

## *Special article*

# Education in anesthesiology for the twenty-first century

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**Abstract** The growth and development of anesthesiology in the twenty-first century will likely depend on two major factors: our vision for the specialty in the future and our ability to implement an anesthesia education plan that will foster the achievement of that vision. The foundation of effective anesthesia education must be built on an understanding of the past and an analysis of the present but, most importantly, it must be shaped by our vision for the future. Focus on the future is essential, for it is remarkably easy to teach others as we were taught, or as we practice today. Unfortunately, the easy path will not foster the advancement of the specialty or develop the leaders for the future. The comments that follow are not a prescription for success. Rather, they are intended to stimulate discussion and planning regarding the future of anesthesiology, leading to a course of action that will enhance the development of the specialty. Long-term success for the specialty will depend on our efforts in undergraduate and graduate medical education, whereas short-term success will depend on our efforts in the continuing medical education of current practitioners.

**Key words** Graduate medical education · Workforce · Perioperative medicine · Critical care medicine · Anesthesia research · Nonphysician provider

## Introduction

Effective organizations of all types share one trait that seems to be universal: they plan their future steps carefully by establishing strategic directions and goals, and then implementing a series of steps that guide them towards those goals. The full potential of anesthesiology will likely not be realized by serendipity; rather, it will

be accomplished by careful strategic planning. Medical specialties, like other organizations, can benefit from thoughtful strategic planning. There are many reasons to adopt this approach for anesthesiology at this time. An overall global view for anesthesiology will be helpful, but that global vision will need much refinement at the regional (e.g., Asia vs Europe vs North America, etc.) and national level, as the stages of evolution of the specialty are quite variable among the various countries and regions. Educational change, like overall planning, will inevitably proceed at various rates depending on the local circumstance, but a broad consensus on the long-term future will foster educational focus at all levels.

## Background of the specialty

Anesthesiology is a relatively new medical specialty in most countries. In the United States, the importance of surgical anesthesia received special attention as a result of national and international armed conflict. The benefits of surgical anesthesia gained initial attention during the United States civil war (1860–1864, shortly after the introduction of ether anesthesia in the mid-1840s), and were further enhanced during World War I (1914–1918). However, World War II was the genesis of what many believe was the true evolution of the discipline as we now know it. Large numbers of generalist military physicians received brief focused training in basic anesthesia techniques for the care of combat casualties, and many of these individuals returned to civilian life in the late 1940s with a firm understanding of both the benefits and limitations of then-current anesthesia practice. Many continued to practice anesthesia in community hospitals, while others entered graduate medical education (i.e., residency) programs to enhance their knowledge and basic skills; many from this latter group became the leaders of American academic anesthesia in

the 1950s, 1960s, and 1970s. Although specific circumstances may differ depending on national events and needs, the time course of the emergence of anesthesia is relatively similar in most highly developed nations, including Great Britain [1]. Most importantly for our current considerations, the events of the twentieth century have brought anesthesia to a new threshold for the twenty-first century [2]. Many academic medical centers have a cadre of highly trained and competent anesthesiologists; our challenges include defining the “highest and best” uses for this talent, and developing the leaders of tomorrow who will shape the specialty in the twenty-first century. These goals can only be accomplished by a careful review of the current status of the specialty, for it is impossible to chart a course for the specialty without knowing the starting point, as well as the intended destination.

### Current status of anesthesiology

Anesthesiology can be evaluated in a variety of ways. Two useful approaches include an assessment of the stages of development of the discipline, and a review of the strengths, weaknesses and opportunities based on the stage of development in each region or nation.

#### *Stages of development*

The stages of development might be subdivided into three categories: emerging, established, and comprehensive. For want of a better scheme, these might be defined according to the criteria given in Table 1.

#### *Strengths and weaknesses of anesthesiology*

The strengths, weaknesses, and opportunities for the specialty vary depending on the stage of development, and, likely, each region and country can identify specific locales that are in various stages of development. However, for the purposes of this article, we will focus on the established and comprehensive environments, for these

are the environments that provide global leadership for the discipline. (These leaders have, of course, an obligation to help their colleagues who are in the emerging stages of anesthesia development, but here again this help will often take the form of education if it is to have a lasting effect.)

The strengths of the specialty include a remarkably satisfying practice that requires broad-based knowledge in a variety of medical and surgical disciplines. Such broad-based knowledge leads to considerable intellectual satisfaction, and avoids the boredom and tedium of repetitive work that is accomplished by rote rather than by the application of professional knowledge and judgment to specific situations. Similarly, especially in the more advanced academic centers, anesthesiologists often are recognized as balanced institutionally oriented leaders who are attuned more to overall institutional accomplishment than individual or departmental control or dominance. (Recently, an increasing number of anesthesiologists have been selected to lead academic medical centers in the United States, likely because of this broad-based knowledge and institutional orientation.) Much of anesthesia practice is associated with acute care, which provides access to high technology and immediate gratification for one’s efforts. There is great satisfaction from the knowledge that one’s efforts truly “make a difference”, and not infrequently are directly responsible for survival in critically ill patients [3–6]. Further, there are the financial rewards of medical practice. (Although anesthesiologists are not as highly rewarded as some of the more prominent surgical specialties, the income and standard of living for anesthesiologists is far greater than that of the general population in nearly all countries.)

