

The Advanced Pediatric Anesthesiology Fellowship: Moving Beyond a Clinical Apprenticeship

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The article by Andropoulos et al.¹ in this month's issue of *Anesthesia & Analgesia* summarizes the 60-year history of pediatric anesthesiology in the United States, tracing its roots from a clinical apprenticeship into an Accreditation Council for Graduate Medical Education-recognized subspecialty with defined goals, objectives, curriculum, and an American Board of Anesthesiology examination granting subspecialty certification in pediatric anesthesiology.¹ In addition, the U.S. evolution of the subspecialty created an organization, the Society for Pediatric Anesthesia, that promotes the education of anesthesiologists in the clinical and social needs of children in the perioperative period. The mission of the Society for Pediatric Anesthesia includes advancing the safety and quality of anesthetic care, perioperative management, and alleviation of pain in pediatric patients.

Over these 60 years, the specialty of pediatric anesthesiology has undergone a significant metamorphosis. As the specialty advances, the training of pediatric anesthesiologists needs to advance as well. In this issue of the journal, Andropoulos et al.¹ propose expanding the length of training of pediatric anesthesiology fellowship programs for physicians interested in further subspecialty training or in developing the foundation for an academic career in pediatric anesthesiology. This additional specialization could be in clinical pediatric subspecialties such as pediatric cardiac anesthesia, pediatric regional anesthesia, pediatric pain management, pediatric intensive care, and pediatric cardiac intensive care. Alternatively, the additional training could also be in academic areas involving basic science or translational research, clinical trials, outcomes research, education, quality assurance, or patient safety.

In assessing the proposal by Andropoulos et al.,¹ it is important to explore the difficult questions in pediatric anesthesiology and pediatric anesthesiology training, namely what

exactly is broken, and whether the proposal fixes an identified problem. It is always difficult to argue against additional training, especially because the specialty has become even more complex and more specialized. Indeed, many pediatric program directors and faculty express concern, at least in private, about the clinical and academic readiness of trainees as they near completion of the "standard" 1-year pediatric anesthesiology fellowship. The proposal by Andropoulos et al.¹ reflects an existing ad hoc approach already in place in programs with the requisite resources to support 1 or more years of additional clinical and/or academic training at the "junior attending" or "advanced fellow" level.

The issues of subspecialization in pediatric anesthesiology are challenging. Many highly specialized aspects of pediatric anesthesiology, such as pediatric cardiac anesthesiology and pediatric pain management, require considerable expertise and experience. The knowledge, experience, and technical expectations in these highly specialized clinical disciplines are simply not satisfied by a core residency, followed by a 1-year pediatric anesthesiology fellowship. The proposal by Andropoulos et al.¹ provides guidelines in the overall organization and content of "advanced" pediatric anesthesiology training fellowships. At the practical level, the proposal begins to address limitations inherent in the current 1-year fellowship by recommending time and directions to further concentrate in one of these areas while continuing to mature as a general pediatric anesthesiologist.

The education of the trainee in a 1-year pediatric fellowship is also compromised by entering fellowship training immediately, following a conventional internship and the core anesthesiology residency without significant additional skill sets (e.g., substantial bench or clinical research background, advanced clinical pediatric medical competence, and/or Master-level training in epidemiology). Training during a 1-year pediatric anesthesiology fellowship may also be compromised by competing tasks such as board certification, moonlighting, and job-hunting.

The proposal of Andropoulos et al.¹ does not address what is fundamentally broken: how can pediatric anesthesiology training programs not only produce specialists who provide excellent clinical care but also advance the specialty? How can pediatric anesthesiology training programs impart to the next generation of pediatric anesthesiologists the knowledge and skill sets necessary to promote research, education, and administrative leadership in the field?

