

30th Bethesda Conference

The Future of Academic Cardiology (1998)

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BETHESDA CONFERENCE REPORT

30th Bethesda Conference: The Future of Academic Cardiology*

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This Conference, sponsored by the American College of Cardiology, was held at Heart House, Bethesda, Maryland, October 26–27, 1998.

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*The recommendations set forth in this report are those of the Conference participants and do not necessarily reflect the official position of the American College of Cardiology.

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30TH BETHESDA CONFERENCE

Introduction

Kenneth Lee Baughman, MD, FACC, *Conference Co-Chair*,
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Academic cardiology has been largely responsible for the medical advances which have resulted in the dramatic decline in death rates from cardiovascular disease over the last 30 years in the United States. Changes in the health care environment including managed care, decreased physician payment for patient care activities, diminished industry support and a stringent regulatory environment have had a profound effect on the academic medical center. These changes have reduced funding for medical research and the training of physicians and have pitted the academic medical centers against the private sector in competition for patients and scarce health care resources. Most academic centers were ill equipped to deal effectively with these changes. Consequently some have declared bankruptcy, and many are in financial crisis. The American College of Cardiology has grown increasingly concerned about the effect of the current environment on the nation's academic cardiology programs. The 30th Bethesda Conference "The Future of Academic Cardiology" was convened to address these concerns. The conference organizers assembled cardiologists from academic medical centers and the private sector as well as experts from organized medicine, industry, government and payers. The purpose of the Bethesda Conference was not only to define market force corrections necessary for the survival of academic cardiology, but also to formulate a paradigm that would sustain academic medical centers into the next millennium.

The tripartite mission of academic cardiology is to train adult and pediatric cardiologists, to conduct research in cardiovascular diseases and to provide secondary and tertiary patient care. Although all academic programs share these missions, medical centers differ in their ability to support all of the missions well. In addition, some are state supported, others are private institutions, and others are hospital-based training programs not associated with a university medical center. Thus, not all of the recommendations put forth in this document will be applicable to each academic cardiology program. However, the conference did attempt to provide basic principles that should guide the future development of academic cardiology. Although the document is primarily directed toward the future of academic cardiology, there may be aspects that would be of value to other specialties and the academic enterprise.

To sustain academic cardiology in the future, a new paradigm must be developed within the academic medical center. This paradigm encourages product line development

and integration across divisions and traditional departments. The product line integration would include all three missions of academic cardiology including patient care, research and teaching. The product line concept would allow a seamless transition of patients through the health care system with an integrated approach eliminating duplication of effort and allowing cost savings. Not only patient care resources, but also those used for teaching, research and administration would be consolidated. Traditional relationships would exist between product line divisions and their academic departments for promotion, teaching and taxation. However, some expenses previously supported by departments would be assumed by the product line entity and taxation reduced appropriately. Product line development could expand to other entities within the academic medical center such as gastroenterologic services and thoracic care.

The conference participants strongly believed that the traditional medical school expectations that faculty excel in all three academic missions are no longer relevant in the current academic milieu. The expansion of the knowledge base in all three areas, the dedication necessary to make each area financially self-sustaining and the effort required to stay at the cutting edge of each of these endeavors make the individual capable of succeeding in all three an anachronism. Likewise, the conference participants believed that the model which demands research faculty members make brief appearances on the wards or in the clinic a few times a year is not an adequate model for the training and patient care missions of the institution. Nor is the clinician who performs a few experiments funded by clinical earnings a useful model for advancing the science of cardiovascular disease. Specialization in one or two of the missions is required, and consequently most medical schools have developed faculty tracks such as the clinician-educator, the clinician-scholar or the research scientist.

The conference participants believed that each of these academic tracks should have its own criteria for evaluating faculty performance, its own criteria for promotion and its own concept of tenure or job security. The classic tenure track also is anachronistic. Although the conference believed that some element of job security was important, the traditional tenure system should be reevaluated. A review policy to make sure that the faculty member is still performing at the level that originally granted them tenure and adjustment in salary or position retention based on this

review should be initiated. Also, faculty must be trained to function as part of a team with other health care professionals and workers. All on the team should be respected for their unique contribution to the enterprise and a spirit of collegiality developed. Finally, those who attended the conference were very concerned that academic cardiology is not attracting large numbers of women and minorities and believed that increased sensitivity to the special needs of these groups needs to be taken into consideration in the future academic cardiology model.

The survival of academic cardiology is dependent on the operation of the entity as a business. Patient care revenues which previously were used to support the teaching and research mission are no longer available. Specifically, budgets must be developed to support teaching, research, patient care and administration. Those components of the mission most in jeopardy are teaching and the support of young investigators. The teaching performed by the cardiovascular faculty must be quantitated and segregated into that which is integrated into, and that which is separate and distinct from, patient care activities. The proportion of Medicare Part A funds intended for faculty supervision of patient care and teaching should be directed toward those performing these activities. Endowment funds should be raised specifically to fund young investigators and to promote dedicated teaching activities. There must be an alignment of the incentives between the cardiology sections, the health care system and the academic hospitals. This alignment may allow resources to be allocated to cardiology sections to support appropriate activities which directly and indirectly benefit the health care system. Finally, it is important that the leaders of future academic cardiology sections or cardiovascular institutes be trained as business persons capable of understanding the intricacies of health care finance.

A collaborative arrangement with physicians in the private sector is important for all three missions of academic cardiology. The academic cardiology section needs help with teaching, especially that performed by accomplished clinicians in outpatient venues. Practitioners can help with the recruitment of patients for clinical trials and other clinical research activities that will not only increase the number of patients in the trials, but will bring new treatments and procedures to a broader spectrum of subjects. Finally, private physicians can help maintain an adequate

volume of patients at the academic center to sustain its missions by helping to support clinical activities in collaboration with the academic center. An example of such an activity may be cardiac transplantation or a highly specialized and investigational technique such as transmyocardial revascularization. This collaboration should be accomplished in a fashion that allows all involved to benefit from the interaction, including the practitioner and his or her patient. Some academic medical centers have developed strong collaborative relationships with practitioners, including shared resource and clinical care business opportunities. Although the conference participants realized that this collaboration with the private sector will be a challenge in today's highly competitive markets, they believed that this is the only system that would insure the sustained success of academic cardiology.

The academic medical center should be preserved by the health care system and supported by academic cardiology. Although some of the research and teaching missions and much of the patient care can be accomplished in peripheral institutions, the academic medical center embodies certain features that warrant its continuation and support. The academic medical center's primary role is the maintenance of a milieu of research investigation, innovation and teaching throughout all of its activities. This milieu and collaboration has spawned many of the discoveries that have dramatically influenced science and ultimately, patients. This milieu cannot be maintained in a dispersed system that does not support all three primary missions as core objectives.

The American public, and many involved in health care finance, are unaware of the true cost of research and education. It is important that the true educational cost associated with the production of a cardiologist be accurately determined. The value of these trained cardiologists, most of whom will ultimately practice in the community, must be defined. The importance of the allocation of the cost of training to the public and payers must be justified by the value to the community. Similarly, the rigorous nature of basic investigation and clinical research needs to be transmitted to the American people, who ultimately support and benefit from research investigation. Only through such educational efforts can the support that academic cardiology sections have received in the past be preserved or enhanced in the future.

TASK FORCES

Task Force 1: Clinical Care

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PURPOSE OF CLINICAL CARE IN THE ACADEMIC MEDICAL CENTER

Academic cardiovascular programs are currently defined as subspecialty programs committed to advancing clinical care, promoting innovative basic and clinical research and fostering comprehensive teaching of all health care professionals in cardiovascular diseases. The unique integration of these commitments distinguishes an academic medical center from community hospitals, research foundations and pharmaceutical companies and enhances the opportunities to improve overall medical care. Academic cardiovascular programs provide optimal patient care by applying state-of-the-art technology, the most recent advances in medical science and the medical expertise of acknowledged opinion leaders and experienced clinicians. Such programs may or may not be associated with a university or a single teaching hospital, may vary in relationships to community health care providers and may or may not have single leadership, but all remain committed as their primary purpose to all three missions. A critical mass of both expertise and clinical challenges in an environment of questioning is central to its success.

Indeed, academic cardiovascular programs have been highly successful in achieving the goals of each of these three missions. Over the past several decades, academic cardiovascular programs have trained large numbers of excellent clinicians who have taken their expertise into the community, effected major changes in the care of patients with cardiovascular disease through innovative translational research and developed high technology approaches to the care of patients with cardiovascular disease, resulting in improved outcomes with lower mortality and morbidity and at decreased costs. Paradoxically, it is these successes that in many ways have led to the conundrum now facing the academic cardiovascular program. Their success in training cardiovascular specialists and appropriately exporting expertise and technology to the community now makes it increasingly difficult for academic cardiovascular divisions to be differentiated from other providers on the basis of quality of care and to compete on an economic basis without differentiation despite the costs of education and an increasing number of indigent patients. To confront these assorted pressures, some academic cardiovascular divisions have attempted to increase clinical volume, which has stressed traditional missions of teaching and research. The necessary changes in staff requirements or in academic expectations

have not been made, further confusing mission and long-term goals.

In the earlier era of fee-for-service reimbursements, cardiovascular divisions provided substantial revenues for both the academic medical center as well as for non-revenue-generating divisions within the departments of medicine or pediatrics. Furthermore, many academic centers had a virtual monopoly on high technology services including interventional coronary procedures and high risk coronary revascularization. Professional revenues as well as public resources were readily available to support dedicated faculty, and to provide high quality teaching and outstanding clinical care. But revolutionary changes in the organization and delivery of medical care in this country threaten the integrity of the academic medical center, necessitating recent restructuring of purpose and redefinition of mission to be a more integral component of health care delivery systems (1-4). Recent catastrophic failures have resulted from academic medical centers failing to establish links, isolating themselves in an adversarial managed care environment (5) and being too late in recognizing the strength of partnering with community providers.

Current organizational structures of academic medical centers compound the dilemmas of the current cardiovascular academic division (6). Diminished third party reimbursements, decreased public funding for training and smaller profit margins on high technology procedures have resulted in substantial decreases in cardiology-based revenues. Without an accompanying decrease in cost shifting within the academic department of medicine/pediatrics, divisions of cardiology are still held responsible for subsidizing non-revenue-generating divisions within the departments and are held accountable to a different economic standard, making it impossible for academic cardiology divisions to be competitive with community specialists on an equitable footing.

Academic cardiovascular divisions have also traditionally had a monopoly on investigational drugs, biologics and devices. They used superspecialized physicians possessing a unique knowledge base compared with the community, but this expertise has become more readily available. Investigational device, drug and biologic sponsors have found enrollment of patients at times easier in the community hospital with lower overhead, fewer bureaucratic impediments and more ready access to patients and have moved their studies to these new partners who have physicians of comparable expertise.

In the next decade, academic cardiovascular programs must pursue business-like practices and compete aggressively within the market if the traditional mission is to be sustained. Such competition should be in partnership with other colleagues within the academic medical center or in community hospitals. They must restructure relationships within and outside the academic medical center to meet these challenges. This will require modification in external relationships as well as internal organization summarized as follows:

External relationships.

- Multidisciplinary integration of programs and personnel that may not always be in the division of cardiology or departments of medicine/pediatrics aligned with product line services.
- Effective integration/coordination with nonacademic colleagues to accomplish teaching, research and patient care, redrawing the boundaries of academic cardiovascular programs.
- Effective relationships fostered by mutual respect of individual contributions to a joint purpose, where financial relationships may be but one component of this relationship.
- Reconnect with primary patient populations through excellence of clinical products and fiscally sound relationships.

Internal restructuring.

