

# The Importance of Anatomy in Health Professions Education and the Shortage of Qualified Educators

Robert S. McCuskey, PhD, Stephen W. Carmichael, PhD, and Darrell G. Kirch, MD

## Abstract

The current shortage of faculty qualified to teach anatomy in U.S. medical schools is reversible. Sufficient numbers of individuals are in the pipeline to provide a future cadre of well-trained faculty members educating students in gross anatomy. The challenge is to realign departmental, institutional, and federal training grant priorities and resources, creating incentives for graduate students, postdoctoral fellows, and faculty members to

stay the course and become the teachers needed to educate the next generation of health professionals. These strategies include (but are not limited to) team-teaching gross anatomy, thereby distributing the time commitments of a laboratory-based course more widely within a department; funds made available from the administration of medical schools to allow postdoctoral fellows to participate in teaching and providing compensation

for the research activities; using "mission-based budgeting" to specifically compensate for faculty teaching time; and, finally, re-instituting federally funded training grants that solved this same teaching crisis in the not-too-distant past.

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**K**nowledge of the structure of the human body from what can be seen with the unaided eye (gross anatomy) down to the molecular level is fundamental to understanding bodily function and how both structure and function are modified by disease. During the last few decades, there has been an explosion of new techniques for imaging anatomy in living patients. Examples range from endoscopy and laparoscopy to computed tomography (CT) and magnetic resonance imaging (MRI), together with newly emerging technology for three-dimensional visualization. The emergence of these sophisticated imaging techniques has been accompanied by the development of minimally invasive therapy targeted to specific organs and/or sites within them.

**Dr. McCuskey** is president, American Association of Anatomists; professor and head of cell biology and anatomy, and professor of pediatrics and physiology, University of Arizona College of Medicine, Tucson, Arizona.

**Dr. Carmichael** is a recent past-president, Association of Anatomy, Cell Biology, and Neurobiology Chairpersons; professor and chair of anatomy, and professor of orthopedic surgery, Mayo Clinic, Rochester, Minnesota.

**Dr. Kirch** is senior vice president for health affairs; dean, College of Medicine; and chief executive officer, Milton S. Hershey Medical Center, Pennsylvania State University, Hershey, Pennsylvania.

Correspondence should be addressed to Dr. McCuskey, Department of Cell Biology and Anatomy, College of Medicine, P.O. Box 245044, University of Arizona, Tucson, AZ 85724-5044; telephone: (520) 626-6084; fax: (520) 626-6084; e-mail: (mccuskey@email.arizona.edu).

As a result, knowledge of gross anatomy has become increasingly important, not only to interpret the images that are produced by these sophisticated techniques, but also to understand the pathway for targeting therapy to a specific site.

Ironically, at a time when knowledge of anatomy is increasingly important, we now are facing a crisis in anatomical education. A deepening shortage of experienced faculty members willing to teach gross anatomy to medical and dental students, as well as other health professions students, has developed. In a survey conducted jointly by the American Association of Anatomists (AAA) and the Association of Anatomy, Cell Biology, and Neurobiology Chairpersons (AACBNC) in 2002, more than 80% of the chairs of departments responsible for teaching anatomy anticipated having "great" or "moderate" difficulty recruiting qualified faculty to teach gross anatomy.<sup>1</sup>

In this article, we examine how the shortage of faculty developed, document the current situation, and offer some suggestions on how it can be resolved.

## Historical Perspective

Changes in the training of anatomists in the United States began to develop in the late 1960s. Until then, most training programs in departments of anatomy required all graduate students to take the medical school courses in gross anatomy,

microscopic anatomy, and neuroanatomy. In turn, they were then expected to teach in most, if not all, of these laboratory-based courses. Also, during the 1950s and early 1960s, anatomists were highly active in using newly developed techniques in electron microscopy and cyto- and histochemistry to define cellular morphology and function. The National Institutes of Health (NIH) funded training grants to support students engaged in both anatomical education and research using these new techniques. By the late 1960s and early 1970s, however, the development of new methods to examine the molecular and genetic basis of cellular function in health and disease stimulated an expansion of basic scientific knowledge that, coupled with the concomitant expansion of clinical diagnosis and therapeutics, led to increasing density in the medical school curriculum. This, in turn, stimulated the rapid development of "new concepts" of medical education that stressed early clinical contact, extensive clinical-pathologic correlations, the development of problem-solving skills, and other pedagogical approaches requiring curricular time. Due to gross anatomy's large time commitment within the first-year curriculum, the time allotted to the teaching of gross anatomy often was reduced as its relevance was questioned. At the same time, medical schools vigorously pursued sponsored research support to expand research productivity and the size of their faculties. The indirect cost recovery accompanying these grant

