Introduction

After the Flexner report, academic medical centers differentiated themselves from other patient care institutions because they seriously undertook the task of training the next generation of physicians. After World War II the tremendous advances in medicine led to subspecialization so that physicians could both master all of a narrower field and commit to understanding the physiology and pathophysiology of an organ system. This highly specialized training has led to dramatic changes in the way that cardiac disease is diagnosed and managed and has enabled the wide availability of these techniques. A decrease in mortality due to cardiovascular disease in the United States resulted.

In the past, the three roles of teaching, research and provision of patient care were largely the purview and responsibility of the academic center. Most consultant cardiologists 25 years ago were housed in academia, and they spent a good amount of time teaching students, primary specialty residents and a few cardiology fellows. They taught a cognitive discipline based on physiology but with few technical instruments beyond the stethoscope and the electrocardiogram (ECG). Former students referred their problem patients back to the professor for the definitive diagno-
sis, usually based on "his" clinical experience. There was a limited need for wide dissemination of cardiologists.

Technologic Revolution

In 1967 much of this changed with the application of coronary bypass surgery. Cardiologists started moving to the angiographic laboratory to identify patients who could have surgery. Academic centers in many cases followed the lead of private institutions. Ten years later, balloon angioplasty sprang on the scene, further transforming adult cardiology. Suddenly the cardiologist became a "less invasive" surgeon. Other technologic advances, such as ultrasound, nuclear techniques and electrophysiologic procedures influenced this transformation.

There was a demand for more cardiologists trained in invasive techniques to join cardiology practice groups. The academic centers have responded by offering training in all these fields. More and more cardiologists have opted for these technically oriented aspects and have moved out of training centers to practice in community hospitals. Training requirements have been increased so that these graduates now have 3 or 4 years of cardiology training before entering practice. Hospitals anxious to participate in the technologic revolution within cardiology have provided excellent facilities for performing procedures. A generous reimbursement schedule during the 1970s and 1980s assured the hospitals of profit centers from the laboratories and increased their enthusiasm to recruit cardiologists to perform these procedures. By 1992 there were 13,611 American Board of Internal Medicine (ABIM)-certified cardiologists. However, a 1992 survey of the American College of Cardiology (ACC) members at the time of their membership renewal shows self-reported estimates as shown in Table 1 of the Task Force 5 report. Of the adult cardiologists in the United States who have completed training, 60% perform diagnostic cardiac catheterization, 42% interventional catheterization, ~80% echocardiography and 10% electrophysiology. Although training standards and case volume levels to maintain competence have been advanced, there has been no real restriction on the entry into these highly technologic areas.

What Are the Future Needs in Cardiology?

Clearly, the advancement of knowledge of cardiovascular disease requires continuation of the academic tradition of excellence that has brought so many advances. This requires enhanced training of investigators as well as their continued support. Some academic institutions are already requiring 2 years of research in addition to or preceding clinical training to ensure that fellows seriously committed to investigative careers are selected. New sources of funding for training of investigators must be found.

The clinical needs in cardiology, however, are changing. What role will the academic center play in training personnel for the clinical needs of the future? The answers to these questions will in large part depend on what the specialty of cardiology becomes and who delivers cardiac care. If cardiologists take a traditional path as fully trained internists who are providing consultative cardiac care as well as functioning as the primary physician for some of their patients, then there may continue to be a need for a large number of cardiologists. Conversely, if the specialty is constricted, it may be composed of only the superspecialized, technically proficient cardiologist who serves as a resource to primary physicians delivering the bulk of preventive care and the routine management of cardiac patients. If this is the direction in which cardiology moves, significantly fewer cardiologists will be needed. The direction that cardiology takes will depend in large measure on the revolutionary changes occurring within the health care delivery system. Until final approval of a plan is implemented, the impact of the changes will remain somewhat speculative. There is no doubt, however, that subspecialty medicine is under attack from several fronts.

What Is an Academic Cardiovascular Health Center?