- Development of cardiovascular units to include personnel and programs separate from the departments of medicine/pediatrics whose fiscal and governing structure optimizes the likelihood of success.
- Leveraging intellectual capital by developing new or more effective business products (e.g., disease management, faculty-owned companies or an expanded model of clinical research).
- Active support for development of clinical performance measures and outcomes that result in benchmarks.

This report will assess these opportunities, recognizing the variation in needs from community to community. Such long-term restructuring of academic cardiovascular programs will be central to the success of all cardiovascular specialists and will improve the access of all patients to the best cardiovascular care.

CURRENT CHALLENGES

General Considerations

Although community providers are under the same ultimate financial constraints, the academic cardiovascular program has unique challenges that must be addressed. These include the following:

1. The funding mechanisms for medical education are unclear and differentially burden the cost of medical

education to academic medical centers, yet all payers benefit from the products of this education process.

2. The current decision-making process in academic organizations is often bureaucratic, cumbersome and too slow for rapid response to changes in the marketplace.
3. Multiple agendas within an academic medical center and the multiplicity of priorities and commitments often make response to market forces slow and tedious.
4. The ability of each academic department within an academic medical center to delay or stall critical decisions burdens the deliberations.
5. Due to more limited and focused agendas, for-profit institutions and other health care systems without the academic medical center overhead and mission have more effectively invested resources in competitive strategies for clinical care.
6. Academic medical centers have traditionally relied on quality of care as a differentiating factor, but such quality is often difficult to measure and exists in the community.
7. The multiple agendas and missions within an academic medical center dilute the focus on clinical care. In many departments of medicine/pediatrics, for example, emphasis has been restricted to research productivity at the expense of developing appropriate clinical and teaching programs.
8. Rigid stratification of teaching techniques/paradigms also limits any advantage of an academic medical center.
9. The additional cost of training house staff and students is above and beyond the costs of medical care without a structure to finance this commitment.
10. Relationships between academic medical centers and community providers have often been strained and ineffective.
11. Academic medical centers strive to develop a profile of tertiary and quaternary care which inherently provides them with adverse selection, and high acuity of illness. In an environment of capitation and prospective payments, such adverse selection may be detrimental to the survival of the academic medical center.
12. Academic medical centers have often focused on care of the underinsured and fragile population, constituents of our society who are by and large ignored by the current forces of managed care and other payers. Research performed by the Association of American Medical Colleges suggests that the burden of this care in academic medical centers is increasing and may be of major consequence for the future of the academic program.
13. Current and proposed payment policies of the Health Care Financing Administration fail to recognize the unique role of academic medical centers in the delivery of health care services to Medicare beneficiaries and threaten the financial viability of institutions and programs that serve a critical public good.
14. Each academic cardiovascular program has a critical

and minimal patient volume that is central to its missions, but cannot resort to historical strategies to maintain patient referrals fundamental to its teaching and research missions.

15. Traditional organizational schemes of academic departments have placed cardiovascular programs with less related specialties, rather than with specialties such as cardiovascular surgery, interventional radiology, cardiovascular anesthesia and pediatric cardiology.

Challenges to the Academic Cardiovascular Program

Academic medical centers have had increasing difficulty attracting sufficient patients, particularly in areas of the country in which managed care has achieved market dominance (7). Several factors render traditionally structured academic centers ineffective in the marketplace.

Shifting resources. The business of academic cardiovascular programs has historically relied on delivering high quality services and a monopoly in tertiary care of complex patients. However, they have succeeded in training outstanding physicians who have moved into the community. As high quality cardiovascular resources have proliferated in the community, academic cardiovascular programs have lost much of this traditional advantage to the community provider.

Separation from the community. Traditional academic cardiovascular programs have segregated themselves from their primary care feeder stream to pursue their tertiary and quaternary care goals and have had difficulty constructing the provider networks that are necessary to contract under managed care. Attempts by some academic programs to develop their own feeder programs have further alienated the community. The teaching model in which attending physicians were on service for only a month or two per year and most of the communication with referring physicians was conducted by residents often fails to establish the necessary relationships with community physicians that they deserve.

Noncompetitive structure. The structure of the academic medical center has failed to provide sufficient incentive in patient care and tends to inhibit collaboration among providers of related services outside the departments of medicine/pediatrics. Cardiology divisions have often been disproportionately viewed as the major revenue source for departments of medicine/pediatrics. The subservience of the cardiology division to the department of medicine often creates disincentives against profitable initiatives and may stymie appropriate collaboration with the hospital, with the cardiothoracic surgery division and with community-based physicians. There is often a lack of alignment between departments of medicine/pediatrics and divisions of cardiology, and economic structures may neither support academic cardiology nor foster profitability within divisions of cardiology. Because procedural revenue has decreased, this

problem has become a major issue in most departments of medicine.

Cardiology divisions at risk. With the development of high cost procedures such as interventional cardiology, large clinical revenues were available to support cardiology divisions and departments of medicine. With the expansion of interventional and bypass programs to community-based hospitals, academic cardiology divisions have been placed at risk. This has been further influenced by these community hospitals having cardiology and interventional training programs, which increases the competition from the community with additional available practitioners. Furthermore, with falling reimbursements and increasing costs of these technical innovations, it may be more cost-effective to shift less complex procedures to the community, further reducing revenue to the cardiology division, departments of medicine/pediatrics and ultimately the academic medical center.

Changing environment. The forgiving environment of state support and fee for service medicine has been replaced by declining revenues, the uncertain future of managed care and the progressive loss of government support. This threatens not only the health but, in some cases, the survival of academic medical centers.

Primary care emphasis. Current economic forces tend to organize delivery of health care around primary care physicians. Academic medical centers have traditionally focused on specialty care. Patients are often channeled away from academic medical centers in newly integrated health care delivery systems. Building new relationships with the physicians in the region when these relationships have been strained in the past is difficult and many times impossible, particularly in geographic areas with heavy penetration of managed care contracting. This problem may also exist within an academic medical center when primary care physicians provide an inadequate referral base for cardiovascular programs.

Internal structure. Many of the challenges to academic medical centers are internal, however, and must be solved by the center. These include a faculty structure in which each department functions with little accountability to the whole. Whereas competitors have a focus on efficient health care delivery, academic medical centers try to excel simultaneously in research, teaching and patient care. The impact of this approach is substantial and it may not be tolerable.

Performance measures. In the past, academic medical centers have considered effective management of difficult cases as a quality indicator, whereas the managed care industry and government define quality as adherence to Health Plan Data and Information Set indicators. Thus, statistical comparisons do not accurately reflect quality when applied to tertiary and quaternary patients in academic medical centers. This is best reflected in the number of patients who are transferred from community hospitals and

other tertiary care centers for high risk interventions or surgery. This information is not available on current standard databases and underscores the importance of the development of better measures of clinical performance and outcomes with resultant benchmark criteria.

Teaching models/mission. Academic medical centers have historically developed models for teaching and attempted to adapt them for patient care rather than the reverse. The structure of these services follow guidelines imposed by residency review committees and often are ill suited for clinical care. Placing specialty patients on general teaching services requires an attending physician who may not be suited to provide specialist care. The quality of patient care can be supported by liberal use of consultants, but precious hours and dollars are lost in the process. Trainees in the outpatient clinic can also produce inefficiency and patient dissatisfaction if the teaching model is not well constructed. In addition, variation in practice patterns from one physician to another is as prevalent in academic medical centers as in community counterparts. Following a single care path with a new contingent of residents each month is challenging. Furthermore, academic cardiologists are sometimes removed from more highly remunerative activities on the cardiology services to treat noncardiac patients on the general internal medicine service.

Faculty expectations. Faculty members who chose academic careers in another era are often disgruntled because the expectations have changed and their ability to meet their career goals is threatened. Meeting the goals of the institution with people who are dissatisfied, and who often have tenure, is a major challenge to the medical school and therefore the academic medical center. In cardiology, talented clinicians and proceduralists are often underappreciated during promotional reviews and are instead attracted to community-based opportunities. Clinical contributions are not measurable by classic academic scales and are not as central to promotion as education and research contributions. Furthermore, cardiologists are often held to a productivity standard that is different than that of other department of medicine members. In addition, for those in the clinical arena, tenure consideration during promotion is often of lesser value.

Reimbursement/documentation. The future holds more challenges. New documentation requirements of the activity of the faculty imposed by the Health Care Financing Administration are costly to implement. In addition, changes in the Practice Expense component of the Medicare fee schedule will disproportionately affect specialty-laden faculties and especially cardiology divisions. Continued pressure on reimbursement is likely, and the appetite for cost containment of the nation has not yet been sated.

ADVANTAGES OF ACADEMIC MEDICAL CENTERS

Despite considerable challenges confronting academic medical centers in the immediate future, such centers have unique capabilities/strategic advantages that should be used to confront the challenges. These advantages can enhance the opportunities for integration of research, teaching and clinical care while providing incentives for potential relationships with community providers.

Expertise. Academic medical centers are capable of providing a broad spectrum of expertise that should provide for unique capabilities in innovation of clinical care. Some subspecialists may be used in the evolution of critical pathways, product line development and restructuring of clinical care models (8). Moreover, the depth of expertise may make reorganization across product lines more feasible in an academic medical center than in the traditional context of specialty health care providers. In many locales, academic programs offer unique expertise in high risk angioplasty, congestive heart failure/transplantation, electrophysiology, adults with congenital heart disease and cardiac genetics.

Application of basic research to clinical practice. The opportunities for translational research from basic science to the bedside represent enormous growth opportunities for academic medical centers. Indeed it is the opportunity to link sophisticated investigator-initiated biological research with clinical expertise that most strongly differentiates the academic medical center from community providers and industry. Recent basic research discoveries have led to novel therapies that include, but are not limited to, brachytherapy for restenosis, percutaneous transmyocardial laser revascularization to stimulate angiogenesis and vascular endothelial growth factor (VEGF) for peripheral vascular disease, and the promise of gene transfer technology presents unique opportunities for academic medical centers to expand their clinical responsibilities. Alignment between industry and academic medical centers in translational research provides enhanced opportunities for academic medical centers to market themselves as the providers of true quaternary care to a knowledgeable and discerning patient population. Moreover, the American patient population continues to demand access to specialists who are capable of the most sophisticated medical care. The alignment of the academic medical center to industry represents an important strategic advantage in this regard.

The academic medical center needs to be more aggressive at protecting and developing the intellectual property of its faculty. This will clearly be a source of future revenue during this time of rapid growth in biomedical and genetic engineering. If patents can be licensed to companies in the same geographic region as the academic medical center, that can be of benefit to the local community. If faculty are encouraged to develop companies so that patents they develop can be licensed back to faculty companies, additional methods

will be created to fund research as well as maintain faculty in the academic medical center.

Academic medical centers that have successfully partnered with community physicians possess a unique opportunity to enroll large numbers of patients in industry-sponsored trials. Academic medical centers often possess the opinion leaders who provide the impetus to these trials, and whose participation in the design, implementation and data analysis of these trials is of importance. Better marketing of these two advantages by the academic medical center to industry can also serve as a revenue source in the future.

However, when industry is the initiator of new drugs, biologics or devices, the academic medical center is often not the partner they currently seek for initial patient trials. Recognized expertise is in the community, the overhead costs are often lower and bureaucratic obstacles are typically less burdensome. The academic cardiology division cannot afford to surrender this traditional relationship with industry and must continue to compete for clinical studies generated from basic science work performed in industry.

Organizational structure. The organizational structure of academic medical centers might suggest that there can be a closer alignment of purpose between faculty, hospital and medical school than in the community hospital with community specialists. This potential alignment is not often strategically explored, as traditional agendas have been perpetuated.