The optional second year of training proposed by Andropoulos et al.¹ as an advanced pediatric anesthesiology

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fellowship would provide the trainee with more clinical experience. However, if the conventional 1-year pediatric anesthesiology fellowship and advanced 2-year pediatric anesthesiology fellowship only provide more clinical experience, then the advanced pediatric fellowship is just a perpetuation of a more prolonged clinical apprenticeship. On the clinical side, time alone does not, of course, ensure competence. The proposal by Andropoulos et al.¹ mentions competency-based requirements, and with the exception of the advanced cardiac fellowship, the remainder of the proposal lacks details of how this would be done. Consideration and development of competency-based “graduation” requirements would in contrast represent a true advance and contribution to the specialty. As Andropoulos et al.¹ note, additional advanced clinical training fellowship does not address the issue of scholarly activity or the preparation for a career where the fellow develops his/her academic focus, skills, and credentials. The proposal by Andropoulos et al.¹ includes efforts to encourage scholarly activity, but they are only adequate if the trainee wishes to remain in a clinician/educator academic tract. They are not adequate for trainees interested in a more traditional career as an investigator.

It is not clear how the subspecialty programs in education or quality assurance described in the proposal by Andropoulos et al.¹ will fit into the continuum of pediatric fellowship training. Programs in education or quality assurance are generally designed for fellows with several years of experience in pediatric anesthesiology following residency, and predicated on the fellow incorporating this experience into his or her fellowship education (much like the business school model). Other types of educational programs have well-defined and established curriculum; the advanced pediatric anesthesiology fellowship training in education needs to incorporate these criteria to add legitimacy to the training.

The program in education in pediatric anesthesiology should also result in a Masters (or equivalent) degree in education. This is the standard we expect of professional educators, and we should hold our own trainees in education to this same standard. Similarly, advanced pediatric anesthesiology programs focused on epidemiology, biostatistics, safety, or quality science should result in a Masters or equivalent degree in the field. Resources (time and money) are required to support training, leading to advanced degrees. It is not clear where these resources will come from, given the financial constraints of many training programs.

There are other obstacles for trainees interested in pursuing research training in the second year of the advanced pediatric anesthesiology fellowship. In addition to the very unfavorable funding climate that exists at present (and likely well into the future), other major obstacles to research fellowships include:

- 1) a lack of appreciation for the amount of protected time, dedicated dollars, and likely success rate for training a clinical fellow level to become an independent investigator. It is estimated that a commitment of approximately \$1M or more over 3 or more years must be made to provide the resources and protected time necessary to have a chance for success. This is especially true since the average age of first

successful RO-1 grant from the National Institutes of Health for an MD or MD/PhD researcher has risen progressively (currently, it is approximately 44–45 years of age)²;

- 2) the lack of significant previous research training in the background of most anesthesiology residents and pediatric fellowship candidates. A recent survey of anesthesiology program directors did not include “research” as a major factor in resident recruitment and selection, and it appears that a minority of anesthesiology residency programs include formal and time-dedicated research training components; whether such efforts promote the development anesthesiologists committed to research for the long haul is also uncertain^{3,4};
- 3) the reduced current and future likelihood of a department’s capability to support research time and expenses out of clinical operating revenues; and
- 4) the relative paucity of established mentors and role models in anesthesiology programs in general and pediatric anesthesiology programs in particular.

When one looks at other models in medicine, fellowship specialization is usually a 3-year process. Academic faculty is expected to be productive investigators and successful mentors. Training in research methodology, and role models of successful mentorship, must be fully integrated into a truly advanced pediatric anesthesiology fellowship program. Unfortunately, research activity and research mentoring are woefully lacking in most pediatric anesthesiology programs. There are almost no publications of basic science research by pediatric anesthesiology faculty. Some editors have expressed concerns that publishing peer-reviewed pediatric anesthesiology articles lower a journal’s impact factor.⁵ As medicine focuses on patient outcomes, working with large databases, solving public health issues, conducting outcome and comparative effectiveness trials, and understanding biostatistics, engineering methodologies, and other “foreign” disciplines will become essential tools for the academic pediatric anesthesiologist. But who will teach these methodologies? At present, anesthesiology departments have major voids in these areas, and the deficits in pediatric programs are probably even larger.^{6–8}

Advanced pediatric anesthesiology fellowships that fail to address the need for appropriate mentoring and do not provide the infrastructure for the scholarly academic pursuits will likely fail to advance the specialty. Pediatric anesthesiology programs need to reach across medical disciplines and into other academic departments to identify and provide the necessary infrastructure for fellows to develop the skills required for academic success. It is myopic to simply increase the time in pediatric cardiac anesthesiology just to gain more clinical expertise without addressing how the additional training will advance the academic mission of the specialty and ultimately improve the care of children.