An academic cardiovascular health center is one that supports and integrates not only multiple Accreditation Council on Graduate Medical Education (ACGME)-approved graduate medical education programs but also the other major subspecialty programs within the cardiovascular field. The center is in an environment that fosters and supports scholarly educational activity and a meaningful research experience.

Three Missions of Academic Health Centers

The three missions of the academic health center that are generally agreed on are teaching, research and patient care. Successful academic centers will be those who find a way to nurture each segment of their responsibility. The analogy of parents with three children suggested by Dr. Willis Hurst is appropriate. Just as parents must feel responsibility for each child even though strengths and needs may differ, so the academic center must responsibly care for education, research and patient care without ignoring any segment. Just as with children, the strengths and needs of each component may differ, but if one component is ignored, problems will arise. Let us consider these three components and how the academic center should function in relation to each.

Teaching

Recommendations regarding the educational process for practitioners and the number and type of practitioners who should be trained depend in great measure on how cardiovascular care is to be provided in the future. Currently most cardiovascular care is provided by cardiologists. This was not always so (1). Physicians identifying themselves to the
American Heart Association (AHA) as practitioners of the internal medicine specialty of cardiovascular diseases increased from just <2,000 in 1965 to 16,000 in 1990, an increase of 734% (2). During this same time, internal medicine increased 154%, and general practice decreased 68%. Thoracic surgery, due to much tighter training controls, increased only 40% over these 25 years. If the goals expressed by the ACGME (3) of increasing the number of physicians providing primary care and decreasing the number of physicians providing specialty care are adopted, then one of two scenarios will have to be achieved: 1) The training of cardiologists will have to broaden to include very extensive primary care experience, thereby creating cardiologists to provide not only tertiary medicine but also primary care for their patients. 2) Conversely, if cardiology is to become a highly subspecialized group of practitioners providing only tertiary care, then there may be a significant contraction in the number of cardiologists trained (see Task Force 5). Examples of these two extremes exist in Europe. In the United Kingdom, where the cardiologists fit the second definition, there is less than 1 cardiologist/100,000 inhabitants. This means that most cardiac care is administered by less specialized physicians than are available in the United States. In Italy, where much of the primary care is provided by cardiologists, there are 12 cardiologists/100,000 inhabitants (4). Currently in the United States there are ~6.5 cardiologists/100,000 inhabitants, roughly twice the average of other Western countries. A recent article concerning the potential for managed competition suggested 3.4 cardiologists/120,000 population (5), whereas another consultant suggested 10 cardiologists/100,000 inhabitants (6).

The current requirements leading to ABIM certification in cardiovascular disease include full training in internal medicine (providing an educational background competent for delivery of primary care) plus a 3-year training program in cardiology. This requirement is consistent with the recommendations of the ACC’s 17th Bethesda Conference (7). The ACGME has put forward special requirements for the subspecialties of internal medicine—special requirements for training programs in cardiovascular diseases in a document that provides in some detail the program content required for cardiology training (8). A structured training program, including clinical experience in a wide variety of patient situations in both inpatient and outpatient settings and the mastery of technical skills, is required. In addition to these clinical experiences the trainee is expected to be actively involved in research. The specific aspects of these training programs will have to shift over the years to reflect the type of training needed for the cardiovascular practice of the future. A great strength of academic cardiology in the past and hopefully for the future has been the ability to allow trainees to move in multiple directions, ranging from a primary cardiology practice to highly technical clinical areas of special competence, such as echocardiography, nuclear cardiology, electrophysiology or interventional cardiology, or to an academic career involving the most basic elements of research.

The ABIM now offers a certificate of added competence in electrophysiology that could, over time, become the standard for hospital credentialing in this discipline. In addition, the ABIM is exploring the possibility of a certificate of special competence in interventional cardiology.