Administrative structure. An important advantage of the academic cardiology program is that the practitioners within the academic medical center have defined leadership and are used by a single entity. This structure is in marked contrast to nonacademic medical centers that must contend with multiple group practices and which often have unwieldy bylaws requiring a majority vote to enact any new practice patterns or to establish contractual relationships with insurers. Furthermore, it provides a mechanism by which physicians can be given incentive to maintain a relatively consistent practice pattern and to comply with new practice guidelines.

Brand equity. The American population will continue to demand access to specialty care. This is manifest by point-of-service options, plateau enrollment in heavily controlled managed care plans and continued requests for subspecialty services. The brand equity that academic medical centers bring to specialty care has not been sufficiently exploited by many centers. Patients will never want to be excluded from the "court of last resort," and academic medical centers are in the unique position of providing such quaternary care. In addition, evidence of patient concern about not being able to choose their own physicians is responsible for the negative backlash against Health Maintenance Organizations appearing in recent U.S. congressional campaigns.

Information systems. Whatever occurs in the evolution of American medicine, information system capabilities will be

central to the long-term success of health care providers. The integration of information systems with clinical care, medical management and any prospective payment system will occur. Academic medical centers may be in the unique position to take a leadership role in the evolution of such information systems that integrates inpatient and outpatient activity and larger system approaches. In the short term, community providers may have more relevant information systems that address their day-to-day needs. The academic medical center also has had a traditional mission to provide access to computerized reference services and innovative educational material, but the widespread availability of Internet services has deeply discounted this traditional role.

POTENTIAL SOLUTIONS/OPPORTUNITIES

Academic medical centers are poised to redefine their relationships with the community and the departments of medicine/pediatrics in a fashion that can be instrumental to their long-term viability (6,9-11). Geographic differences and rapidly moving market forces make a standardized approach impossible, but a number of different strategies have already proven to be successful. Whatever solution or opportunity is identified, academic medical centers must be proactive in its initiation.

External Relationships

Acquire primary care practices. The acquisition of primary care practices has clearly channeled specialty care to a number of academic medical centers. This has allowed them to maintain a high census during times of declining specialty care needs. However, such acquisitions have been a financial burden, and are now being reconsidered by a number of integrated health care systems. Moreover, shifting an acquired practitioner from a private practice model to a staff model for remuneration purposes has consistently resulted in reduced provider productivity. Academic cardiovascular programs have benefited from these department/institutional initiatives, but should not rely on them as their sole future strategy.

Develop primary care networks. Although such networks have usually been directed toward the development of a system capable of accepting large managed care contracts, their intended consequence has also been to rechannel specialty care to the academic medical center associated with such networks. Moreover, the investment in the infrastructure of such networks has primarily benefited the primary care physicians and only indirectly the specialists.

Subspecialty care clinics/outreach programs. Establishing subspecialty clinics in conjunction with community physicians has been welcome in many regions. Although some community specialists will certainly view this as direct competition, the ability of academic specialists to work closely with community physicians will often be perceived as enhancing the capabilities of community physicians. The

academic medical center benefits because new sources of potential patient referrals are created. These relationships can often be established based on "goodwill" without formal contracts. This is in keeping with traditional referral patterns that are based on mutual respect and personal relationships and not exclusive contracts. However, it is important to note that one means of changing referral patterns is providing financial incentive. Moreover, inviting community specialists to participate in other missions of the academic medical center (teaching, clinical research protocols) serves to enhance their participation/affiliation/allegiance to the long-term mission of academic medical centers.

Partnering of community hospitals and academic specialists serves a similar need. This outreach provides community hospitals with sub-subspecialty care that might not otherwise be available to them.

Subspecialty carve outs. There are a number of potential carve-outs that may emerge in managed care for subspecialty care and will depend upon the degree of managed care penetration. Such carve-outs might include diabetes, hypertension, end-stage renal disease and congestive heart failure. They offer the ability of an academic cardiovascular program to offer cardiology capitated carve-out products as managed care evolves. This model requires the ability to offer regional cardiology services, which can be capitalized by the large academic medical center, and provides high quality practitioners for managed care providers. It also potentially provides for cost saving, since a single employer is identified so practice patterns can be uniform and respond quickly to the rapidly changing environment of health care reform. Additional cost savings can also be realized because this model allows shifting of procedures such as stress tests, echocardiograms and diagnostic catheterization to community hospitals where they may be able to be performed at lower costs, while shifting more complex procedures to the academic medical center, fostering mutual benefit. Such carve-outs by definition require a broad geographic distribution of academic center-related cardiologists and are an important outgrowth of long-term specialty outreach strategies.

Leasing arrangements. Full-time interventional faculty or sub-subspecialists in the academic division of cardiology are leased to community clinical cardiologists who wish an affiliation with the academic medical center but do not wish to be purchased. The community cardiologist pays a portion of the academic salary and in exchange, the academic clinician/interventionalist receives patients for interventional procedures or clinical care. The academic medical center gains new referrals and associated referrals to other cardiology services while the patient is in hospital. The community cardiologist can then legally receive part of the professional fees from the interventions or other procedures performed, since the academic cardiologist is a part-time employee of the community practice.

Purchase of cardiology practices. Due to falling reimbursements and excessive numbers of cardiologists in the community, high quality community cardiologists may consider being purchased by academic medical centers. In exchange, they expect regional exclusivity within the academic cardiology network and full membership in any network products. They are also provided with long-term contracts with minimum salary guarantees. Once purchased, these groups include the academic center as a site for interventional procedures. Because most academic medical centers expect minimal numbers of interventional procedures to be performed in their facilities, these purchases increase the academic centers' interventional patient volumes and associated inpatient admissions. Once these physicians develop relationships with other academic specialists including electrophysiology or congestive heart failure/transplantation, additional referrals to the academic medical center may occur. However, preexisting referral patterns may abrogate the ability of purchased practitioners to move their cases to the academic center if the groups referring primary care physicians demand that their patients remain at the nonacademic medical center.

Internal Restructuring

The future success of the academic cardiovascular division depends on its ability to leverage a number of the potential market advantages that it possesses in a business-like fashion to maximize their impact. These include:

Broad clinical strength. Community hospitals often possess cardiologists with skill and technical expertise equal to the faculty in academic divisions. However, academic programs often have greater breadth of expertise with sub-subspecialists in congenital heart disease in the adult, electrophysiology, congestive heart failure/transplantation and outcomes analysis.

Align incentives. The academic medical center should foster an environment that is conducive to alignment of incentives among physician groups (e.g., cardiology and cardiothoracic surgery divisions) and between physicians and hospitals. Such alignment may be instrumental in augmenting revenue and managing down institutional costs to maximize profitability of the entire system. These factors—academically credible clinical strengths and an environment conducive to aligning incentives—are often not adequately leveraged by academic centers, in large part because of bureaucratic obstacles, a lack of mutual trust among the various parties and fear, on the part of departments of medicine/pediatrics, of losing control.

Become cost-competitive. It is imperative for survival that academic medical centers provide care at costs that are competitive with surrounding community hospitals. The academic medical center faces this challenge with a number of intrinsic disadvantages and some advantages which have not been adequately developed and deployed. In many

instances the faculty practice only at the academic hospital, and practice at the academic hospital is dominated by faculty members. This facilitates aligning financial incentives to reduce cost. When patients' length of stay is reduced, the reimbursement to the physician correspondingly drops. But the physician effort required to produce the shortened length of stay may increase. If physician and hospital incentives are allowed to conflict, improvement in performance can be achieved only by imposition of rules, guidelines and threats; and success will be limited. In creating a funds flow process in which the academic departments benefit as the hospital thrives it becomes possible for the faculty member to provide the extra effort required for good fiscal results. Because the faculty may be employees of the health system, novel financial arrangements may be constructed between the hospital and the academic practitioner. Cost-competitive care can be delivered by other means; the academic medical center is an ideal environment to standardize purchasing and inventory items; physician involvement can produce substantial savings through bulk purchases of high-end technical equipment.

Minimize variation in practice patterns. Variation in practice patterns increases cost of medical care without measurable influence on quality. Although one can argue which group of physicians is offering procedures at the "correct" frequency, there is rarely evidence that the general health of the population treated with the higher number of procedures is better. Academic medical centers might prefer to consider their practices evidence-based, but this may not always be the case. The same clinical history, stress test result and stenosis identified by coronary angiography may trigger variations in coronary intervention or medical therapy.

The value of variation in patterns of acceptable practices must also be readdressed. The educational mission traditionally requires proof that more than one direction of care is acceptable. A standard approach to care may reduce inventory costs and provide routines that allow nursing and technical personnel to become very skilled and efficient in providing care. However, such an approach is viewed by many as antithetical to the academic environment in which the trainee is traditionally thought to benefit by observing multiple paths to the same end. The trainee is considered to be in a better position to judge the best way after this varied experience. This precept must be reconsidered, for this educational approach is prohibitively expensive and scientifically flawed. To propose that the educational "best way" can be determined by a trainee based on uncontrolled experiments in which patients vary, entry criteria are not defined and end points often are not collected or analyzed except in an anecdotal fashion is inconsistent with our collective scientific heritage.

Define training/workforce. Unlike our colleagues in many of the surgical subspecialties, adult cardiologists have failed to limit the number of physicians that are trained in

cardiovascular disease each year. Legal concerns about restraint of trade are usually articulated as justification for lack of action. This fact, more so than any other, has negatively affected the economics of cardiovascular care in the U.S. and might well contribute to the actual or perceived overuse of cardiovascular services in many geographic regions. Although many academic cardiovascular programs have substantially restricted the number of fellows that are enrolled each year in their cardiovascular training programs, nonacademically affiliated and smaller training programs have failed to alter their enrollments. In fact, any reduction in the smaller training programs threatens their viability with regulatory bodies and the institutional purpose that they serve. Furthermore, many of these community-based training programs barely meet or fail to meet the basic requirements provided by the American College of Cardiology. Their clinical volume often precludes adequate training in sub-subspecialty areas, including electrophysiology, preventive cardiology, heart failure and cardiac transplantation and adequate six-month research experience resulting in scholarly publications. Although there are many examples of excellent non-university-affiliated programs that meet these requirements, many more cannot. Since such training is a requirement of certification, it is imperative that the academic cardiovascular programs, the American College of Cardiology and the Accreditation Council for Graduate Medical Education address this issue.

Nonphysician extenders. Academic cardiovascular programs have often been slow to optimize the value of physician extenders to improve efficiency of clinical care. Residents and fellows are traditionally integrated into the continuum of clinical care as part of the teaching mission, whereas community providers have markedly improved their efficiency with nurse practitioners, clinical nurse specialists or physician's assistants. It now becomes a challenge to the academic program to incorporate these valued non-physician colleagues in a fashion that compliments the educational mission.

Advocate change in payment policies of the Health Care

Financing Administration. Current and proposed payment policies of the Health Care Financing Administration should be revised to diminish their adverse effects on clinical practice at academic medical centers. Specifically, the policies should:

- Recognize uncompensated care as a legitimate physician practice expense.
- Provide adjustments to the outpatient prospective payment system to recognize the added costs of teaching and providing care to populations with a disproportionate share of Medicaid recipients.
- Extend the exception for teaching physician supervision of residents to all specialties that provide evaluation and management services.
- Provide payment to teaching physicians for the services of

medical students provided under direct physician supervision.

- Reduce the physician presence requirements of the teaching physician rules for private practitioners willing to teach residents in their offices.
- Provide adequate payment to support the care of children and adults with congenital heart defects.

Any future discussion of payment of graduate medical education by payers other than Medicare should recognize that the current level of funding may be inadequate. In other words, some of the contributions to the funding of graduate medical education by payers other than Medicare should be in addition to, not as a substitute for Medicare funding.

