

Curricular Reform in Musculoskeletal Medicine: Needs, Opportunities, and Solutions

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Musculoskeletal medicine is not taught adequately in American medical schools and the predictable consequences are seen. Students cannot show cognitive mastery of the subject and lack confidence in this topic. To address this, the Academic Orthopaedic Society held a symposium on medical school education at its annual meeting in 2001. There, the panelists presented an analysis of the problem and proposed solutions. Specifically, it was noted that because of the autonomy of the various schools and their varied approaches to teaching, it would be unlikely that one monolithic and mandated plan could be effective on a national basis. Rather, successful reform would comprise a coalition-based effort to define learning objectives, to provide teaching materials, and to create forums for sharing resources. Recruitment of national organizations was thought to be essential. Finally, it was felt that although inadequate education is neither new nor

necessarily unique among disciplines, the coming year or two, (the beginning of the Bone and Joint decade) was seen to be a particularly auspicious time for attempting curricular reform.

Musculoskeletal medicine is not taught adequately in American Medical Schools. Although diseases of the musculoskeletal system are the primary reason that patients seek medical attention, nearly half of American schools do not require any explicit instruction in this subject. Schools that do require a course typically provide one of only brief duration.² Therefore, the typical student is deprived of adequate instruction in and exposure to this important area.

In a study reported by Freedman and Bernstein³ a basic competency examination was administered to 85 medical school graduates. This examination was validated by chairpersons of orthopaedic surgery departments and directors of internal medicine residency programs.^{3,4} Three-quarters of the examinees failed the test. This lack of grounding in the basics has practical effects, as shown by Clawson et al.¹ They surveyed more than 5000 residents in primary care specialty programs and discovered that there is a striking lack of confidence among these doctors in the realm of musculoskeletal complaints.

This crisis in musculoskeletal medicine education must of course be placed in proper perspective.

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Anecdotally, deans of students report that nearly every academic department at one time or another has an area of education that is deficient and in which reforms are needed. Although musculoskeletal medical complaints are the prime reason patients seek medical attention, it is wrong to say that musculoskeletal medicine should be the dominant topic of the medical school curriculum. Many of the musculoskeletal complaints are for self-limiting disease and are not particularly interesting. A curriculum whose main focus is back pain followed by the common cold is obviously fatuous. Diseases are to be studied not only in proportion to their impact but also to their potential to educate.

Despite these factors, the data arguing for change are convincing: there is not enough education in medical school on musculoskeletal topics, and the predictable consequences of this deficit are evident. Reform of medical school teaching in musculoskeletal medicine is needed. This reform comprises a reevaluation of the amount of musculoskeletal medicine training that should be required and the content of new and old courses.

DEFINING TERMS

To engage this reform effort, terms must be defined. What is musculoskeletal medicine? It seems to be mostly orthopaedics—but it is not exclusively so. Musculoskeletal medicine is not only a surgical discipline, but it is not quite rheumatology, neurology, physiatry, or radiology either.

Musculoskeletal medicine can be defined as the study of diseases that involve the bones, muscles, and joints. It includes topics in endocrinology relating specifically to calcium and phosphorous metabolism. It also overlaps with hematology and neurology, as the machinery of hematopoiesis and the wirings of the nervous system are housed in or between the bones respectively. Musculoskeletal medicine comprises many fields, with a dominant contribution from orthopaedics.

This definition of the scope of musculoskeletal medicine is critical, as it defines those

called to this curricular reform and those who would implement changes that are suggested. Even though musculoskeletal medicine is larger than the field of orthopaedics it is likely that the reform of medical school curricula will and must start with the efforts of orthopaedic surgeons. However, the efforts should not end there. It would be impractical for one group to mandate a universal solution. A broad-based coalition representing all interested disciplines and departments is necessary.

The term curricular reform also must be defined. Is there an argument for a new required course? Would there be satisfaction with new methods and new content for old courses alone? Or will an updated syllabus and list of required competencies suffice?

Curricular reform can be all those things. The words curricular reform denote any change in the presentation of musculoskeletal medicine that leads to more effective teaching, greater exposure to and retention of the material, better application of information, and better synthesis of subject matter; in sum, a change for the better in how teachers present the subject and how students use it. Curricular reform is the set of steps needed to obliterate the deficits in competency, confidence, and exposure that have been identified.

IMPEDIMENTS TO REFORM

There are some predictable impediments that curricular reform will encounter. Some are inherent in the process of change in general, and others are unique to the discipline of musculoskeletal medicine. Any successful effort must anticipate the idiosyncrasies of both circumstances and move beyond them.

