An advanced second year fellowship in pediatric pain medicine: development, implementation, and challenges

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Abstract

Background

There is a growing need for advanced fellowship training in pediatric pain medicine and other subspecialties of pediatric anesthesia. Increasing clinical and educational demands have necessitated the development of a novel pediatric anesthesia pain fellowship at our institution.

Principal findings

Following an iterative process with a workgroup, we have developed and implemented a novel one-year advanced fellowship program in pediatric pain medicine. We describe our experience developing and challenges faced implementing the program. The fellowship has clinical, education, research and administration components. Elective periods are offered for additional specialized training. To date four fellows have been recruited to the fellowship program.

Conclusion

We present an overview of a novel pediatric medicine pain fellowship. Initial feedback and reviews suggest the fellowship is meeting the needs of fellows and patients in various pediatric settings. It is hoped that continued work to improve the fellowship will enhance patient care by educating physicians in effective methods of pain management in an increasingly complex subspecialty. By enhancing clinical care, education, research and leadership in pain the ultimate aim of the fellowship program is to alleviate pain and improve outcomes in children.
Introduction

Pediatric anesthesiology has seen significant growth and development as a subspecialty in the past decade. Reasons for this growth include an increase in the complexity and scope of clinical practice; advances in surgical and medical care; the formation of new anesthesia clinical care models including multidisciplinary teams for the management of acute and chronic pain; increasing use of regional anesthesia and ultrasound-guided techniques; and increasing focus on quality and safety.¹ Commensurate with this growth comes the need for additional advanced subspecialty training.

A particular area of growth is the management of acute and chronic pain in children. Through its various pain management programs, the Department of Anesthesia and Pain Medicine at The Hospital for Sick Children, Toronto, provides leadership in managing children’s pain. These programs include the Acute Pain Service, the Chronic Pain Program, and the Sedation & Satellite Anesthesia Program. In the period 2006 to 2014, the Acute Pain Service managed approximately 900 patients/year, the Chronic Pain Program had approximately 1000 patient-visits/year, and the Sedation & Satellite Anesthesia Program delivered care to approximately 10,000 patients/year. The patient mix and volume managed through these programs offered an opportunity to create a specialized pediatric pain fellowship (Figures 1-3).

Figure 1. Pediatric specialties utilizing the Acute Pain Service
Figure 2. Pain management interventions used by the Acute Pain Service

Figure 3. Patient volumes for satellite anesthesia
We describe a novel advanced second year fellowship in pediatric pain medicine, the challenges faced in implementation, and future directions.

**Fellowship Goals and Curriculum**

The primary objective of the pediatric pain fellowship is to provide a clinical and academic training program that will prepare fellows to function as highly competent specialists and leaders in pediatric pain. The curriculum is designed to develop clinical knowledge, skills and judgment in pediatric pain management, and to provide opportunities for teaching, research, and administration.\(^2\) The curriculum provides a framework to inform a future subspecialty in pediatric pain management based on the general objectives for training recommended by the Royal College of Physicians and Surgeons of Canada. These objectives target competencies in seven CANMEDs roles: medical expert/clinical decision-maker, communicator, collaborator, manager, health advocate, scholar, and professional roles.\(^3\)

**Application Process**

**Eligibility**

The one-year advanced fellowship position is offered to candidates who have the potential to become future clinical and academic leaders in pediatric pain management. Eligible applicants must have completed residency training in anesthesiology and a one-year core clinical pediatric anesthesia fellowship, with preference given to those who have demonstrated interest in pain research and/or education. Since its introduction in 2011, four fellows have been enrolled into the fellowship program.

**Interviews**

Interested individuals are sent an information folio and respond by sending a curriculum vitae, letter of interest, and other supporting documents including letters of reference. Following an initial review of applicants’ documents, a Skype™ or face-to-face interview is arranged. Applicants are rated using a 5-point Likert scale on the following categories: 1) education, 2) training, 3) relevant work experience, 4) interest demonstrated, 5) communication skills, 6) interpersonal skills, 7) teamwork, 8) flexibility, 9) maturity, and 10) overall ability.

The interview process is designed to: 1) determine the applicant's fellowship interests, 2) evaluate their personal characteristics, 3) evaluate their experience in pediatric anesthesia, and 4) discuss with the applicant the challenges they anticipate in clinical and academic work in pediatric pain medicine. Present at the interview are staff anesthesiologists involved in acute and chronic pain management, the pediatric anesthesia fellowship director, and support staff. After rating each applicant in the ten categories, interviewers are asked to indicate whether they would recommend enrolling the applicant (Yes, No, or Uncertain) and a final decision reached by consensus. A single applicant is offered the position.