Relationship between the academic cardiovascular division and the departments of medicine/pediatrics. The academic mission of the departments of medicine/pediatrics is essential, but academic cardiology programs have a traditional relationship with their department of medicine that needs to be reexamined. Although the departments of medicine/pediatrics continue to be central for academic recruitment and credentialing, there are other constituents and partners for the academic cardiovascular programs, which include hospital leadership and integrated networks among others, whose needs must be addressed. A restructured academic cardiovascular division will ultimately be of more benefit to a department and its other subspecialty divisions than the current fragmented approach.

The present alignment of the various subspecialties into departments of medicine, pediatrics, surgery and obstetrics and gynecology dates back to the late 1800s, a time when cardiologists' primary tools were their hands and their stethoscopes. However, like all of medicine, the practice of cardiology has changed dramatically. Indeed, cardiologists are sub-specialized with independent board certification in at least two of these highly specialized areas, electrophysiology and interventional cardiology. Furthermore, the primary point of service is more often an interventional laboratory than an outpatient clinic, and the practice of cardiology has far more in common both intellectually and technically with the surgical subspecialties than with traditional medical subspecialties. Despite these differences, cardiology divisions are still expected to support less remunerative divisions of the departments of medicine/pediatrics, and meet more robust productivity standards. However, this disparity is far from novel. Over the past several decades, similar disparities existed between the goals of the surgical subspecialties and those of the department of surgery, resulting in the development of departments of otorhinolaryngology, neurosurgery and cardiothoracic surgery. Even in schools of medicine, divisions of neurology and dermatology have become independent departments. However, perhaps the most relevant models for the cardiology programs of the future are the 50 centers of excellence in oncologic disease that have been developed at academic centers across the U.S. These centers of excellence, funded

both privately and publicly, have had substantive effects on the care of patients with malignancies and have provided multidisciplinary and collaborative centers allowing for outstanding levels of patient care, rapid transition of new technology to the patient and interdisciplinary collaborative research. These stand-alone facilities compete effectively for patients with community hospitals and practitioners and in some ways exist as economically independent entities. By having administrative responsibilities to a larger health system, they are able to bypass much of the academic bureaucracy that has slowed the ability of these academic divisions to respond to change.

A number of different and successful models should be considered by the academic cardiology division. Cardiovascular specialists at the Washington Hospital Center have developed a superb organization structure for cardiovascular care outside the traditional department of medicine. Their clinical trials in interventional cardiology are leadership investigations, their commitment to basic research is expanding and their outreach/merger with other institutions or individuals makes them competitive with the most prestigious institutions in the mid-Atlantic States. In other regions, for-profit ventures in cardiac catheterization have proven to be fiscally sound and serve as an example to academic cardiology programs for their efficient business-like clinical care.

Several cardiovascular centers have been successfully integrated into the academic mission of their respective institutions; Mount Sinai Medical Center's Cardiovascular Institute and the Cardiovascular Institute at the University of Pittsburgh Medical Center are perhaps the most compelling current examples. Common characteristics of these efforts include advisory boards responsive to the governing health care system, horizontal multidisciplinary integration across clinical care and all research endeavors and independence from their traditional departments to forge new community relationships and to develop marketing and philanthropic strategies while maintaining fiscal responsibilities to and academic credentialing by their respective departments and medical school.

OPERATIONAL CHANGES

There are a number of operational changes that might be considered by academic cardiovascular programs.

Hospitalists

The evolution of hospitalists may in fact improve the efficiency and use of patient resources. Full-time individuals committed to inpatient care should result in reduced length of stay and hospital costs. However, the evolution of academic hospitalists will require substantial restructuring of traditional academic/clinical roles. The early involvement of an attending physician who can direct care in a way that moves the diagnostic workup in the most expeditious manner, and institutes therapy and discharges the patient at

the earliest reasonable moment is essential. This requires that alternative strategies must be created for training programs which benefit from a more leisurely hospital course.

Academic medical centers can provide care with low mortality and with acceptable lengths of stay when consideration is given to the severity of illness found in patients at an academic medical center (12). In many instances the costs of this care are still higher than in the community. These higher costs could be due to higher utilization or other inefficiencies or cost shifting from the educational mission and from the care of indigent patients. To the extent that they are the former they must be addressed.

Advantages of a Product Line Structure

Restructuring the delivery of cardiovascular services into a "product line" consistent with its academic mission and goals represents one mechanism for advancing the academic cardiovascular division toward a more competitive position. Furthermore, product line development links cardiologists with the most appropriate academic colleagues: those specializing in cardiothoracic surgery, pediatrics, interventional radiology and cardiac anesthesia. Such a structure might have the following characteristics and advantages:

1. Strengthened fiscal and operational ties among physician groups that provide related clinical service, in a structure that provides incentive for revenue-seeking and cost-cutting behavior.
2. Alignment of incentives between hospital and physicians.
3. Facilitation of initiatives toward maximizing quality while minimizing cost.
4. Facilitation of specialty-oriented risk contracting, serving to network the academic cardiovascular division and community providers by adding value through initiatives to a) reduce cost internally and b) implement medical and disease management programs system-wide.
5. Increased use of clinical care teams, including nonphysician health care extenders.

Product Standardization

Product standardization is difficult to implement, because specialists tend to cling to their favorite device or implement. In many instances the faculty members may have participated in the development of a device or performed crucial research to validate or improve a device or drug. When a hospital is forced to stock numerous brands of the same device it raises inventory costs for the hospital and it prevents the hospital from participating fully in volume discounts or in buying consortia that reduce costs. Academic cardiologists will be faced by requests from hospital administrators to use predominately a single brand of pacemaker, defibrillator or angioplasty catheter to offer their services to an adequate volume of patients. In some instances their choices will be limited by a buying consortium that is

remote from the institution. Therefore, regular meetings of a group of cardiologists to present patient cases for discussion to develop common practice patterns will be of importance. An example would be weekly conferences for the interventionalists in the catheterization laboratory. They may decide to develop consistent strategies for a given stenosis morphology, a specified IIb-IIIa antagonist only for angiographically identifiable clot, and they may choose a single "workhorse" balloon (from a single vendor) for the most straightforward stenoses. Such an approach is preferable to having such decisions imposed by a hospital administrator and can drive down operational expenses.

Clinical Pathways

Practice patterns can be standardized by using clinical pathways, practice guidelines and algorithms. The design and implementation of these tools is difficult and time-consuming but, if properly performed, can produce improvements in outcomes and reduction of cost. Resistance is often encountered by condemning these efforts as "cook-book medicine." They should never be used as an excuse for failing to meet the special needs of a patient or providing appropriate variation in care when the clinical situation demands it. Appropriate use, however, provides reminders for the implementation of care, a time-conserving set of standard orders that can be modified to fit the clinical situation and a template from which variation can be recorded. The greatest value of pathway development may accrue from the act of development in which experts and other providers come together to research current practice patterns in the hospital and agree on a uniform approach based on best evidence. Usually these groups can agree on a best approach, but when legitimate disagreements occur it provides a basis to compare the financial and clinical outcomes of patients treated in different ways.

In cardiology there are a number of conditions that are suitable for pathway development such as chest pain, myocardial infarction, pacemaker implantation or pulse generator change and coronary angiography for stable angina. Other conditions such as congestive heart failure will be more difficult, because the clinical course of a patient may be driven by a number of comorbidities that are found in these patients. In many complex conditions found in an academic medical center the best guidance may come from practice guidelines or algorithms which apply branching logic at key decision points rather than the linear course provided by a clinical pathway.

Communication of the pathways and guidelines is a challenge for academic medical centers because of the inclusion of fellows and residents in the care model. Geographical concentration of like patients allows nurses to become important promoters and educators of the residents in standard procedures. Storing materials on easily accessible and user-friendly electronic media or web pages complete with references, tables, diagrams and preprinted orders promotes use of the path and offers an educational resource

for the trainee. Limiting the number of faculty attending physicians to a small expert group who perform attending tasks regularly rather than assigning the attending task to a large group for one month per year favors standardization of practice and use of these tools. Finally, the use of "hospitalists" and physician extenders will also be important for accomplishing these goals.

Redesign Teaching Models

None of these efforts will be successful in producing the required results if the teaching model that has been used for decades continues without modification. In its most extreme form residents were permitted to evaluate and treat the patient with input sometime during the course of the admission from an attending physician who concentrated on the interesting pathophysiologic mechanisms and left the details of care to the residents. In many instances decisions with major cost implications have been made before the attending physician intervenes. The resident, who feels more pressure to be complete than to be cost-effective, orders more tests than necessary and relies on the laboratory examination rather than the history and physical examination to establish the diagnosis.

Whenever possible the attending physician must be expert in caring for the condition with which the patient presents. Relying on consultations in an academic medical center predisposes to the use of more resources and longer lengths of stay. Residency review committees which favor general wards for medical patients rather than specialty wards should reexamine their position. Patients whose reason for admission is cardiovascular disease should be cared for by cardiologists and patients with other illnesses should not be cared for by cardiologists in the academic setting, nor should cardiologists carry teaching responsibilities on noncardiovascular services.

Trainees are not and should not be faced with the primary responsibility of maintaining the fiscal integrity of the academic medical center. They should, however, be taught to practice medicine in a cost-effective manner, for that will be their obligation for the remainder of their careers. It is the obligation of their teachers to provide this education. Most important, many referring physicians want to communicate exclusively with the attending subspecialist and not with trainees. The commitment of the academic faculty to excellence in all the nuances of effective clinical care and communication must be identical to their commitment to excellence in research.

Disease Management

Disease management and medical management services: rationale. The future viability and competitiveness of academic cardiovascular divisions will depend on offering value to the community, particularly as services continue to shift to the community and community-based cardiologists assume more and more of the financial risk for health care. Academic cardiovascular divisions continue to have unique

expertise, facilities and stature that place them in an excellent position to add value through development and implementation of disease management and medical management services.

Medical management is an interactive process through which a medical manager interfaces with clinicians providing care, reviews the medical advisability and necessity of anticipated services, screens for service duplication and offers cost-effective alternatives. It has proven highly effective in reducing health care costs, but requires sophisticated information networking and processing. Disease management is a methodology designed to increase cost-effectiveness of care associated with a specific disease entity.

There is a substantial opportunity to network with community providers by offering subspecialty risk carve outs to primary care providers receiving capitation. Academically based cardiologists can offer such carve outs alone or in collaboration with community-based cardiologists. Medical management and disease management programs represent the principal strategies through which academic programs can help to manage down the cost for the community provider, while maintaining or improving quality of care.

Vying for the delivery of disease management services.

The academic medical center will be competing with a number of different contenders vying for the delivery of disease management services. These include commercial vendors, Health Maintenance Organizations, nonacademic and for-profit delivery systems and community-based management services organizations. The academic delivery system is in an excellent position to compete for delivery of disease management services, if it can a) leverage the expertise of its specialty services, particularly cardiology and b) forge the proper relationship with community-based providers.

The expertise and credibility of academic cardiovascular divisions create an immediate advantage over commercial vendors in the development and delivery of disease management services. Furthermore, the academic cardiovascular division need not make an immediate direct profit on the disease management services that it develops. Rather, it can: a) leverage the value of the product toward network development and b) derive value in the long term through managing down the costs of its own patients and those of its networked community physicians. Therefore, in contrast to commercial vendors, the academic cardiovascular division is positioned to deliver a less costly and more cost-effective product.

The challenge is for the academic medical center and the academic cardiovascular division to overcome the obstacles that impede them from benefiting from their natural advantages. These obstacles include the sluggish, unresponsive nature of the typical academic bureaucracy and reluctance to invest without demonstrable short-term gain. It is essential for the leadership of academic cardiovascular divisions to meet this challenge.