awards was used in a massive expansion of the research infrastructure. As a result, many faculty members perceived that research productivity was emphasized and teaching contributions were minimized in faculty recruitment, and especially in the promotion and tenure of faculty. Following the lead in other basic science departments, graduate students in departments of anatomy became more enamored with the rapid developments in cellular and molecular biology, focusing on establishing their independence as investigators, and turning away from taking laboratory-based courses and participating in teaching.

The forces described above led to major changes in most departments of anatomy and their graduate programs. Departmental names were changed to reflect the expanded research activities of the faculty and to attract graduate students. Course requirements for graduate students were reduced dramatically, often eliminating gross anatomy. As experienced teaching anatomists retired, new faculty members were hired for their research strengths, particularly in cellular and molecular biology. They typically had no formal training in teaching anatomical disciplines, learning to teach “on the job,” often after spending only a few weeks in a “crash” course or dissection experience. This led to the crisis we now face—the perception among leaders in the field that there is a severe shortage of faculty qualified and/or willing to teach human gross anatomy. As noted above, this perception was confirmed by the results of the 2002 AAA/AACBNC survey.

### What is the Current Situation?

In the summer of 2002, the AAA and AACBNC conducted a survey of all the academic departments related to anatomy in the United States and Canada to establish a base of information regarding the instruction of anatomy within academic institutions. Data collection was concluded in August of 2002, with 95 respondents submitting data about their institutions. The complete data from the survey can be found on the AAA’s Web site.<sup>1</sup>

In part, the impetus for this survey stemmed from reports that medical school administrators’ plans for faculty hiring and curriculum changes were based on the supposition that too few

anatomists are being trained to meet future teaching needs. A key goal of the survey was to gather the data to support or refute this assertion, which could then lead to the development of strategies for the future. This issue was addressed in a session at the February 2003 AACBNC Annual Meeting and reported on in the March 2003 *AAMC Reporter*.<sup>2</sup>

As indicated above, concerns about recruiting qualified faculty to teach gross anatomy were validated by the survey results with more than 80% of the chairs of departments responsible for teaching anatomy having “great” or “moderate” difficulty recruiting. In contrast, “little to moderate” difficulty was reported in the recruitment of faculty expected to teach in microscopic anatomy or neuroanatomy.

Profiles of the departments revealed some very interesting data. The median number of full-time faculty within a department was 14. In addition, there was a median of ten graduate students and four postdoctoral fellows per department. Of the 14 faculty members, six had received training in gross anatomy, but only four of these currently were teaching this subject. On average, fewer than one of the postdoctoral fellows per department had received or was receiving gross anatomical training, and none of these intended to teach gross anatomy in the future. Only 37% of the departments required graduate students to take a course in gross anatomy, and even fewer (11%) required their students subsequently to teach in the course. Nevertheless, five graduate students per department (41%) currently had or were going to receive training. However, only two intended to teach gross anatomy subsequent to completing a postdoctoral fellowship.

The results of this survey suggest the following conclusions. Whereas there are limited requirements for taking and teaching gross anatomy, at least two students per department on average are doing this and intend to teach gross anatomy in the future. For the 95 schools reporting, this translates into 190 potential gross anatomy instructors available during the next few years. An even larger potential pool (475) exists of those who have received training but do not intend to teach gross anatomy in the future. It is clear that most graduate students do not intend to use their training in subsequent faculty positions. This leads to the con-

clusion that, whereas an adequate number of students are receiving training in gross anatomy, most are being lost as teachers during their postdoctoral years. Instead, postdoctoral fellows are doing little or no teaching and are committed primarily to their research activities. Following their postdoctoral years, they are focused on establishing an independent research program, obtaining extramural funding, and covering a significant portion of their salary via grant funds as required by most institutions. There is little incentive to become involved in teaching gross anatomy, an activity that in most institutions is time intensive, with a mean commitment of 160 contact hours per academic year. This far exceeds the amount of time faculty members in other basic science disciplines generally are expected to teach. It also greatly exceeds the time commitment needed for teaching other anatomical subjects such as microscopic anatomy or neuroanatomy, which average approximately 80 contact hours per academic year.