Time

The first (and general) impediment to reform is that medical school curricula are overwhelmed with content already. Volume overload is a perennial problem, but its magnitude grows. Medical knowledge is expanding geometrically, but there cannot be commensurate growth in the number

of curricular hours. The gap between needs and resources is widening, and lengthening postgraduate training has not been enough to compensate. Therefore, any blueprint for curricular reform must include a map of how the curricular time is to be redistributed to accommodate additional material. Declaring that *X* should be added without identifying the *Y* to be cut or rearranged is to offer a polemic, not a plan.

Money

Another problem that may impede reformers is the generic problem of funding: curricular reform costs money. To begin, even with national facts and figures, it is likely that a given medical school would insist on a so-called needs assessment of its curriculum, collecting and analyzing its own data before any changes are effected.

In addition, a new course would require funding for teachers' time and instructional materials. Even if new a new course uses efficient modes of instruction (such as web-based learning) such that it is cheaper to implement it than the course it replaces, the department whose course is excised may not cede that money back to the Dean's office for redistribution.

Raising funds for this new course may not be easy. Although musculoskeletal conditions are a major source of decreased quality of life, they are not thought to decrease the amount of life (although overall fitness is a predictor of life expectancy). Accordingly, there can be no narrative of saving lives to tug at the purse strings of donors or legislators. In addition, because musculoskeletal problems are common, they may be perceived as trite; that is they lack the cache that otherwise can motivate fund raising.

Politics

Reformers must solve the problems of content and funding, but that is not enough. They must successfully navigate the political waters of the individual schools and they may lack the needed political skills. First, many reformers are going to be concentrated in departments of orthopaedic surgery that typically are small and eccentric to medical school power structures, particularly the

preclinical segment of the curriculum. The second factor is that the teachers of musculoskeletal medicine are spread out across several departments, diluting political influence.

Successful reform of musculoskeletal medicine education will therefore be achieved only by coalition. To succeed, orthopaedic surgeons must partner with anatomists, physiologists, rheumatologists, endocrinologists, radiologists, general practitioners, and basic scientists. Leadership of that coalition should include orthopaedic surgeons, as they are the custodians of much of the knowledge. Orthopaedic surgeons may not be the masters of every aspect of this expansive topic, but they are likely to have the broadest knowledge base. Leading this coalition without offending all partners will require thoughtful sensitivity, but it must be done well.

Lack of Enthusiasm

Departments of orthopaedic surgery may be reluctant to battle for curricular reform. The first issue is complacency. Although there may be problems in musculoskeletal medicine education, things may be acceptable from the perspective of the academic orthopaedic surgeon. Orthopaedic residencies are highly competitive (recruiting residents is a common reason why a department may be eager to teach medical students). Orthopaedic surgeons also may be not unhappy that their field is not mastered by the average student. If ignorance and lack of confidence on the part of primary care doctors persists, such circumstances can increase referrals to orthopaedic specialists.

The second source of reluctant participation by orthopaedic surgeons is the opportunity cost of teaching. Orthopaedic surgeons are among the highest paid medical specialists. For them, an hour spent in the classroom is hundreds of dollars of income foregone. The silver lining of the cloud of decreased reimbursements may be that this opportunity cost also is decreasing; but even if recent trends in decreased reimbursement continue, it will be a long time before the differential

opportunity cost between surgeons and other medical doctors and scientists is obliterated.

FIRST STEPS

There are impediments to be sure. What are the solutions? Specifically, reformers must be cognizant that there are more than 100 medical schools in the United States and therefore more than 100 unique cultures in which medical education is offered. Although at the superficial level these schools have much in common—the human body is the human body, and all students must pass the same licensing examinations—at a deeper level, one sees that schools have unique missions and histories. This makes a monolithic approach unwise and impractical. A set of solutions, not one universal solution, must be devised.

An important feature of reform is that it must be assistive rather than proscriptive. More good will be done if the curricular reformers spend their time building tools and making them widely available beyond defining the ideal curriculum. A smart reformer will do better by providing the impetus and raw materials for locally generated solutions. Although such reform may entail the loss of economies of scale, it reflects the reality of medical school education. The solutions offered must be sufficiently malleable so they are at once meaningful to large and small schools, to state and private institutions, and to those which emphasize primary care and those who train scientists or specialists.

Defining Content

The process of curricular reform comprises three steps: determining what currently is taught; defining what needs to be taught; and offering means to address the deficit.

The third step is what many would deem the essence of curricular reform. But the first two steps also are essential, although perhaps more subtle. Even the seemingly simple step of determining what currently is taught can be tricky. Not every course in musculoskeletal medicine goes by that name, and traditional courses such as anatomy and physiology contain considerable

musculoskeletal information. But there must be interest in more than facts. What is to be taught in medical school is not just facts but skill acquisition skills. Students must be taught to be life-long learners. They must be taught to teach themselves after leaving the confines of formal education. Because of that imperative, a curriculum that presents all of the needed facts (but only the facts) still will come up short.