Marketing Strategies of Academic Medical Centers

Academic medical centers are in a unique position to develop and enhance their capabilities in conventional marketing strategies. A marketing and planning department of an academic medical center may be an integral part of its success. This will contribute to an understanding of the marketplace and marketplace issues, and represents an opportunity to study, and then shift market share into academic programs.

Although contrary to the original purpose of academic medical centers, the marketing department of an academic medical center brings a new perspective to its mission by focusing on activities which reflect priorities and strengths, building value and loyalty among target markets. In such marketing efforts, the image of quality and integrity can be maintained, supporting the role of the academic medical center. Such marketing activity can include:

- Market analysis and market research, to make customized market information available to administrative and clinical management.
- Development of regular reports on referring physician information, by demographics, number of referrals and so forth.
- Addressing the responsiveness of academic medical centers to customer preferences by internal reorganization, improving the often unfriendly customer service attitudes that prevail within academic medical centers in responding to referring physicians' needs.

Telemedicine

An academic marketing and planning commitment also entails a commitment to the evolution of telemedicine. Telemedicine capabilities expand the access of academic medical centers to referring physicians and consumers. Interactive marketing techniques, including the Internet, CD and telemedicine capabilities, represent unique opportunities for academic medical centers in the future.

CONCLUSIONS

The preceding discussions demonstrate the importance of subspecialization within the academic division to enhance cost-effectiveness and to strengthen unique aspects of the academic division which distinguish it from community providers. Future strategies cannot be based on surrender of the clinical mission to community cardiologists but rather a closer collaborative relationship with them. The future academic division should not be a small core of academic physicians involved in basic research or outcomes research solely on the patients of community cardiologists. Rather, its future should be based upon strengthening the subspecialization within cardiology, so that the academic division continues to provide a unique expertise across all disciplines in cardiology which is not widely available in the community. This model is based on continuing the tradition of the

academic clinician, through patient care, identifying important areas for future investigation, education and continuing to provide leadership for the direction of both basic and clinical research. However, this approach also recognizes that the era of "triple threat," the academician capable of performing successful patient care, research and teaching emulated in the past, is no longer a part of a viable academic model.

Academic cardiology divisions must be proactive in redesigning their purpose and relationship to other providers to maintain traditional missions. This restructuring should ultimately benefit all health care providers and improve access of all patients to the best cardiovascular care.

RECOMMENDATIONS

- To sustain and expand their commitment to patient care, teaching and basic and clinical research, academic cardiovascular programs must respond to the revolutionary changes in health care by restructuring external relationships and redesigning their internal organization.
- Academic cardiovascular programs should redraw their conventional boundaries by the development of collaborative relationships with a broad base of practitioners and hospitals for advancing clinical care, promoting clinical research and fostering more comprehensive teaching of all health care professionals.
- Academic cardiovascular programs should approach their long-term mission in a more business-like fashion. Incentives must be aligned, cost-competitive measures instituted and variation in practice patterns reassessed.
- Academic cardiovascular programs should reexamine their traditional relationships to respective departments of medicine or pediatrics. Reorganization of clinical, research and teaching commitments with related specialties in other departments may ultimately enhance the success of all participants in the academic health center and improve the access of patients to the best cardiovascular care and research ideas.
- Academic cardiovascular programs should promote their unique capabilities in clinical care, disease management, outcomes analysis and clinical and translational research to a broader constituent base of both patients and providers.

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Task Force 2: Research

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EFFECT OF CURRENT NATIONAL MEDICAL PRIORITIES AND REIMBURSEMENT STRATEGIES ON CARDIOVASCULAR RESEARCH ACTIVITIES IN ACADEMIC MEDICAL CENTERS

Scope of the Problem

The value of academic cardiologic research. During the past 40 years, management of patients with cardiovascular diseases has changed dramatically, and primary prevention of disease has emerged as a practical reality. Extraordinary benefits in length and quality of human life have resulted. The primary reason for these developments has been the body of new knowledge created by a sustained research effort marked by both its quantity and its quality. The research has resulted from a partnership between academic (medical school-affiliated teaching centers) and nonacademic medical centers, industry and government in which the academic centers traditionally have played a leading role.

Current national medical priorities and reimbursement strategies threaten the potential for similar efforts by academic centers in the future and, thus, threaten the productive relation between medical centers, industry and government. Specifically, the ongoing reorganization of delivery and funding of medical services and funding of research jeopardizes the development and even the existence of the clinician-investigator, the clinically trained and clinically active physician who is centrally involved in shaping research goals and effecting research projects. In the past, development of the clinician-investigator has been a primary contribution of the academic medical center. Resolution of this issue, with survival of the clinician-investigator, is critical to continuing reduction of the burden of cardiovascular diseases in our society. To understand the value of the academic medical center in cardiovascular research it is necessary to define research, the processes it entails and the research products of academic centers in the recent past.

Within the scientific community, research is a formal discipline for creation of new knowledge. The process involves application of the scientific method (hypothesis generation and formal hypothesis testing according to long-accepted principles for this purpose) to the solution of problems and questions, using prespecified methods which are ethically justifiable. The product of research is the scientific paper; research is not complete until it has been reported to the scientific community in sufficient detail so that it can be replicated, criticized and, in the case of biomedical research, applied in a process aimed to benefit society (1).

The foregoing definition implies a degree of rigor which generally is employed by those with formal research training. Many academic cardiologists (i.e., those who are employed by a medical school and who are responsible for teaching), particularly those who have earned a PhD as well as an MD, have undergone such training and embrace research as defined above. However, as discussed below, formal training in the principles of research is not necessarily integrated into the medical school curriculum, nor is it a part of most cardiology fellowship training programs. Rather, for most cardiologists, research training occurs during an apprenticeship under a mentor, and instruction in the formal principles of the discipline may be lacking. Thus, many cardiologists, particularly those without formal research training and those involved solely in clinical care, may be relatively unfamiliar with the definition of research as stated above, and with operational principles which the definition entails.

For society at large, understanding of the definition and methods of scientific biomedical research varies according to individual background. However, even among well educated persons, the concept of research generally is understood as information gathering. The concept does not necessarily encompass the process and, particularly, the rigor required for proof of conclusions by the trained and experienced

researcher. This difference in the perception of research partially accounts, for example, for the public (and professional) outcry when drugs are not approved on the basis of observational or uncontrolled data. The public perceives research quantity to be "very large" in the U.S., a perception fed by National Institutes of Health budgets of many millions of tax dollars as quoted in the public press. In general, the public perceives research quality to be very high, as well; indeed, though it is seldom the focus of intense consideration, the current generation believes that research "will find the answers" and has difficulty understanding why "they haven't found the answer to that [problem] yet."

Perceptions have changed during the past decade, most particularly because of the proliferation of communications technologies. These have enabled increasingly detailed and focused questioning of the scientific community by the nonscientific community. The result has been expanding public awareness and sophistication and a growing need by scientists to justify the use of public money for scientific research (and, as a corollary, the increasing need to develop measurement tools to define the research product). The major influence on public perception is the public press, including all mass media. Academic researchers can influence these perceptions (indeed, they are the source for much reporting). However, access to mass media is limited for academic cardiologists and varies regionally. Sophistication in the means of effective communication by academics to the nonscientific audience similarly varies and, as a result, complex and important issues often are oversimplified, leading to unrealistic public expectations and misperceptions. Thus, there is great potential for public education by the academic medical center.

In each major area of cardiovascular disease, including coronary artery disease (chronic stable, acute), hypertension and congestive heart failure and its many causes (including ischemic, hypertensive, valvular and cardiomyopathic), extraordinary benefits have resulted from research performed largely in academic medical centers and involving clinician-investigators, often as part of multidisciplinary teams fostered and nurtured within such centers. A few examples should suffice for illustration. Within the past 25 years, basic science interdisciplinary research resolved the hepatic metabolic pathways responsible for endogenous cholesterol biosynthesis. This discovery enabled cardiologist-basic scientists to develop pathway-specific pharmacologic inhibitors of the synthetic reaction. Ten years ago, other clinician-investigators demonstrated the natural history-improving benefits of applying the new therapy in practice; currently, clinical trials are actively extending the envelope within which net benefits can be expected from treatment. The result has been major event reduction associated with our society's primary cause of "premature" death. Currently, among patients with known coronary artery disease, approximately six lives per thousand can be saved each year by application of the results of this research (2).

Perhaps the most dramatic developments have been in

the area of heart failure, a condition which affects almost 5,000,000 people in the U.S., with an increase of approximately 500,000 new cases each year. Preclinical and basic science studies of angiotensin-converting enzyme inhibitors in heart failure, led and largely performed by clinician-investigators, quickly were followed by clinical trials which have revolutionized the treatment of this important cause of morbidity and mortality. By extrapolation from published data, application of this research can be expected to prolong life by at least 1 year, beyond that otherwise anticipated, for up to 300 of every 1,000 patients with heart failure (3). More recent research, again featuring clinician-investigators in the creation of concepts and shaping of objectives, has begun assessment of molecular therapy for this condition, promising added benefit (4). Indeed, application of the methods of molecular biology in cardiovascular research has been growing rapidly, and promises extraordinary future health benefits. Contributions to the latter process have come from both the academic and industrial sectors in newly evolving partnership relations. However, the clinician investigator, the product of the academic medical center, again has assumed a critical role in shaping this application of forward-looking technology.

Comparison of the performance of academic cardiology with that of other research sectors is difficult. Currently, private research entities, though increasing rapidly (see below), are relatively small and few in number and, thus, cannot be compared effectively with the large, heterogeneous entity that is academic cardiology. Industrial biomedical research primarily occurs in the pharmaceutical and devices industries. This activity is not directly comparable to that of academic cardiology because, driven by economic necessity, industrial research is, by definition, applied. Academic and industrial research areas are complementary. Therefore, even in the area of drug discovery at the basic science level, industrial research largely is generated in response to the fundamental pathophysiologic discoveries which result most commonly from research in academic medical centers. Industrial drug discovery, in turn, can stimulate and enable further pathophysiologic understanding, commonly achieved by applying the existing machinery of academic cardiology with industrial grant funding. Similarly, although preclinical drug/device testing can occur in industrial laboratories, much also is performed under contract by academic centers which have developed the relevant expertise for multiple purposes. Finally, clinical testing of drugs and devices requires effective study design and a cadre of patients, testing physicians and enabling facilities which already exist within the context of academic cardiology and would be expensive to fully duplicate for industrial purposes (although, as noted in several sections below, inroads into the position of academic centers are being made even in this area). A symbiotic relation exists in which academic resources and expertise are harnessed in perfecting study design and recruiting, testing and caring for patients in the context of therapy assessment. However, as noted below,

Table 1. Financial Support of U.S. Medical Schools (% of Total)

Source of Funding	Years			
	1965-1966	1975-1976	1985-1986	1995-1996
Federal government	54	37	25	21
State/local government	16	28	22	12
Self-support*	17	23	43	57
Other†	12	12	10	11

*Self-support includes revenues from practice plans, hospitals and clinics, as well as from tuition, fees and parent university support. †Other includes endowment and developmental funds, foundation grants and private philanthropy. Modified from: *AAMC Data Book: Statistical Information Related to Medical Education*. Washington (DC): Association of American Medical Colleges, 1998, Table D1.

the growing inefficiency of the academic medical center in recruiting patients for trials (potentiated by evolution in medical practice featuring tertiary center care only for the very sickest patients) and in obtaining institutional approvals for studies and contracts is tending to drive industry to non-academic center partners for performance of clinical trials when this strategy is feasible. To the problem of academic center inefficiency is added the problem of overhead costs which support the academic machinery, also tending to make the academic center less attractive than the growing cadre of alternatives for industrial contracts.