The training of young physicians for academic careers now requires a significant time investment for research training. Nevertheless, all trainees express the desire to be fully competent in general clinical cardiology and many want to be expert in some of the cardiology procedures as well. The ABIM currently requires candidates to have 2 years of clinical training and 1 additional year devoted primarily to investigation in order to qualify to take its certification examination in cardiovascular diseases. Several training programs wishing to train only physicians who will remain in academic centers and in research have extended their standard training programs to 4 years. Some require that the initial 2 years be devoted to investigational laboratory work so that trainees clearly understand the program goals. Many would argue that physicians who understand clinical problems are most desirable as investigators. Will the academic center continue to train clinician-investigators? Alternatively, the academic center of the future might train one group as investigators and another as clinicians.

Finally, it will be important for academic centers to make a judgment as to who will be trained to provide cardiac care in the future. Certainly for the near term, there are ample numbers of adult cardiologists in many highly technical and specialized disciplines, especially in interventional cardiology. Even were training programs reduced, this fact is unlikely to change in the near future because the practice life of a cardiologist is ~30 years. Seventy-nine percent of practicing cardiologists are <55 years old, and 53% are <45 years old. Nonetheless, with a strong emphasis on training primary care providers, it is likely that in some areas primary cardiology will be provided by family practitioners and general internists with assistance from nurse practitioners and physician assistants. Academic centers must take these factors into account and plan for adequate training of these clinicians, especially in delivery of preventive care and basic diagnostic cardiac evaluations.

If one accepts the notion that adequate numbers of clinical cardiologists are already trained and that invasive cardiologists actually exceed the number required, then what response should the academic center make with regard to the training of people to provide cardiac care? The academic cardiovascular health center should provide a well balanced educational experience and encourage more trainees to enter a practice that is office or ambulatory based (nonprocedural). Training tracks that emphasize clinical

cardiology and research and have minimal exposure to invasive cardiology should be considered. Any reduction of positions in cardiovascular training leading to certification by the ABIM should be based on retaining programs on the basis of quality of the educational experience provided. We strongly oppose an “across the board” arbitrary reduction in positions or the use of geographic quotas. Any decision on reducing positions should be made only on the basis of quality by appropriate professional review committees. More emphasis must be placed on the number of cardiologists needed for the delivery of cardiovascular services rather than the number of trainees needed to provide clinical coverage at the academic institution. There are alternative means of providing care to the patients in the academic center, including increased utilization of nurse practitioners and physician assistants.

Funding a clinical fellow requires ~$35,000 to $40,000, with salary and benefits. A full-time nurse practitioner or physician assistant for the catheter-angiography, echocardiography or ECG laboratory costs ~$45,000 to $60,000 in the same region of the country. This has encouraged the use of fellows for these technical duties, or at least has inhibited conversion to use of technicians, in many academic centers despite agreement that the training of excessive numbers of clinical cardiologists is counterproductive and unwanted for many reasons. Funding to support care provision by more costly personnel instead of subspecialty trainees will aid academic health centers in facilitating this transition while continuing to meet the needs of the population, particularly the underserved.

As educators in the broad field of cardiovascular medicine, cardiologists who participate in fellowship programs should have a meaningful role in the education of the generalist physician. General internists, family medicine practitioners and pediatrics should be encouraged to participate in continuing medical education opportunities that stress cardiovascular patient care (e.g., ACC, AHA programs). Academic cardiovascular health centers must maintain enough flexibility in their structure to provide prompt and appropriate responses to needs and opportunities.

Research

Although research in cardiology has been impressive in solving clinical and basic problems and has led to an amazing array of therapies for cardiovascular disease, we are still on the frontier of potential achievements. One should not forget that research in ischemic heart disease led to coronary care units in the 1960s, coronary bypass surgery in the 1970s, balloon angioplasty in the 1980s and new interventional techniques in the 1990s and is leading to fascinating opportunities in molecular biology into the next century. Adequate support for research and incentives for some of our brightest graduates to enter research careers is a vital mission of the academic health center. Funding is becoming more difficult. As government funding has become more scarce, academic centers have turned to funds from clinical practice and to grants from the pharmaceutical and equipment industry. As reimbursement for clinical work is reduced, retention of clinical faculty will be more difficult. If the patient flow is not maintained, this avenue for funding will not be available. Likewise, the pharmaceutical industry is currently a favorite target for cost control measures aimed at restraining profits and will probably reduce its subsidies to academic institutions.