### How Can the Shortage of Qualified Educators be Rectified?

During the last few decades, institutions have used several strategies to combat the shortage of faculty members qualified and willing to teach gross anatomy. These have included training new faculty members (who usually were recruited on the basis of their research) to teach gross anatomy; using nontenured, part-time, and/or retired faculty members (including physicians); training and retaining their own graduates students and postdoctoral fellows to teach anatomy; hiring physical anthropologists; and hiring non-licensed physicians from foreign countries. In most cases, these individuals do not contribute to the research enterprise. Unfortunately, despite their important educational contribution, they all too often are treated as “second-class citizens” of the academic community.

The best solution would be the recruitment of new faculty members who have active research programs and also are interested in and willing to contribute to the teaching of gross anatomy. Since the survey data indicate that these individuals are being trained, the key would seem to lie in providing incentives to encourage them to teach gross anatomy when they make the transition from postdoctoral fellows to junior faculty members. The

following are a few recommendations that could be implemented on different levels.

At the departmental level, the teaching load for teachers of gross anatomy could be reduced and mirror that of other faculty teaching in microscopic anatomy and neuroscience. This can be accomplished by making gross anatomy a team-taught course with research-active faculty participating for segments of the course (e.g., head and neck, trunk, or limbs), as is done currently in a number of schools.

At the institutional level, the school administration could provide financial support of that portion of the time of a postdoctoral fellow required for teaching activities. This support might counteract the loss of trained teachers, which seems to occur during the postdoctoral years. If this were done for a few individuals at most institutions, a very modest investment by each school would solve a national problem, as well as benefit the curriculum locally. Better-trained and more teachers would eliminate “on the job” learning and training at the junior faculty level. The research enterprise also would benefit, since the partial salary released from supported individuals could be pooled to hire an additional postdoctoral fellow. To give a specific example, an arrangement for a postdoctoral fellow to dedicate 25% of his or her effort to teaching anatomy could be negotiated to result in 25% of this fellow’s stipend coming

from the budget of the administration, not the grant of the principal investigator. The fellow would have somewhat less research experience per year of fellowship, but would emerge with an additional skill set (ability to teach anatomy) that would expand his or her employment opportunities. If four of these positions could be negotiated, the teaching faculty would expand accordingly, easing the teaching burden in the department, and another fellow could be hired on grant funds, compensating the investigator for lost effort in the research activities.

Another institutional strategy derives from the fact that many U.S. medical schools are instituting some form of “mission-based budgeting,” a process that seeks to allocate mission-specific revenues (e.g., tuition and state appropriations for education) with quantified faculty activity (e.g., hours devoted to classroom and laboratory teaching). It should be clear that, under such systems, there is the opportunity to allocate funds more specifically to faculty members engaged in a time-intensive activity such as teaching gross anatomy. This would directly counter the perceived disincentive for teaching anatomy.

Finally, at the national level the problem could be addressed by re-instituting NIH training grants that include support for training in teaching gross anatomy. This solution solved the national problem several decades ago. As those anatomists

who were supported on NIH training grants in the 1960s are now retiring, it is the time to examine these past solutions and determine how they can be applied to current problems.

If we choose not to address this issue, we risk producing a generation of health professionals—surgeons, radiologists, internists, nurses, dentists, physical therapists, pharmacists, and others—whose knowledge of human structure and function comes primarily from instructors who learned human anatomy just in time to teach today’s lesson.

Increasingly sophisticated research and technology are combining to enhance our capacity to diagnose and treat disease. We owe it to the future to ensure that those who develop and use these complex tools and drugs are taught by educators with an in-depth knowledge of and appreciation for the human body.

## References

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- 2 Association of American Medical Colleges. Wanted: more anatomy instructors—institutions explore ways to cope with shortages. *AAMC Rep.* 2003;13(6):6–7.