Defining what needs to be taught is also a complex endeavor. One could turn to lists of common diseases, and declare that students must master the facts of arthritis, back pain, fractures, sprains, and osteoporosis. However, an approach based on collecting facts on common conditions is incomplete. Educators must elucidate the underlying concepts that explain diseases—and help students connect the dots between seemingly unrelated conditions.

The best way to create this curriculum of themes is to hold a consensus conference, convened by the Academic Orthopaedic Society or the Council on Academic Affairs of the American Academy of Orthopaedic Surgeons. This conference could develop a list of learning objectives and the best method to teach those themes.

Consider the topic of osteoporosis. The underlying themes or principles associated with osteoporosis include bone remodeling, fatigue fractures and material properties of bone, estrogen effects and other molecular signals, pharmaceutical modulation of bone remodeling, nutrition, and aging. The methods of teaching could include a clinical case presentation of a young woman's stress fracture or self-study problems centering on the hormonal and mechanical signals of the osteoblast. These latter two examples show that even in the absence of an expert on osteoporosis a sports medicine doctor or basic scientist can present material which provides wide access to the topic of bone remodeling and its consequences.

Creating Teaching Materials

These same organizations also can be called on to help create teaching materials. Much educational material regarding content already exists. The Academic Orthopaedic Society or the Council

on Academic Affairs of the American Academy of Orthopaedic Surgeons also could serve as a clearing house for teaching materials that individuals are willing to share. Having these materials available will reduce the cost of building a new course, and may facilitate some school's decision to require such curricular change.

Teaching material can be prepared for two contingencies: the addition of a new independent course in musculoskeletal medicine, or the introduction of musculoskeletal topics into already existing courses. These materials may include textbooks, lecture slide shows and notes, self-study materials, examination questions (for students and teachers), and web-based instruction.

NEXT STEPS

Reclaiming the Fourth Year

It is not enough to articulate what is missing in current curricula; successful curricular reformers also must support and participate in the process of defining the topics that must be given less emphasis or cut entirely. Selective pruning is important in maintaining the vigor of the entire tree. Pruning is needed not only because new facts are being added to the corpus of medical knowledge but also because some previously held facts are found to be untrue.

Despite the need for cutting, a healthy and appropriate dose of education in musculoskeletal medicine can be added to the curriculum without sacrificing other important topics currently in it. The fourth year of the typical medical school curriculum lacks rigor and content compared with the other three. Some of musculoskeletal medicine can be added in the fourth year's offerings without eliminating anything essential.

The argument against adding courses in musculoskeletal medicine only in the fourth year is that by then it is too late to teach the basics. That argument should be rejected. Such an attitude reflects an overly pessimistic view of medical education: the fourth year of medical school is approximately the mile mark of the marathon of lifelong medical education. Using

the fourth year to introduce students to musculoskeletal medicine may deprive them of the familiarity they could use to make career choices, but it will provide needed instruction. Obviously, a slot in the first or second year would be preferable, but a fourth year course can still be effective.

The Stealth Approach

If local considerations argue against the creation of a stand-alone musculoskeletal medicine course, another option is to intercalate musculoskeletal topics into existing courses: the stealth approach. Anatomy courses in the first year would benefit from additional input by musculoskeletal clinicians, as would other courses. The physiology of the endocrine system can be the home base for better instruction on calcium metabolism and bone remodeling. Courses in neuroscience can include the pathomechanics of back pain and disorders of the peripheral nerves, if they do not already. Even less central topics such as medical decision analysis can be related to musculoskeletal medicine: for example, the methods of cost benefit analysis can be taught in context of hormone replacement therapy for women who are postmenopausal. This could be an optimal time to teach students about osteoporosis without the course being strictly devoted to musculoskeletal medicine.

Going Beyond the Stealth Approach

Students have a deep and abiding interest in musculoskeletal topics the day they enter medical school. For many students, their only previous encounters with the medical system were as patients with a musculoskeletal problem. Many students on their first day at medical school could not put their hands on their thyroid or their thymus, but almost all could grab their patellae without even translating the word patella to the vernacular word kneecap. That interest must be leveraged. If musculoskeletal medicine is denied its own course in the formal curriculum, it may be worthwhile for teachers of musculoskeletal medicine to hold evening and optional seminars on musculoskeletal topic.

Fourth Year Reform

One problem with reclaiming the fourth year is that such efforts will clash with the other (non-educational) mission of that year, namely, auditioning for postgraduate residency spots by traveling to other schools for weeks or months at a time. Perhaps there is no better way for those in orthopaedics to show their commitment to a reinvented fourth year by taking a leadership role in the reform of the practice of visiting clerkships. If academic leaders in orthopaedics frown on multiple month-long visits, it may go a long way to reengineering the fourth year.