It is clear that important symbiosis and synergy exist between academic cardiology and industry. However, loss of the distinction between these entities is inherently dangerous. Research entails free inquiry which often fails to support preconceived ideas. Serendipitous findings, and resulting development of new lines of inquiry, must allow the capacity for failure. By its structure and purpose, industry must minimize failed efforts and must focus its resource allocations toward prespecified applications of new knowledge. Thus, industry is most efficient if its work is based on fundamental knowledge which already has been developed and tested. Redevelopment of the academic environment within the industrial sector inherently is uneconomical and is unlikely to occur in the foreseeable future. Conversely, in the absence of an environment which fosters unfettered inquiry, new knowledge is unlikely to develop at the rate our society implicitly has come to expect. Without the creation of new knowledge, neither industry nor cardiovascular health will be served.

Current research funding for academic cardiology and its limitations. The future of cardiovascular medicine depends on the creation of new knowledge resulting from high quality clinical research and clinically relevant basic research. These efforts require well trained and experienced investigators, a collegial atmosphere, protected time, highest quality facilities and financial support. By their organization and tradition, academic cardiovascular centers are best positioned to produce new knowledge from cardiovascular research. Unfortunately, the productivity of clinically trained cardiovascular researchers is being eroded by increasing pressure to enhance diminishing clinical revenues, loss of time due to increasing requirement for redundant

documentation and other administrative burdens and the performance of nonreimbursed activities, including teaching. Today, clinical reimbursements no longer are sufficient to subsidize otherwise unfunded research efforts; sources of funding specifically earmarked for research also are in jeopardy. Although research funding has increased during the past decade, research costs have increased even more rapidly, in part due to the complexity of modern research and its associated facility and specialized labor requirements. The public demand for research products also appears to have increased, fueled by the successes of the recent past. This factor, as well as the increased emphasis on research as a measure of excellence of academic centers, has led to a marked increase in the number of investigators, especially in basic science disciplines, resulting in heightened competition for research support. Consequently, a progressively increasing proportion of investigator time must be devoted to obtaining research support (5).

As this overview suggests, during the past three decades, financial support of U.S. medical schools has changed dramatically (Table 1) (5). Total support from all sources has increased. However, as a proportion of total funding, support from the federal government has decreased and has been replaced by reliance on revenues generated within academic institutions. Such self-support, which includes revenues from practice plans, hospitals and clinics, as well as from tuition, fees and allocations from the parent university, increased from 17% to 57%, whereas support from the federal government decreased from 54% to 21%. However, self-support is precisely the component most adversely affected by recent health care reforms.

Though total funding for medical schools has increased since 1965, the proportion allocated to research has decreased. Overall research expenditures have decreased more than 25% as a proportion of total health care expenditures. Thus, from 1970 to 1994, the gross domestic product increased from \$1,036 billion to \$6,931 billion, a near sevenfold increase; during this same period, national health care expenditures increased from 3.8% to 14.7% of the gross domestic product (more than a 25-fold increase in total expenditures) and reached \$1,021 billion in 1995. However, since 1965, the proportion of health care expenditure allocated to research has fallen from 4.8% to the current

level of approximately 3.5%, where it has remained since 1989 (5).

As allocation of health care funds has changed, so too have the sources of research financing (5). The dramatic rise in total health care expenditures since 1970 has been accompanied by a slower growth in National Institutes of Health funding, which has risen 15-fold during this period (actual dollars). Moreover, though apparently substantial in absolute dollars, this increase in National Institutes of Health funding must be viewed in the context of the explosion of complex technology and associated costs that has occurred during this period. Research funding requirements have been made up in part by industry; industrial contributions to academic research have jumped 41-fold during the same period. However, industrial research generally is directly tied to product development and is less likely to be investigator-originated than National Institutes of Health funding.

Though research funding has lagged, public expectations for medical progress have increased, fueled by the successes of the 1970s and 1980s. Simultaneously, in response to a "doctor shortage" predicted in the 1950s and 1960s, the number of medical school graduates and PhD scientists has grown markedly. Cardiovascular specialists also have increased, though it may be argued that their number has not increased in proportion to the growth of new knowledge which they are specifically trained to apply. In recent years, the increase in researchers has exceeded the increase in research funds, leading to heightened competition for research support and a growing disenchantment with research as a realistic career option. The recent dramatic reductions in clinical fee structures have compounded the problem. Thus, with diminishing federal support, academic medical institutions have depended increasingly on clinical remuneration for survival, and reductions in fees have led to extraordinary pressure on clinically trained academic faculty to devote increasing time to clinical activities to maintain total remuneration. In earlier times, clinical income, as well as more readily available training grants, commonly were employed to support the initial research efforts of trainees and junior faculty, as well as new lines of investigation by established researchers. This "seed funding" enabled the generation of data to support subsequent applications for peer-reviewed extramural funding. These opportunities are progressively diminishing, with a concomitant fall in the proportion of junior faculty members who are successful in establishing a career of clinical research or clinically relevant basic science research.

Increasing research costs and increasing competition for available research dollars (as evidenced by the current, historically low 16% rate of funding National Institutes of Health RO1 grant applications) both have contributed to a reduction in the frequency with which MDs now enter cardiovascular research. These issues are compounded by dramatic alterations in the requirements of modern clinical practice of cardiovascular medicine which have led to

increased clinical subspecialization in both invasive (e.g., interventional cardiology, electrophysiology) and noninvasive (e.g., echocardiography, transplantation medicine) areas. Such subspecialization now requires intensive and lengthy training and prolonged experience for acceptable competence, minimizing time available for research by many cardiovascular physicians, except as the research may relate to evaluating new equipment, drugs and techniques. In 1995, 19,152 physicians in the U.S. were classified as cardiovascular physicians (6). Of these, only 775, or 4%, identified themselves as devoted primarily to research.

Because of the increased competition for research funds, successful research proposals must be of higher quality and supported by greater quantities of "preliminary" data than in earlier decades. Three products of this apparently salutary trend require comment. First, the need to justify the goals of new proposals with preliminary data, in the context of increasingly limited funding to support acquisition of these data, minimizes the opportunity for new researchers to obtain peer-reviewed funds. Second, the requirement for preliminary data, most readily available from previously funded investigators, tends to diminish funding for exploration of new ideas not generally accepted by the research establishment. Third, with limited "seed" funds for research by clinical trainees, the growing requirement for "preliminary" data minimizes the opportunity for clinicians to compete effectively for peer-reviewed research dollars, foreclosing future research options (7). The net effect of these trends is diminution of clinician involvement in research.

Attempts by academic centers to minimize negative financial trends by capturing more clinical health care dollars have been thwarted, in part, by the inherent disadvantages of academic centers in competing for clinical market shares against nonacademic providers. As noted above, funding for medical research and education are becoming increasingly limited. However, it remains an inalienable responsibility of academic centers to teach new physicians and to create new knowledge through research. Therefore, available resources must be deployed to effect these responsibilities as well as to support clinical service. Traditionally, departments of medicine have subsidized relatively less profitable divisions from clinical cardiology revenues. Though reimbursements have diminished, the tradition of taxation has not, further handicapping academic divisions of cardiology in their capacity to undertake research.

As noted previously, the loss of sources of research support has resulted in ever greater dependence on industry. Even in this area, in which academic medical centers have exercised a virtual monopoly, new competition has developed (8). Clinical research organizations now frequently employ nonacademic physicians to perform clinical research and centralized industrial data managers to document and analyze data. The outsourcing of pharmaceutical research is due to both nonfinancial and financial factors. The primary problem for the academic center is its inefficiency in

Table 2. Institution Response Rates

Region	Institutions Responding
Northeast (CT, DC, MA, MD, NH, NJ, NY, PA, RI, VT)	39 of 39 (100%)
South (AL, AR, FL, GA, KY, LA, MS, NC, OK, PR, SC, TN, TX, VA, WV)	32 of 34 (94%)
Midwest (IA, IL, IN, KS, ND, NE, MI, MN, MO, OH, SD, WI)	24 of 29 (83%)
West (AZ, CA, CO, HI, NM, NV, OR, UT, WA)	14 of 14 (100%)

recruiting patients and delivering the research product required by industry. This problem is attributable, in part, to the increasing capacity for outpatient management of patients even with relatively severe disease. The result is that the academic center tends to attract the sickest and most complex patients, who may not meet the rigorous inclusion and exclusion criteria for modern drug trials. This factor is compounded by the relatively high indirect costs in academic medical centers, needed to support other institutional priorities, and by the administrative complexities and delays involved in developing contractual relations between industry and academic centers. The result is that clinical research organizations and pharmaceutical manufacturers seek alternative sites for applied clinical research.

The Current Status of Research in Academic Cardiology

The researchers. Researchers in academic cardiology are drawn from the faculties of medical schools. Precise information about research activities of specific faculty subgroups is not available. However, some inferences can be drawn from data gathered for the 1994-1995 report of the Association of Professors of Cardiology from 109 of the 116 member academic medical centers in the United States. Response rates by geographic region are listed in Table 2 and show the size of the full-time academic workforce.

Data from the reporting institutions are tabulated by faculty rank (Table 3) and by faculty job description (Table 4).

Breakdown of faculty is not available in these surveys by 1) basic research versus clinical activities, 2) type of medical affiliation, 3) race and ethnicity, or 4) gender. In addition, this database does not include researchers in government,

Table 3. Number of Academic Faculty by Academic Rank, 1994-1995

Academic Rank	Total in USA
Instructor	95
Assistant Professor	801
Associate Professor	532
Professor	544
Other	41
Total	2,013

Table 4. Number of Academic Faculty by Job Description, 1994-1995

Job Description	Total in USA
Chief/Associate Chief	157
Clinician	455
Critical care unit staff	102
Echocardiography staff	326
Catheterization staff	200
Electrophysiology staff	193
Nuclear staff	58
Transplantation	72
Research	137
Non-MD	124
Other	155

industry, private research institutions and nonacademic and nonphysician researchers performing clinical research. However, the newly restructured American Heart Association National Research Awards provide some, albeit limited, data regarding proportion of MDs versus PhDs and distribution of women and members of minority groups in academic cardiology research that receives peer-reviewed funding.

In 1996 there were 1,450 applications for the >\$52 million research grants (9) (Table 5).

Those with MD degrees fared less well competing for scientist development grants but had similar success to PhDs for established investigator grants and grant-in-aid support (Table 6).

Thus, American Heart Association research funding was directed at young faculty but also was available to more established investigators.

Women are applying in greater numbers than in the past though, for scientist development grants, established investigator grants and grant-in-aid support combined, female applicants are outnumbered by male applicants by 3 to 1. Nonetheless, evidence indicates funding levels are comparable to those of men. American Heart Association funding of minority group members now comprises 6% of total research funding.

Similar data can be obtained from the National Heart, Lung, and Blood Institute. However, these statistics characterize only the principal investigators, do not represent the total pool of funded investigators and cannot be extrapolated to industry-based funding.

Funding sources and sites of clinical cardiology research

Table 5. Percentage Applicants and Percentage Receiving Funds by Degree

	% Applicants	% Receiving Funds
MDs	27%	23%
MD/PhDs	12%	15%
PhDs	60%	62%

Table 6. Percentage Applicants and Percentage Receiving Funds by Grant Type and Academic Rank

	SDG		EIG		GIA	
	% Apply	% Funded	% Apply	% Funded	% Apply	% Funded
Professor					21%	17%
Associate Professor			27%	26%	31%	35%
Assistant Professor	53%	51%	68%	68%	34%	32%
Instructor, postdoctoral	16%	49%				

SDG = scientist development grants; EIG = established investigator grants; GIA = grant-in-aid support.

currently are changing, affecting the traditional research opportunities and activities of the academic cardiology community. As discussed above, non-academic-affiliated research institutes are increasing in number and are involving community physicians in clinical research, enabling improvement in patient recruitment efficiency, as well as reduction in research costs by eliminating or minimizing institutional overhead charges. Consistent with this trend, large trials conducted under the auspices of industry or of the National Institutes of Health now commonly involve research grants paid on a per case basis rather than by prepaid contract, whether investigators are full-time academics or private practitioners.