**Program Structure**

The structure of the Pediatric Pain Fellowship is based on a multidisciplinary experience that encompasses key
aspects of managing pediatric pain (Figure 4).

Figure 4. CANMEDS roles

Fellows are expected to become active members of all multidisciplinary teams through which they rotate and to relate to other members of the teams in a professional manner. The fellowship positions are for one year with an opportunity to renew for a second year focused on clinical or basic research in pain. The fellowship curriculum is focused on four key areas: clinical care, research, education and administration. The objectives and goals for each area are summarized in Table 1.

Table 1 Areas of competencies for pediatric pain fellowship.

| Area | Competency |
|------|------------|
| 1    | Clinical   |
| 1.1  | Competency in pain history and physical exam |
1.2. Competency in using age appropriate pain assessment tools
1.3. Competency in identifying surgical procedures that require post-op acute pain service involvement
1.4. Competency in diagnosing and managing acute and chronic pain conditions
1.5. Competency in prescribing and programming PCA
1.6. Competency in prescribing and performing regional blocks, single-shot administration and continuous infusions of local anesthetics
1.6.1. Neuraxial blockade: caudal, lumbar and thoracic epidurals
1.6.2. Peripheral and Regional Nerve Blocks
1.6.2.1. Popliteal nerve block
1.6.2.2. Saphenous nerve block
1.6.2.3. Transversus abdominis plane block
1.6.2.4. Infraclavicular brachial plexus block
1.6.2.5. Axillary brachial plexus block
1.6.2.6. Ilioinguinal, iliohypogastric nerve block
1.7. Competency in opioid prescription, conversion, and transition
1.8. Competency in managing opioid-induced adverse effects
1.8.1. Opioid-induced pruritus
1.8.2. Opioid-induced bowel dysfunction
1.8.3. Opioid tolerance, and hyperalgesia
1.8.4. Opioid withdrawal and wean
1.9. Competency in prescribing adjuvant medications
1.9.1. Ketamine infusion
1.9.2. Anticonvulsants for pain
1.9.3. Antidepressants for pain
1.9.4. Sedatives, hypnotics, and antispasmodic
1.9.5. Alpha-2 adrenergic agonists
1.9.6. Others
1.10. Competency in managing pain in medical conditions
1.10.1. Mucositis
1.10.2. Graft vs. host disease
1.10.3. Sickle cell
1.10.4. Juvenile rheumatoid arthritis
1.10.5. Headaches
1.10.6. Recurrent abdominal pain
1.10.7. Complex regional pain syndrome
1.10.8. Others
1.11. Competence in managing sedation and procedural pain
1.12. Competence in attending and supporting end-of-life situations
1.13. Competence in diagnosis and managing toxicity associated with local anesthetics, opioids and other pain medications
1.14. Others
2 Research
2.1. Attends and participates in ongoing research seminars that form part of the pediatric anesthesia fellowship program
2.2. Conducts audits of pain related issues
2.3. Presents one or more abstracts at U of T Shields Research Day
2.4. Presents one or more abstracts at a national/international meeting
2.5. Publishes a literature review or original manuscript on pain-related topic
3 Education & Teaching
3.1. Studies and teaches topics related to pain as listed in recommended pain textbooks
3.2. Participates in lectures for health care professionals, including nurses, APNs, residents, fellows and staff
3.3. Presents at the Department of Anesthesia and Pain Medicine Friday Grand Rounds
3.4. Others
4 Administrative
4.1. Manages clinical rounds independently

4.2. Ability to create a pain service in other organizations

4.3. Ability to update and create pain-related policies and guidelines

4.4. Ability to manage patient data by using and/or constructing pain databases

4.5. Others

**Acute Pain**

Clinical work is vital in providing contextual learning through rotations in key areas related to pediatric pain medicine (Table 1). A comprehensive approach to pain management is used to minimize the discomfort associated with the specialized surgical and medical care delivered at SickKids. The Acute Pain Service manages all patients requiring patient controlled analgesia, neuraxial blocks, and regional anesthesia for surgical or medical indications. The Acute Pain Service consists of pain staff anesthesiologists, the second year advanced fellow in pain, a first year pediatric anesthesia fellow and pain nurse practitioners. Fellows rotate through the Acute Pain Service attending inpatients from Monday to Friday to maintain continuity of care. The pain fellow is expected to interact with other complementary services including physiotherapy, social work, surgical teams, and the patient’s family. The pain fellow is responsible for pain-related calls during weekdays from 8 AM to 5 PM and on weekends during their Acute Pain Service rotation (Table 2)
Chronic Pain