The weaknesses of the specialty include a narrow scope of practice (often a result of the desperate need for anesthesiologists in operating rooms), and a lack of public recognition for the role of anesthesia in overall health care; this lack of recognition does not foster prestige for the discipline. Another weakness is the willingness of some practitioners to readily accept these narrower definitions of anesthesia practice, thus inhibit-

**Table 1.** Stages of development of anesthesiology

Stage of development	Functions provided by fully trained anesthesiologists			
	Intraoperative care	Perioperative care <sup>a</sup> and pain medicine	University-based graduate medical education	Advanced research
Emerging	Yes	No	Variable	No
Established	Yes	Yes	Yes	No
Comprehensive	Yes	Yes	Yes	Yes

<sup>a</sup>“Perioperative care” includes elements of preoperative evaluation, critical care medicine, and acute postoperative pain management, whereas “pain medicine” is defined as chronic pain management

ing the potential scope of practice for those who seek to expand into perioperative care and pain medicine, for example.

The opportunities are many and they are attainable, for there are examples of outstanding comprehensive anesthesia programs in many institutions. The opportunities encompass both clinical practice and academic development. Clinical, research, and educational initiatives will be required to achieve a comprehensive anesthesia status more widely.

### **Clinical initiatives**

Extending the skills and talents of anesthesiologists from the operating rooms to the perioperative environment is a natural progression for the specialty, as the cadre of well-trained and dedicated anesthesiologists increases. These opportunities are especially attractive in areas such as the preoperative evaluation of surgical patients, postoperative acute pain management, and critical care medicine. Indeed, as medicine becomes more complex and as technology continues to develop, subspecialties, such as critical care medicine, are logical areas for expanded anesthesia practice [7]. Extending practice into these areas improves patient outcomes [6,8] and reduces costs [5], and thus brings value to patients and to the health care system overall. Additionally, it brings increased public recognition to anesthesiologists. In the more advanced centers, the development of subspecialization within the operating rooms (e.g., cardiac anesthesia, neuroanesthesia, thoracic anesthesia, etc.) leads to enhanced professional recognition, for these subspecialties are highly valued by our surgical and medical colleagues. The public visibility of anesthesiologists is perhaps most apparent in areas such as acute pain management, chronic pain medicine, and critical care medicine. In each instance, the anesthesiologist is clearly identified and recognized by patients and families, leading to increased prestige for the specialty overall.

### **Research initiatives**

Research initiatives are vital to the image of the specialty and essential for its further development as a major medical discipline (the discovery of new knowledge is one of the factors that identifies a profession rather than a trade). A recent new book described the public demonstration of ether anesthesia in 1846 as "America's greatest medical discovery" [9]. Strangely, anesthesiologists have done little to capitalize on the contributions of our discipline to the advance in current health care, although these advances rely heavily on

surgical care (an estimated 41 million surgical procedures are performed annually in the United States!). Outcomes research is vital to documenting our value, yet the most important outcome, survival, is rarely studied by anesthesiologists. More often, anesthesia research examines intermediate outcomes, such as vital signs, cardiac output, muscle twitch tension, blood gas data, or other surrogates for improved care, whereas outcomes such as surgical mortality or return to full function remain the domain of other disciplines. There are fruitful opportunities here, as evidenced by recent publications which document that anesthesiologists improve surgical outcomes [4,8]. More research of this type will demonstrate our value to health care, and will influence both overall workforce policy and the appropriate development of subspecialty anesthesia practice.

### **Education initiatives**

Education is the means by which we build on the strengths, address the weaknesses, and achieve the vision of comprehensive anesthesiology in the twenty-first century. Educational efforts will need to include all aspects of the specialty, ranging from undergraduate recruitment to the education of nonphysician providers, but will necessarily focus especially on graduate medical education, which, clearly, is the single most effective site for assuring the success of the specialty in this century.