The Association of Professors of Cardiology Committee on Research Resources has issued a communique detailing the mission of cardiovascular research programs (9). This organization makes a strident plea for universities to support research as one of their major commitments with both personnel, space and adequate funding. The committee recommended that the aggregate average amount of time dedicated to research activities fall between 30% and 50%. This would obviously vary significantly depending on the strengths of each center. Most recently, the shift in National Institutes of Health funding to more molecular biology-based projects has left many academic center clinical faculties unfunded for research. As other traditional funding sources for clinical research begin to constrict the number and size of grants, there will be a great temptation to utilize clinical funds to an increasing degree to offset the shortfall. However, excessive taxation and overhead will significantly disadvantage clinical activities as centers attempt to deliver high quality but efficient and low cost care. There should be a mechanism for funding education and research by means of a direct pass-through from predicted cost-savings.

Patient Care

The old model of medical schools caring for the indigent and private practice caring for the insured is producing severe financial strain on some medical schools. With universal health coverage a probability in the future, what will be the impact of this change on the academic health center? The providers of entitlement care (Medicare and Medicaid) are actively shopping for the best price. Universal coverage implies that Medicaid may become obsolete and that these patients will be cared for in the private sector. Efficient low cost care can often be delivered by those with only one hat to wear (nonacademic hospitals) rather than those who must wear up to three hats (academic medical centers).

Many academic centers are feeling the pinch of increasing competition from physicians they previously trained. It is a point of pride and a point of concern at the same time. Academic centers must maintain a healthy balance of training, research and patient care so that trainees can be exposed to forward-looking faculty (with active research interests) and a large clinical base. Although the academic center provided the vast majority of cardiology patient care 20 to 30 years ago, the explosion in the number of cardiologists has dramatically changed this equation. Academic centers are now being challenged to compete for contracts to
provide cardiac services. It is estimated that by 1995, 75% of the U.S. population will be covered by some form of managed care. If Medicare and Medicaid are also purchasing the most efficient and low cost cardiovascular services, the pressure on academic centers will become more intense.

Managed care programs using alternate reimbursement scenarios, such as packaged pricing and especially capitation, will negatively impact the revenue from services performed (10). Evidence points in this direction from the Group Health Association of America's annual health maintenance organization (HMO) industry survey and National Hospital Discharge Survey, which shows that coronary bypass operations were performed in patients >65 years of age at a rate of 3.33/1,000 enrollees in HMOs and 6.5/1,000 in patients covered under fee for service programs. The numbers for cardiac catheterization are 8.5/1,000 for HMOs and 14.1/1,000 for the fee for service group (11).

Some academic centers have a widely distributed comprehensive care system already in place, but these are in the minority. Most lack primary, entry-level care and have depended on referral of patients who are either highly selected because of unique, complex problems requiring tertiary care or because of the patient's inability to pay for care otherwise. To maintain an adequate clinical volume for teaching and research purposes, academic centers must move in one of several directions. One model is for academic centers to develop a vertically integrated system providing everything from entry-level primary care all the way through tertiary subspecialty care. These centers could establish HMOs for comprehensive care of patients. Because of the vast number of patients needed to generate subspecialty cases, this scenario may not work where a great deal of subspecialty care is already in place.

Another model would be cooperative participation in subspecialty contracts with primary care provided by others who have a referral relationship with the medical center. An important consideration in such relationships will be how to ensure that the benefit goes to both providers and that additional referrals can be generated for the primary provider because of the relationship with the academic institution. There has been an erosion of the percentage of cardiovascular care provided by academic health centers and a shift to those they trained. A balanced ecology should be the goal, with private groups supportive of the center and academic centers content with a volume sufficient to maintain clinical excellence and fiscal viability in order to train the future providers of cardiac care. Clinical research will increasingly involve nonacademic centers collaborating with academic centers to ensure large data bases.

