Ontario, these training opportunities were provided through the Northern Ontario Medical Program based in Thunder Bay and the Northeastern Ontario Medical Education Corporation, which had its administrative base in Sudbury. Paediatric residents spending elective months in the northern Ontario urban hubs consistently rated their experiences as highly educational, and wonderful opportunities to learn skills that were not easily gained in tertiary children's hospitals. Having the opportunity to assess a complex disorder, see children with a variety of problems that do not typically require tertiary care services, as well as work in an environment with a 1:1 learner to preceptor ratio were found to be extremely valuable.

In response to these successes, the two northern educational corporations were given the opportunity to develop expanded training opportunities in conjunction with southern partners.

In July 2002, the first resident was admitted into the McMaster (Hamilton, Ontario)/Thunder Bay paediatric residency training stream. The first of its kind in Canada, this program included extensive rotations in northwestern Ontario. The learners spent up to one-third of their time working with general paediatricians in their consulting paediatric practices, providing care in the neonatal intensive care unit and wards of the Thunder Bay Hospital. Residents also spent two months in Sioux Lookout and had multiple learning opportunities in various clinical settings in Thunder Bay. The remainder of their training time was spent in Hamilton doing subspecialty rotations, ward rotations, and neonatal and paediatric intensive care training. The following year, the Northeastern Stream Paediatric Residency Program accepted its first residents in conjunction with the Children's Hospital of Eastern Ontario in Ottawa (Ontario), with approximately one-third of their training occurring in Sault Sainte Marie, Sudbury and North Bay.

Both programs grew and thrived over the subsequent years. The number of applicants and residency spots increased each year. Residents consistently identified their northern rotations as extremely valuable and unique, learning opportunities that provided them with skills, knowledge and an awareness of the full scope of paediatric medicine, which were difficult for their colleagues in the 'mainstream' programs to develop. They have come to appreciate the value of longitudinal learning of each area of paediatrics. In addition to completing focused, one-month subspecialty rotations in tertiary centres at one point in their training, residents in these programs perform assessments in all of these areas as both junior and senior learners while on their northern rotations. The residents point out the enormous difference in working on the acute care services in the northern centres compared with the tertiary hospitals. When in the North, the residents are performing true consultations at the request of nonpaediatric providers. On the other hand, most encounters with new patients on the wards in the tertiary hospitals occur following assessment by another paediatric colleague and so they are doing admissions rather than consultations. Perhaps most beneficial of all is the preceptor model of training in the northern rotations. In this model, a resident and consultant work side-by-side, which is enormously valuable for both learner and teacher. The mentorship, teaching opportunities and supportive, collegial environment are difficult to replicate outside of this setting. The residents develop the skills critical to becoming effective, lifelong learners; identifying their own learning needs following clinical encounters; accessing appropriate resources; and subsequently, discussing them with their preceptors. While in the outpatient offices of the northern centres, the residents perform consultations and follow-ups with children experiencing a very wide variety of medical, developmental and behavioural challenges. They develop a practical approach to problems spanning all of the paediatric subspecialties. As one of our charter residents once said, "Everyday in clinic here is like a practice OSCE [objective structured clinical examination]". The Northern Ontario School of Medicine (NOSM) opened in the summer of 2005, and with it came the need to develop postgraduate training programs. An opportunity therefore presented itself to bring the two northern stream paediatric programs together under the NOSM banner.

In anticipation of this development, a series of meetings and consultations with current and past residents, preceptors, NOSM administration and our southern tertiary partners led to the outline of a proposal that could be submitted to the RCPSC for consideration of new program status accreditation. This arduous process took several months in the winter of 2007/2008 and the submission was made in April 2008.

When developing the program outline, it was of utmost importance to strike the optimal balance between the many and varied learning opportunities in the northern centres, while ensuring that the residents would have sufficient access to all of the required subspecialty and acute care

opportunities in the southern tertiary centre with which the program would be affiliated, the University of Ottawa, Ottawa. It was also believed that the program should have its own program of academic sessions, including an academic half-day. The best aspects of the northwestern and northeastern programs were blended so that a cohesive, pan-northern program could be created.

One of the main difficulties encountered while developing the NOSM paediatric residency program was in giving all of the accreditation stakeholders a clear understanding of what types of clinical encounters the residents would experience while in the north and why they were equivalent, if not superior, to the manner in which such patients would otherwise be encountered in the subspecialty clinic context. For example, anyone who has worked as a general paediatric consultant will know that children with developmental and mental health-related challenges are encountered every day. The prevailing bias that subspecialists are the best suited to teach residents their subspecialty resulted in a requirement to explain and re-explain to the accreditors the fact that not only are such patients managed frequently in northern practices, but that this occurs with a high degree of sophistication using evidence-based interventions. It was also pointed out that consultations occurred in a challenging 'front-line' setting where patients with undifferentiated symptoms and problems were being assessed by a specialist for the first time.

In September 2008, the program received accreditation with new program status, and we were free to enter its four residency positions into the Canadian Resident Matching Service for 2009.

We are fortunate that the two preceding northern training streams allowed us to work out most of the difficulties inherent in providing distributed education across such a vast geographic space. With this new program, we have strived to minimize resident travel requirements, taking full advantage of technological opportunities to bridge the physical distances. The northern preceptors have welcomed the challenge of incorporating both undergraduate learners and residents into their busy consulting practices, and we are all the richer for this.

Although there is currently no evidence to support the idea that the type of training offered in the NOSM's program is superior to traditional training, feedback from residents in the northwest/McMaster and northeast/Ottawa programs and from subspecialist colleagues in our affiliated tertiary hospitals indicate that residents in these programs demonstrate notable strengths in problem solving, are more confident in novel circumstances, and particularly practical in clinical decision making. One of the northern residents once shared with me an anecdote wherein a neonatologist, after a busy weekend of working together, told the resident that she could tell that she was one of the northern trainees because of her calm, practical demeanour, which she had noted in other northern trainees. Other residents have told me that they have been given similar feedback. More than one northern resident

has told me that the only weakness of the program is that you are required to leave the north so often to spend time in the tertiary children's hospital.

Graduates of these two programs have gone on to multiple career paths. Several have gone into subspecialty fellowships and several are now established in practice in northern Ontario. Informal, post-training feedback from these clinicians have indicated that they felt very confident in the training that they received and that they felt significantly more prepared to enter practice than a large proportion of their colleagues in the 'mainstream' arm of their programs.

We are moving forward into a new era of paediatric residency training in northern Ontario, armed with the conviction that the program that we are offering will provide a more complete and well-rounded training experience than what has traditionally been offered. Graduates of our current northern stream programs and future graduates of our NOSM program will all know how to describe Ebstein's anomaly, will know the genetic defect of metachromatic leukodystrophy, and will be able to intubate and insert femoral lines. They may even know what a Mondini defect is. They will, however, also have a practical approach to assessing and managing that 10-year-old foster child with behavioural and emotional disorders that befuddled me that day. They will have the ability to approach an undifferentiated collection of complaints and symptoms in any age of child. They will hopefully be on the road to becoming superb paediatricians.

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