Patients with chronic pain are seen in multiple settings throughout the hospital including the chronic pain clinic, in-patient wards, and the emergency department. The chronic pain clinic is an outpatient clinic managing referrals from physicians throughout the province of Ontario. Out-patients presenting to the clinic are interviewed and assessed by a multidisciplinary team comprising the pain fellow, pain staff anesthesiologists, nurse practitioners, a physiotherapist, psychiatrist, and psychologist. Chronic Pain Service physicians also provide consultation for in-patients diagnosed with chronic pain. Prior to the establishment of the pain fellowship, our Acute Pain Service often provided initial consultation for in-patients and emergency room patients presenting with chronic pain; however, the
assessment and management of chronic pain and related psychosocial issues is outside the mandate of the Acute Pain Service. A key role for the pain fellow is to provide initial consultation and follow-up management in discussion with the attending pain anesthesiologist. This has streamlined the management of these complex patients.

In addition, the pain fellow attends the Transitional Pain Clinic, a relatively new clinic that specifically targets patients at high risk of transitioning from acute to chronic pain (based for example on type/duration of surgery, degree of tissue injury, and pre-existing pain). Early intervention including an aggressive multimodal analgesic approach is often used after surgery to decrease the risk of transitioning to chronic pain, and these patients are often discharged home on opioid analgesics, necessitating early follow-up by the clinic. This clinic has decreased wait-time for these patients to be seen after discharge from hospital. It has enhanced both patient care and the quality of the training experience available to our fellows.

**Sedation and Satellite Anesthesia Services**

These services provide sedation or general anesthesia for patients undergoing painful procedures in satellite areas outside the operating room. Procedures requiring general anesthesia include upper and lower gastrointestinal endoscopy, joint injections, lumbar puncture and intrathecal drug injection, bone marrow aspirate and biopsy, and dressing changes for major burns. Anesthetic care for such procedures is a vital aspect of providing comfort and pain relief to the pediatric population. The pain fellow is assigned to work with a staff anesthesiologist to provide anesthetic care to children in these locations.

**Research**

A key component of the fellowship is an individually tailored, flexible and closely mentored research experience. Opportunities are available for quality improvement studies and basic, translational, clinical, and education-based research. Prior to admission into the fellowship, the fellow receives a list of ongoing or proposed research topics related to pain. Fellows can participate in one or more of these projects and may propose a project of their own for review and implementation during their fellowship. The fellow participates by assisting with the literature review, submission to the Research Ethics Board, patient recruitment, data collection, data analysis, abstract and manuscript preparation, and is expected to present the research at a local, regional and/or international scientific meeting. The fellow attends weekly seminars on research methodology that are open to all fellows in the Department of Anesthesia and Pain Medicine.

**Education and Teaching**

The fellow is expected to review recent literature on pain management in children, and to present a topic or clinical case to the department at Grand Rounds and to other departments that consult the Acute and Chronic Pain services. Feedback is provided to fellows on their presentations allowing them to develop and improve presentation skills.

**Electives**

A total of 14 weeks of elective rotations provide an important educational experience during the fellowship. The elective rotations are a key component of this novel program as they provide the opportunity to gain unique clinical knowledge, skills and competencies. Electives include subspecialty areas such as Image Guided Therapy (where fellows learn the use of ultrasound for performing regional blocks), pediatric palliative care, adult pain and regional anesthesia (at the Sunnybrook Health Sciences Centre), and a children’s rehabilitation hospital (The Holland
Administration

Pain fellows participate in creating, reviewing and updating pain-related policies and clinical practice guidelines. These activities are primarily carried out in the Department of Anesthesia and Pain Medicine and feedback and assessment are provided. They can also attend administrative meetings of the hospital’s Pain Centre.

Discussion

The pediatric pain medicine fellowship at the Hospital for Sick Children is a novel program and the first of its kind in Canada. Prior to this fellowship, there was no formal program focused on pediatric pain management, and individuals undertook self-directed initiatives to gain competencies in managing complex pain conditions in children. We have described a novel pediatric pain fellowship, funding for which is derived from departmental clinical earnings through the Ministry of Health and Long Term Care of Ontario.

Subsequent to the development of our fellowship curriculum in 2010, a Pediatric Anesthesia Fellowship Task Force, comprising members of the Pediatric Anesthesia Leadership Council and the Pediatric Anesthesiology Program Directors Association in the United States, proposed that advanced fellowship training beyond the one-year core fellowship in pediatric anesthesiology was needed to prepare fellows for future academic and leadership roles in subspecialty areas including pediatric cardiac anesthesia and pediatric pain medicine. Similarly, a Pediatric Pain Special Interest Group proposed that a second year advanced fellowship was desirable to effectively train fellows to practice pediatric acute and chronic pain medicine. Of 46 pediatric institutions in the United States with an established one-year core fellowship, nine now offer a second year advanced fellowship in pediatric pain medicine.