It is likely that the “complete” prescription will be disruptive. It may require changes in resident selection. It may require new training paradigms. It may require additional use of “mid-level” anesthesia care providers. It may require more time in pediatric (or adult) medicine, as opposed to “generic” rotating internships, during the clinical base year. It may require more focus on evidence-based practice, and

more exposure to the basic and clinical scientific foundations of modern anesthesiology practice.

We may be the only specialty that takes very bright and motivated people and “train” them by using long periods of limited cognitive activity. We do it because resident labor comes comparatively cheap. However, is this really the best use of a resident’s time? Or would the rare but real dangers of the cystoscopy suite be better learned, by focused but brief clinical experience, to help develop the necessary cognitive and technical skills and then simulation-based sessions to teach management of the severe but rare issues that they absolutely need to know how to manage but may never encounter? Are the “fellow-level” issues surrounding pediatric adenotonsillectomy best learned by days on end in the ear-nose-throat room or, again, by a planned combination of directed clinical exposure and “alternative” educational methods? Would this approach better prepare trainees for their eventual roles as providers, supervisors, consultants, and leaders, as well as free up time for them to be able to think and develop as academic physicians? Physician and nonphysician extenders can be readily trained in the manual skills routinely considered the province of anesthesiologists. Going forward, for pediatric anesthesiologists to provide value, he or she will need not only specialized clinical skills and medical knowledge but also the insight to ask new questions and solve new problems. This is what should be learned in an advanced pediatric anesthesiology fellowship.

Do our operating rooms and delivery of care models need to be dramatically reorganized to promote these efforts (and become more efficient)? Despite increasing use of “satellites” and surgicenters, we frequently care for the healthy elective pediatric patients in much the same way as we care for very sick or complicated patients. Indeed, healthy and sick children are typically comingled in the same operating room, on the same surgical list, with resultant issues of low efficiency and possibly inadequate provider qualifications. Put another way, because they don’t make Fiats and Lamborghinis on the same assembly line, should we be mixing tonsils with Norwood’s? In most pediatric operating rooms, one would be hard-pressed to differentiate among the mid-level anesthesia providers, the anesthesia residents, or the pediatric anesthesiology fellows based on their duties or responsibilities. Is this the way to train high-level physician consultants who are also motivated and equipped to develop new information and new models of care? We would argue that senior leadership pediatric anesthesiologists, particularly those at the major teaching centers, have the responsibility to both their trainees and society to partner with their colleagues, hospitals, insurers, so on, to actively design and investigate the new ways to deliver care that can help address these issues that are directly linked to cost and quality of care and to education and training.

Finally, it is essential to answer the question: “If we build this, will they come?” Regardless of training or educational infrastructure, success as an academic physician requires a substantial and ongoing investment of time and sweat. Are enough trainees willing to balance the training requirements with their financial and personal expectations to undertake advanced training in pediatric anesthesiology? Obstacles such as educational debt and 2-career families are real and very problematic. Those of us responsible for creating the

next generation of training paradigms must support the training as role models, advocates, resource-raisers, and cheerleaders.

There is no doubt that the advanced pediatric anesthesiology fellowship will increase clinical expertise and improve the care of children. These are laudable goals in their own right. However, we believe that the “value proposition” of pediatric anesthesiologists and pediatric anesthesiology training needs to be much greater for it to have any enduring value. Advanced fellowship training is not just about achieving clinical skills and medical knowledge but must engage the trainee in the generation of new knowledge, new technology, and new treatment paradigms. Unless the advanced anesthesiology fellowship is firmly coupled to defined programs and processes to achieve these results, training in the specialty will not significantly advance beyond that of a clinical apprenticeship. ■■

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