The graduate medical education programs are key to the achievement of our goals for the specialty. The programs and faculty who are responsible for graduate medical education can either foster the development of comprehensive anesthesia care, or they can reinforce the status quo. Unfortunately, it is all too easy to confuse training with education, and workforce needs with essential clinical experience. There are subtle but very real distinctions between education and training. The core concept of education involves the imparting of knowledge, whereas the basis of training is the development of behavior patterns by experience and repetition. For example, one "trains" an animal to fetch an object or jump through a hoop, but no fundamental knowledge or judgment is transferred in the process. In contrast, a professional who is educated in a discipline (mathematics, physics, medicine, etc.) is able to reason and apply both knowledge and judgment to new situations. Simulators and multiple case experiences are valuable tools for training anesthesiologists in clinical skills (e.g., management of the difficult airway, etc.), but they do not replace comprehensive medical knowledge as the basis for effective judgment in overall anesthesia practice. In the final analysis, high quality anesthesia care requires both education and training, and too often programs and faculty confuse or ignore these subtle

distinctions. One cannot learn the management of complex anesthesia care from textbooks, lectures, video, or interactive computer programs alone, but neither can a trainee become a true professional by simple repetition of clinical experience. Quality graduate medical education requires an appropriate melding of education and training, and neither alone is sufficient. The pressures to substitute training for education must be managed if the specialty seeks to develop to its full potential. These pressures include busy operating schedules, limited financial resources, and multiple other demands on faculty time that encourage educators to become "trainers". Succumbing to these pressures results in an inferior product from a "training" program, rather than a superior practitioner from a graduate medical education program. Similar pressures lead the program to limit educational experiences for the resident in areas such as chronic pain medicine or critical care medicine, again denying both the learner and the specialty of a practitioner who can participate in true comprehensive anesthesia practice. Training is easy for the faculty, whereas education is difficult, demanding, and often inconvenient. (Preparation of lectures or educational media is tedious and time-consuming, whereas training by experience is far easier for the faculty. Delivering personal anesthesia care to a busy surgical service is demanding, whereas reassigning residents from the anesthesia consult service, the chronic pain clinic, or an intensive care unit is easier for faculty and often preferred by surgeons and hospital administrators.) The leaders of residency programs must review the curriculum regularly, in order to maintain the proper balance between education and training. Similarly, residents must learn the intellectual foundations of the discipline by participating in research conferences, morbidity and mortality conferences, and the development of practice guidelines and protocols. Experiences in these areas will foster some to seek careers in basic or patient-oriented research (including outcomes research), and will encourage all to recognize that high quality clinical care results from an iterative process involving an assessment of clinical experience combined with ongoing review of the scholarly literature.

Undergraduate medical education is the primary site for (a) exposing all medical students to the clinical challenges and strengths of our discipline, and (b) identifying interested students who may seek a career in anesthesiology. Some programs find it difficult to achieve time in the medical school curriculum, owing to the multiple pressures from all services for time in the curriculum. Here again, those anesthesia programs that have achieved comprehensive anesthesiology status are far more likely to be included in the core curriculum, rather than being relegated to elective rotations only. Participating in the broader aspects of anesthesia prac-

tice (pain medicine, critical care medicine, etc.) provides further support for incorporating anesthesia education in the core medical school curriculum.

Postgraduate (continuing) medical education can be used to (a) seek support for a vision of the future of anesthesiology, and (b) impart knowledge that will help existing practitioners implement aspects of that vision in their local environments. Practicing anesthesiologists experience both the strengths and the weaknesses of the specialty in their daily professional lives, and many are motivated to participate in the development of new opportunities. However, some lack the knowledge or skills to extend their practice beyond the operating rooms. Many academic anesthesia programs have the resources that can remedy these deficiencies, and they should be encouraged to develop continuing education programs that address the needs of current practitioners, who can be valuable partners in developing the future of the specialty.

Some countries are exploring the role of non-physician providers, such as advanced practice nurses or anesthesia physician assistants, to supplement the anesthesia workforce in their health care systems. Experience can be gained from other countries (e.g., Sweden, the United States, etc.) where these providers form a significant component of the anesthesia workforce [10]. Although there can be no uniform policy that applies to all countries, the experiences in Sweden and the United States suggest that nonphysician providers can be valuable "physician extenders" for the delivery of anesthesia care. Data from the United States, however, show that surgical outcomes are improved when anesthesiologists direct the care provided by these physician extenders [4], and neither patients nor the profession are well served by allowing these groups to develop independently. Here again, the importance of education is a key aspect of this process. Thought leaders in anesthesiology have suggested that anesthesiologists should be responsible for the education of nonphysician providers [11], and this seems to be prudent advice, based on experience in the United States.

## Summary and conclusions

Anesthesiology made great strides during the last half of the twentieth century. The specialty is now well positioned to develop in a variety of ways that will enhance patient care, discover new knowledge, and improve surgical outcomes. These advances will inevitably improve overall health care in the twenty-first century, and achieve an enhanced status for anesthesiology and anesthesia practitioners. However, achievement of these goals will require a clear vision and an intense

commitment to anesthesia education in all its realms, but especially in graduate medical education.

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