At our hospital, there are a total of 13 pediatric anesthesia fellowship positions, including three advanced fellowships in pain medicine, cardiac anesthesia, and research, giving approximately one advanced fellow for every three first year fellows, which is similar to the overall ratio in the United States.

A key component of this fellowship is intensive training in the management of pain in children in diverse clinical situations. Resources have been highly focused to provide training for one fellow each year. In developing and implementing a novel program such as this, it is important to receive feedback from various stakeholders, and in particular the fellows. Feedback from fellows has been insightful and led to some changes in the fellowship structure. We offer several lessons based on our feedback and experience to date.

Electives in complementary services have provided an opportunity for fellows to acquire relevant knowledge and skills that are normally not acquired in a core pediatric anesthesiology fellowship. Feedback about the electives has been highly complimentary, highlighting in particular that there is often a bi-directional transfer of knowledge and expertise between fellow and members of the elective service. This feedback has led to emphasis being placed on elective rotations and we now allow more time for them. A recurring comment from elective services is that pain fellows are able to provide a pharmacological and management perspective that is unique to anesthesia trainees. The fellows have reported that the electives provide an opportunity to gain additional experience in a multidisciplinary team approach to patient care. Time spent on these rotations also provides an opportunity for knowledge reinforcement and self-evaluation.

Nonetheless, some elective services were concerned that the presence of the pain fellow would diminish the quality
of training and number of cases available to their own trainees. As a mitigating strategy in the case of the adult regional anesthesia service, we scheduled the rotation at times when there is no adult pain fellow rotating through this service. We have learned to be flexible with scheduling the electives, and we have revised our objectives and goals considering requirements for appropriate clinical training and case volumes for both the elective service and our fellowship program. Having taken this approach, the pediatric pain fellowship electives are meeting the needs of both the fellows and the various complementary services.

Involvement in research and education are vital to professional development. Feedback from fellows suggests that involvement in research provides opportunity to learn various techniques used in clinical and basic science research and to develop skills for critiquing scientific data. Presentation of research findings at meetings provides opportunity to learn and discuss new and interesting ideas related to pediatric pain management research and quality improvement. These activities help build the research capacity of the subspecialty. Additionally, involvement in various administrative activities such as hospital committees and quality and safety are key to expose fellows to issues that influence decision-making in health care provision and improvement.

Based on additional feedback from fellows, changes were introduced to the on-call schedule. The pain fellow shares weekend pain on-call with other first year anesthesia fellows. This allows a reduced on-call load for the pain fellows, giving them more time during regular working hours to rotate through the pain services and electives, and enabling greater patient contact.

### Future Directions

A potential long-term goal of the pediatric pain fellowship is to form a framework for future subspecialty training. This is of particular relevance as our university has recently introduced a residency program in Pain Medicine (http://www.anesthesia.utoronto.ca/edu/Pain_Medicine_Program.htm). The curriculum we have developed can be used to inform the pediatric component of this new residency program. Additionally, several disciplines encounter pain in their clinical practice. While the fellowship initially targets anesthesiologists considering specialization in pediatric pain, it may be expanded later to include other specialists, including pediatricians, pediatric surgeons, and interventional radiologists.

We plan to measure the impact of this novel pediatric pain fellowship on patient care, academic output, and fellows’ professional development using a variety of metrics. Metrics we will use to evaluate impact on clinical care include number of patients, timeliness of consultation, waitlist for consultation, quality of management of pain, prevalence of moderate to severe pain, and satisfaction scores of patients, parents/guardians, and healthcare workers. Academic and professional development indices will include scholarly output in the form of abstracts, conference presentations, publications, grants and long-term positions held by alumni of this program. To evaluate the impact of this fellowship on knowledge acquisition we administer a pediatric pain-related multiple choice examination before the start of and at completion of the fellowship.

### Take Home Messages

We present an overview of a novel pediatric medicine pain fellowship. Initial feedback and reviews suggest the fellowship is meeting the needs of fellows and patients in various pediatric settings. It is hoped that continued work to improve the fellowship will enhance patient care by educating physicians in effective methods of pain
management in an increasingly complex subspecialty. By enhancing clinical care, education, research and leadership in pain the ultimate aim of the fellowship program is to alleviate pain and improve outcomes in children.

Notes On Contributors

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Appendices

Declaration of Interest

The author has declared that there are no conflicts of interest.