According to the data compiled by the Association of Professors of Cardiology, inpatient responsibilities alone (attending assignments and procedures) account for 70% of available full time equivalents (FTEs) in divisions of cardiology. This distribution of effort leaves only a relatively small proportion of faculty time and effort for outpatient clinical responsibilities, teaching and research. The Association of Professors of Cardiology concluded that there is a mismatch between faculty size, workload and funds generated, leaving faculty with increasing responsibilities and diminishing time for research. Data to support these conclusions are relatively sparse. Therefore, for purposes of this conference we undertook an informal survey of eight major academic medical institutions, conducted via specially designed questionnaire (Table 7). This survey indicates a 13% increase in faculty time assigned to clinical service, with a concomitant 11% reduction in research time. (The difference is attributable to variation in teaching responsibilities.)

Data defining retention of cardiology faculty in academic medical centers also are relatively sparse. The Association of Professors of Cardiology reports that faculty numbers have been stable during the past few years, but information specific to the research segment of the faculty is unavailable. Nonetheless, for all medical school disciplines, Moy et al. reported an inverse relation between growth of National Institutes of Health awards during the past decade and managed care penetration among U.S. medical schools (10). Our informal survey (Table 7) supplements and tends to support the Association of Professors of Cardiology report, indicating that, during the past two years, faculty reductions

due to lack of research funding occurred in only one of the eight institutions queried. Other aspects of the survey, including those related to faculty stability, training and funding, are reported in Table 7.

Although wide variability is discernible among the respondents to this informal survey, some patterns seem relatively consistent. The proportion of faculty positions primarily supported by research funds has decreased during the past 10 years and, with it, so has faculty time devoted to research. Faculty size has been relatively stable, but time devoted to clinical service has increased, whereas time devoted to teaching has remained constant. There is a modest trend toward increased hiring of PhDs and a clear reduction in dependence on National Institutes of Health funding for research, with a concomitant increase in funding from industrial sources. The majority of cardiology fellows devote less than a year to research during their training, though some institutions now require more than a year of research for all their fellows. Most research at the fellow level is clinical, and a small minority of fellows, involving a small proportion of institutions, receive no research experience at all. These findings tend to support the concerns raised in other sections of this report regarding the demise of the clinician-investigator and the difficulties in maintaining traditional cardiovascular research productivity levels in the academic medical center.

Factors affecting research performance. Just as clinical cardiology has required progressively lengthy training periods, so too there has been an increasing realization that high quality research requires more than the traditional, relatively limited, apprenticeship with an established mentor. Increasingly, physician research training involves intensive and time-consuming commitment to the mastery of research methodology, including the fundamentals of hypothesis generation and study design, as well as expertise with complex technology. In the past, these standards were applied only to PhD training. Today, it is recognized that MD researchers must be trained similarly, and that clinical as well as basic research must be held to rigorous standards. Given the increasing time commitments required for both clinical cardiology and for cardiovascular research, proficiency by a single physician in both areas will become

Table 7. Survey of Research in Divisions of Cardiology: Responses

1. What % of faculty positions are primarily research funded (>50% salary from research)	
10 years ago:	35% (range = 0 to 65%)
Now:	21% (range = 0 to 60%)
2A. What is the time distribution of the entire cardiology faculty?	
Clinical	
10 years ago:	52% (range = 25% to 75%)
Now:	65% (range = 40% to 75%)
Research	
10 years ago:	35% (range = 15% to 65%)
Now:	24% (range = 10% to 50%)
Teaching	
10 years ago:	13% (range = 10% to 20%)
Now:	11% (range = 5% to 17%)
2B. What is the average <i>clinical</i> time (%) for an average tenure track assistant professor?	
10 years ago:	39% (range = 10% to 60%)
Now:	57% (range = 20% to 80%)
3. Number of faculty let go due to decrease in research funding support in the past 5 years.	
Average = 2 positions (range 0 to 5)	
4. How many PhDs are in your division of cardiology?	
10 years ago:	3 (range = 0 to 14)
Now:	5 (range = 0 to 20)
5. What is the training experience for new faculty hired at Assistant Professor level in the past 5 years?	
Approximately half the newly hired assistant professors have had standard 3- or 4-year cardiology fellowships without special research experience, and approximately half have had a 3- or 4-year fellowship plus PhD training or at least 1 full year devoted to research.	
6. What % of assistant professors remain in your academic cardiology division/department for >5 years?	
Tenured:	51% (range = <10% to 95%)
Nontenured:	47% (range = 20% to 70%)
7A. Change in the # of faculty positions in the division of cardiology over the past 5 years.	
Average = +1 (range = -3 to +8)	
7B. As we continue to train academic cardiologists, what is your prediction of job opportunities in academics for finishing trainees?	
Few:	25% of respondents
"Some":	50% of respondents
Many:	25% of respondents
8. What are the sources of funding for research in your division?	
NIH	
10 years ago:	51% (range = 20% to 80%)
Now:	43% (range = 0 to 70%)
Pharmaceutical industry	
10 years ago:	37% (range = 5% to 80%)
Now:	46% (range = 5% to 80%)
Biotechnology	
10 years ago:	4% (range = 0 to 25%)
Now:	9% (range = 0 to 25%)
Other	
10 years ago:	8% (range = 0 to 40%)
Now:	12% (range = 0 to 75%)
9A. In what type of research projects are cardiology fellows participating?	
Clinical:	60% (range = 5% to 90%)
Basic:	36% (range = 0 to 95%)
None:	4% (range = 0 to 15%)
9B. How much time do your fellows devote to research?	
0 to 3 mo:	13% of fellows (range = 0 to 80%)
3 to 6 mo:	24% of fellows (range = 0 to 75%)
6 mo to <1 yr:	19% of fellows (range = 0 to 80%)
1 yr:	10% of fellows (range = 0 to 40%)
>1 yr:	38% of fellows (range = 0 to 100%)

The Subcommittee on Research Issues surveyed eight institutions to assess the research environment in academic medical centers. Participating centers include University of California at Los Angeles, Medical College of Virginia, George Washington University Medical Center, Johns Hopkins, University of Maryland, Cornell, Utah and New Mexico.

increasingly uncommon. Indeed, survival of the clinician-investigator will require creative restructuring of training opportunities and of research funding.

As a result of the increasing dichotomy between clinical and research activities, compartmentalization of faculty into research and clinical practice tracks has increased and often is acknowledged as a separation into tenure and nontenure tracks. Furthermore, whereas clinical research is understood to require clinical faculty, basic research does not. In the past, a compelling reason for performing basic research in clinical departments has been to gain the perspective afforded by the clinician-scientist in disease-related research. When the role of the clinician-scientist in research is minimized, this valuable element is lost. The compartmentalization of faculty into research and clinical practice sections affects two important elements of the academic milieu, compensation and peer attitudes. In her presidential address to the American Society of Clinical Investigators, Swain stated that, "Since clinician-scientists perform activities almost identical to faculty members in basic science departments, they should also expect that their personal compensation be similar to faculty members in basic science departments" (11). The implication of this statement is that the base salary of the clinician-investigator should take account of service to the medical center as research. The statement underscores the fact that clinician-scientists provide clinical teaching of medical students and house staff and serve on house staff selection and review committees in addition to the full range of faculty committees, all generally without specific remuneration or other recognition and all at the expense of potential research involvement.

Peer-reviewed funding during the past decade increasingly has emphasized cellular and molecular genetic techniques and concepts. The strength of the clinician-investigator is in the study of patient-related problems and integrative physiology. However, molecular biological studies most commonly are undertaken in isolated systems from which the confounding influences of many physiologic variables have been removed. As a result of this reductionist emphasis, the role of the traditional integrative physiologist has been diminished in both clinical and basic science departments. Moreover, the simplified models commonly used in reductionist systems tend to result in data that are difficult to apply to hypotheses at the organ or organism level, as is required for solution of clinical problems in cardiovascular diseases. The emphasis on such simplification may be true even at the level of awards, like National Institutes of Health Specialized Center of Research (SCOR) grants, that are meant to emphasize integrative studies.

Because of these trends, major research efforts in many clinical departments have shifted from integrated interdisciplinary studies to large scale clinical trials. This has had some salutary results insofar as such trials can help reorient clinical practice toward evidence-based, scientific decisions. Several clinical trials, such as the Cardiac Arrhythmia Suppression Trial, have shown that logical but unchallenged

clinical practices can lead to unforeseen outcomes and need to be subjected to scientific scrutiny (12). However, even for evaluation of common clinical problems, sample size requirements frequently necessitate multicenter national and international cooperation, with substantial attendant organizational complexities. These undertakings require enormous resources compared with standard National Institutes of Health awards. Universities have recognized both the intrinsic importance of these studies and the large indirect cost allocations that such programs can generate for medical schools. As a result, many major centers have established clinical research units that enjoy substantial autonomy from the traditional departments of medicine. These units bring together clinicians, biostatisticians, data managers and health economists; they can fill a very important role in educating clinical investigators, potentially providing formal and/or mentored training in clinical epidemiology, biostatistics and outcome analysis. In some fellowship programs associated with these units, formal training is combined with a thesis requirement aimed at qualifying trainees for masters or doctoral degrees in Health Sciences. Such developments entail many obvious benefits in terms of research products and research funding. However, such specialized training may tend to further insulate the basic researcher from the clinician-investigator, and both from the clinical practitioner. The optimal reintegration of these different facets of the academic spectrum has yet to be achieved.

In sum, several factors appear to threaten the survival of the academic clinician-investigator, including: 1) the changing health care financial environment, 2) rapid changes in biomedical science and technology, 3) the lengthy period of requisite research training, 4) emphasis on basic rather than clinical research in peer-reviewed funding, 5) outsourcing of clinical trials to community facilities, 6) competition for research funds, and 7) limitations on protected time (13).

Limitations of current research training. Ideally, research training in academic cardiology should provide a wide spectrum of instruction involving didactic and experiential components; these should include elements of scientific theory, basic and clinical research techniques, integrative and health outcomes research concepts and techniques, epidemiology and biostatistics. Many successful investigators currently in academic cardiology did not receive this breadth of formal research training but often experienced 1 or more years of total immersion in research through service at the National Institutes of Health or through postdoctoral fellowships. This informal track has almost disappeared during the past two decades. Training now generally is provided in the context of combined MD/PhD programs for physicians who seek a career primarily in research. Furthermore, PhD programs increasingly provide nonphysician researchers for academic medicine. Some informal research experience also is provided in MD training programs without PhD requirements, but such experience

generally is devoid of any focus specifically on research methodology.

PHD PROGRAMS. The current trend of isolated PhD training is toward a narrow focus. The trainees spend most of their time in one laboratory addressing one issue in great depth. Indeed, depth is a key goal of most PhD programs. Therefore, today's PhD candidates may be gathering a smaller portion of the broad base than in previous years. In parallel with the disappearance of the traditional integrative physiologist, the greatest limitation on current biomedical PhD training is the limited exposure to the pathophysiology of disease and integrative systems. This minimizes ability to recognize findings with clinical relevance.