Unfortunately, one ramification of having a new course in musculoskeletal medicine offered in the fourth year is that it will be missed by many of the MD/PhD students. In many schools, MD/PhD students do not participate in the typical fourth year medical school curriculum. Therefore it is imperative that some exposure to the scientific questions in musculoskeletal medicine be offered in the first or second year.

Residents as Teachers

A major problem recruiting orthopaedic surgeons as teachers is the high opportunity costs these doctors bear when leaving the clinical arena. Not unreasonably, these doctors would want to be at least partially compensated according to these costs. This often is problematic. But even if the financial problems could be overcome there could be a shortage. That's because musculoskeletal specialists, including the nonsurgeons, number fewer than 5% of all doctors. This lack of manpower may undermine a new course in musculoskeletal medicine, especially because schools now stress solving problems in interactive, small group settings.

The need for teachers creates an opportunity for developing a new cadre of instructors: orthopaedic residents. This is a talented group of motivated physicians. With planning and instruction, these doctors can teach. This also is an opportunity for innovation in pedagogic education. All departments need programs to better educate future medical school professors in

terms of teaching skills. Programs of instruction on the mechanics of teaching used in musculoskeletal medicine can be used an example for other fields.

NATIONAL STEPS

Many of the reform efforts described are directed toward faculty, curriculum committees, and deans of students. However, there are other appropriate targets such as national organizations. It would be helpful if the National Institutes of Health, specifically the National Institute of Arthritis, Musculoskeletal and Skin Diseases, were interested and invested in this problem. The stamp of approval of the National Institutes of Health on a proposed solution (and the funding it may share) can help implement a program. National Institutes of Health support for education has been provided in other areas such as instruction in asthma and geriatrics.

Another organization worth approaching is the National Board of Medical Examiners. Testing organizations are influential in shaping the curriculum. Faculty are correct to teach what students need to know to pass their certifying examination. The licensing examination should stress the essentials. Still, too great an emphasis on the examination implies that if a topic is not included on the test it may be hard to have it included in the curriculum. Accordingly, if the National Board could be convinced to place greater emphasis on musculoskeletal topics, it is likely that schools will add additional courses in musculoskeletal medicine.

Unfortunately, this approach is unlikely to work rapidly. Although the National Board will modify their examinations if deficits are found, they do not publicize these changes. The reaction time of schools to changing content of testing typically is slow.

The Liaison Committee on Medical Education, the organization which accredits medical schools, also can be helpful. As part of the certification process, the curricular activities of the school are monitored. It is a routine task of the Liaison Committee on Medical Education to identify deficits in a school's curriculum. How-

ever, the Liaison Committee on Medical Education is not likely to be an enforcer of national reform of musculoskeletal medicine education. Although the Liaison Committee on Medical Education may mandate that a topic be included in the curriculum, and cite schools with deficits, it does not define the details of how that material is to be taught. Thus a school which presents a required topic but not necessarily in depth can probably satisfy the Liaison Committee on Medical Education standards. Still, were the Liaison Committee on Medical Education to announce a greater emphasis on musculoskeletal medicine, this may have positive effects in terms of raising awareness.

Better results may be obtained if the organizations specific to the musculoskeletal system are recruited. The American Academy of Orthopaedic Surgeons already is taking a leadership role. It has formed a Council on Academic Affairs, with a subcommittee specifically focused on medical school education. The Academic Orthopaedic Society, likewise, has had a long-standing interest in medical school education. Both organizations are preparing textbooks for students' use. The International League of Associations of Rheumatology also is addressing medical school curricula and plans to create education materials.

SUMMARY

A cynic can look at the competency data presented by Freedman and Bernstein^{3,4} and the lack of confidence shown by the study of Clawson et al¹ and conclude that all that students need is a lecture on the basic facts and a pep talk to bolster confidence. We hope that will not be the prevailing response. The musculoskeletal system is not only the focus of many patient complaints,

it is intrinsically interesting and there is much more to be discovered. It is the system that students know the most about, and perhaps are most curious about. But these facts have always been true. Curricular reform can happen now because the time is right.

Consider this alignment of circumstances. This is the Bone and Joint Decade, a period of heightened awareness of the musculoskeletal system and how it impacts the lives and health of patients. This an era of rapid scientific discovery, where each day provides new information and new tools that benefit patients with musculoskeletal disease. Today, educators stand at a vantage point where they can learn from the successful curricular reforms of other disciplines, most notably neuroscience. The United States is on the verge of an arthritis and osteoporosis epidemic, as the baby boomers age; this is a crisis but also a source of great opportunity. This is the dawn of the information age, a time when medical journals are moving to the Internet and schools are investigating new teaching methods.

The case for curricular reform is made by needs and opportunities. This is something that must be done.

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