Some emerging new technologies may be developed optimally in the academic setting. There has been some effort in the regionalization of certain types of complex cardiac services (e.g., transplants, myoplasties, atherectomies) by payers, both governmental and private. It may therefore behoove the academic centers to be more proactive in ensuring that, at least initially, the use of newer technology is confined to the academic environment where effectiveness can be objectively determined.

Another area in which academic centers are best equipped to take the lead is in demonstrating methods of determining cost-effectiveness using decision theory as well as determining the methods for development of optimal patient management protocols and outcomes analysis. Cost-effective physician behavior can be taught, and academic centers should accept that responsibility.

Because the nonacademic centers have only one hat to wear, namely the provision of medical care, whereas academic centers must provide teaching and research as well, a type of affirmative action program for academic centers may become necessary in the future to allow these institutions to participate in managed care schemes. In the long run it is in the interest of the academic center and the practicing cardiologist to find common ground for cooperation rather than developing town/gown—type competition. To level the playing field, the universities themselves will have to address the issue of adequate funding for clinical care, teaching and research by finding separate funding mechanisms for all these endeavors. Although clinical activity can provide some support for teaching and research, if too severe a burden is placed on clinical care, the institution will not be able to provide the same efficient low cost care that is being offered by the nonacademic institutions. The United States cannot afford to let academic medical centers decline if we are to have a high standard of medical care and the scientific advances needed in the future.

Conclusions

A consensus seems to be emerging that an adequate number of clinical cardiologists exist in the United States, although certainly there is maldistribution and an undersupply in some areas. Training and support for those focused on an investigative career must be fostered. There is an increased need for noninvasive cardiologists, especially those involved in primary cardiology care and preventive medicine. The current supply of cardiologists performing interventional procedures is at least sufficient, although the vast majority do it only as a part-time endeavor. Primary cardiology services may be performed to a greater degree by family practitioners and internists if the goal of increasing primary care and decreasing subspecialty physicians is achieved. The politically correct drive for more primary physicians, however, should not ignore the impressive advances made by specialty medicine or patients' understandable desire to see "an expert." For academic centers to continue to have adequate patient material to support the teaching and research aspects of the institution, highly efficient, relatively unencumbered clinical activity must be supported and should be similar to that practiced by the best private practice groups. Fellowship training should not be a vehicle to provide extra hands for clinical service at academic hospitals.
The academic institution that nurtures and cares for all three of its “children” (teaching, research and patient care), according to their strengths and needs, will be the one that succeeds.

Recommendations

1. Any reduction in subspecialty training should be based on the quality of the educational experience alone and not on geography or “across the board” reductions. At this time, there seems an abundance of interventional cardiologists; therefore, training should emphasize the other aspects of cardiovascular care.

2. Those training positions designated by the proposed health care system reform should be in academic cardiovascular health centers, as defined above, and funded directly by the system.

3. The ACC should provide advice to national commissions on criteria for judging the quality of training programs.

4. The national health care systems should provide funds to academic health centers specifically for research training and clinical innovation independent of funds for clinical training.

5. The ACC should reaffirm the primary role of the cardiovascular specialist in providing high quality, cost-effective evaluation and management services for patients with suspected or known cardiovascular disease. The academic cardiovascular health center should continue to participate in educational activities for the noncardiologist involved in cardiovascular care.

6. Academic cardiovascular health care centers should play a major role in the assessment of quality of cardiovascular care and in the development of data bases, practice guidelines and outcomes analysis.

7. There is a need for additional cardiovascular scientists with training in basic and clinical science.

8. To participate in cardiovascular patient care, the academic health center must develop efficiencies that allow participation in competitive managed care agreements.

9. Flexibility should be maintained in terms of training cardiovascular specialist to meet the cardiovascular needs of patients on the basis of new problems and opportunities in cardiovascular disease.

References


8. Accreditation Council for Graduate Medical Education. Special requirements for graduate education in the subspecialties of internal medicine, September 21, 1992.