To be more suitable for training in clinical or clinically oriented research, PhD programs will need to incorporate rigorous training in integrative physiology and clinical pathophysiology. This has been achieved in some institutions by incorporating medical school classes on integrative physiology, anatomy and clinical pathophysiology into the graduate school curriculum. For this trend to be supported meaningfully, a reorientation will be needed in the philosophy underlying criteria for acceptable peer-reviewed funding.

MD AND MD/PHD PROGRAMS. The degrees of exposure to research concepts varies dramatically among medical schools. Most provide an opportunity to acquire both degrees simultaneously, and a few integrate PhD training with post-MD medical training. In the absence of PhD training, the emphasis on teaching formal scientific thought and techniques in MD programs varies from minimal to extensive. Currently, the predominant focus of medical education is on the production of primary care practitioners rather than subspecialists. Consequently, most medical students are exposed to a less research-oriented curriculum than in earlier eras. At the level of residency and fellowship, the Accreditation Council for Graduate Medical Education currently requires meaningful supervised research exposure with protected time. In addition, the American Board of Internal Medicine offers a special research pathway emphasizing investigation. For residents and fellows interested in careers in private practice, the "protected research time" often is used to learn techniques which can be applied in clinical service, further reducing true research exposure. For residents and fellows interested in academics, the quality of the research experience varies widely. It can be as limited as a chart review project. Alternatively, it can be valuable experience in rigorous, hypothesis-oriented investigation leading to publications and eventual research independence.

Ideally, training for clinician-investigators should combine the instruction in scientific concepts and methodology provided in PhD programs with the awareness of clinical relevance provided in MD training. This approach would prepare the clinician investigator for high quality research

efforts, for a useful role in the integration of research results into clinical medicine and for competitiveness in seeking funding for clinical, basic, integrative or outcomes research.

RESEARCH TRAINING FOR NONACADEMIC CLINICIANS. At present, most nonacademic clinicians involved in clinical research have obtained their training "on-the-job." Formal training in research methodology, and even meaningful mentoring in the conceptual bases of clinical investigation, usually are lacking. Despite these limitations, clinical trials performed by nonacademicians often are of high quality when the sponsoring organization or industry provides a suitable research protocol.

Recommendations and Conclusions

From the foregoing review of the current status of cardiovascular research at the academic medical center, it is clear that a crossroads has been reached. The explosion of scientific knowledge and technological capacity during the last quarter century alone has led to increasing divergence in requirements for training and technical expertise for those who practice clinical medicine and those who create new knowledge through biomedical research. This factor promotes separation between clinicians and researchers. The situation has been compounded by economic forces which tend to demand that those physicians who provide clinical services must provide them more efficiently, that is, in greater quantity per unit of time, and for lesser remuneration, than in the past. Simultaneously, funding for independent research has not kept pace with total medical expenditures, with our gross national product or most importantly, with the costs of modern research and the demand for high quality research products. Simultaneously, the source of research support has shifted increasingly from the peer-reviewed public or quasi-public nonprofit sector to the applied, profit-driven industrial sector. The result has been to minimize resources of time and money available to support independent research activities by clinically trained and clinically active cardiologists. Together, these trends have jeopardized the existence of the traditional clinician-investigator and, consequently, threaten the rate of development of clinical advances in cardiovascular diseases.

To be sure, this situation may be altered beneficially as evaluation and treatment modalities are introduced that depend on knowledge of cellular and molecular biology. When such developments occur, medical education and training necessarily will more fully incorporate the knowledge base necessary to assimilate and use these modalities (perhaps by an economically unpalatable increase in the duration of medical schooling and training), and a new cadre of clinician-investigators may emerge. Currently, however, the development of this new world does not appear imminent; in the interim, the problem of maximizing the development of clinically applicable new knowledge

remains. The greatest concern is that the demise of the clinician–investigator will mitigate against the optimal shaping of research priorities for the purpose of translating fundamental and preclinical developments into clinically useful new knowledge. As a corollary, of course, emergence of a new clinician–investigator model would not necessarily remediate the associated difficulties in research funding. To overcome this problem, we must resolve the intertwined impediments of the relative paucity of new clinician investigators and the relative lack of resources to support independent clinically applicable research. Several potential solutions are apparent from our review. These strategies are not mutually exclusive and, in fact, should be pursued simultaneously to expand the range of options for furthering cardiovascular research.

Recommendation #1: development and support of the clinician–investigator. Support for the training and development of new clinician–investigators is central to our proposed strategy to revitalize the academic medical center in the production of cardiovascular research. This strategy requires funding for rigorous, formal training in research methodology for clinicians committed to an important role in research. Training for these investigators must include specific programs in hypothesis generation, study design and other fundamental elements and principles of research and of the scientific method, all relatively underemphasized in medical schools today and almost totally lacking in many postgraduate programs. Incorporation of the study of research methodology would be appropriate in the medical school curriculum, but may not be realistic within the current time constraints and the contemporary national priority for education of primary practitioners. MD–PhD programs offer one route around this dilemma, but may not involve those who, ultimately, will have greatest clinical expertise. Therefore, the academic medical center will need to design and offer rigorous training in research methodology for clinicians. It is understood that, in the current era, optimal research strategy often may require interdisciplinary teams, of which clinician–investigators should be integral members. However, there remain many instances in which high quality and productive individual research efforts are feasible; in many instances these, too, can be undertaken by clinician–investigators.

Recommendation #2: the clinician–investigator “surrogate”: interdisciplinary clinician–investigator groups. When, by virtue of the complexity of the research problem, it is not feasible for a single individual to fill the role of clinician–investigator, the function must be subserved by some other organization of effort. The most obvious candidate would be interdisciplinary groups focused on aspects of specific clinical problems. Interdisciplinary groups could be structured on an ad hoc basis, with size and composition appropriate for the proposed project. However, generally, they should include at least one member with expertise in study design, at least one member with relevant basic science expertise when clinical projects are being considered

and at least one member with relevant clinical expertise when basic science projects are being considered. The potential for useful employment of nurse PhDs in such interdisciplinary groups deserves special mention; these scientists bring unique clinical insights as well as expertise in their areas of doctoral study. In certain settings, interdisciplinary groups may be organized most effectively by empaneling representatives from more than one institution. Though the possible loss of frequent direct contact is a potential problem, a well organized inter-institutional approach may become increasingly feasible as communications technology progresses.

Recommendation #3: education, training and interaction of interdisciplinary groups. To enable implementation of recommendation #2, the following actions will be useful.

CLINICAL EDUCATION FOR NONCLINICIANS. Training of nonphysician biomedical researchers, and nonclinically focused physicians, will need to incorporate specific elements to assure knowledge of the characteristics of cardiovascular diseases. Because PhDs are not necessarily interested in clinical problems, this solution may require some reacculturation. In addition, PhDs focused at the most fundamental levels of research also may need additional grounding in the principles of study design, as opposed to experimental design. The level at which the new training must occur is not immediately obvious, but probably will need to be offered within academic medical centers both to postdoctoral fellows and to established faculty through rigorously designed programs. Past efforts at such training have been limited, and results have not been encouraging. Therefore, metrics will need to be established to evaluate the efficacy of training programs and to enable modification as needed.

TRAINING IN RESEARCH METHODOLOGY FOR THE CLINICIANS. As a corollary (see recommendation #1), clinician–investigators must be created for involvement in interdisciplinary groups. This process must include rigorous, structured training in research methodology, as previously noted.

REGULAR, PLANNED AND MUTUALLY EDUCATIONAL INTERACTIONS OF THE GROUP. The appropriately trained investigators must interact regularly to create a community of interest which will allow them to understand each other’s cultures and to develop mutually accepted project goals. Such interaction implies a commitment of time and effort to understand conceptually the specific methods and contributions of different group members. This commitment may require exploration of literature outside the immediate areas of expertise of individual group members.

Recommendation #4: public and quasi-public funding to enable formation (including requisite training) of the new group entities. Funding mechanisms must be devised to support development of the new clinician–investigators and interdisciplinary groups, including the

training programs envisioned in recommendations 1 to 3. Because of increasing constraints on unrestricted funds for academic centers, research training for clinicians will require commitment of public funds, most appropriately through the National Institutes of Health. Novel means of creating public funds (e.g., an all payers tax) may be justified by consideration of the resulting public good. Publicly funded efforts can build on the K30 program recently announced by the National Institutes of Health, which provides limited funding for academic centers to develop curricula to train clinicians in research methods. Federally sponsored enabling grants should be supported by similar enabling instruments from other quasi-public nonprofit sources (American Heart Association, American College of Cardiology and others). In the short term, development of such funding instruments may reduce funds available for independent research. This may be a burden we must bear. However, when public funds are used, ultimately they must be justified via a political process. It follows, then, that the academic cardiology community must develop a cogent and understandable case supporting its views and must bring this case to the public and to the public's elected representatives. This responsibility devolves on us individually, but also should be an important focus of our professional organizations and, specifically, of the American College of Cardiology.

Recommendation #5: mechanisms enabling industrial funding, and enhanced public funding, of investigator-initiated research. Additional funding may be available from industry. To define appropriate areas for industrial funding, a continuing dialogue for this purpose must be maintained between industry and academic cardiology, involving a forum for identifying areas of mutual interest and concern. The American College of Cardiology has initiated such dialogues, and should accept major responsibility for their enhancement and maintenance. Industrial grants resulting from such mutually determined needs should be awarded by external peer review, with results available to industry for profit-making activities according to some formula based on the magnitude of the initial investment. Alternatively, the funding goal may be achievable by development of agreements between individual academic centers and individual industrial concerns which allow shared profit from the application of independent research. In addition, concomitant with federal commitment for funding research training for clinicians, a federal commitment is needed for increased funding of research efforts led by clinician-investigators. This requires an attitude shift by the National Institutes of Health to recognize the value of traditional clinical research; recent National Institutes of Health initiatives indicate that this shift is under way.

Recommendation #6: reasonable cost-accounting of currently unremunerated academic activities by clinical faculty, with development of appropriate rewards. Academic medical centers must analyze their operating budget

formulae, must provide reasonable cost-accounting of heretofore unremunerated academic activities by clinicians and must provide rewards of some form for this activity, creating an opportunity for "protected time" for research. Among the financial arrangements which require review is the widely applied policy of taxing cardiology activities, and particularly procedural activities, more heavily than clinical activities in other areas of internal medicine to support work in noncardiology disciplines. In the context of diminishing revenues for clinical services, and particularly for cardiac services, such policies must be reconsidered in favor of similar financial treatment of all clinical divisions in academic medical centers.

Recommendation #7: organized interactions with the nonmedical public. Public and private funding for academic efforts in cardiology depend upon shared belief in the value of research by medical researchers and by the general public. Cardiology, through its professional organizations, must develop programs to heighten knowledge and awareness of the public regarding cardiology research, including its methods, its successes and the relation between resource availability and the potential for meeting public expectations. The planned activities during the 50th Anniversary celebration of the American College of Cardiology can be expected to begin this process, and will serve as a test bed for methodology for future efforts.

The creation of new knowledge and its clinical application is a very real requirement of academic cardiology, as of all academic medicine. If this need is not met, the expectations of our society will not be fulfilled. However, to resolve this problem, we will need to expand beyond traditional patterns of research organization and research financing. Most importantly, we will need to make a convincing case to the other sectors of our society to justify the redistribution of societal resources which will be needed if the medical progress of the last quarter century is to be maintained.

SUMMARY RECOMMENDATIONS

Academic medical centers must

1. Develop and support clinician-investigators, that is, well trained researchers who also provide patient care.
2. Expand the focus and contribution of clinician-investigators by initiating formation of interdisciplinary clinician-investigator groups comprising basic scientists, epidemiologists/statisticians, clinician-investigators and others, focused on complex, multidisciplinary patient-related research.
3. Provide clinical education for nonclinician researchers involved in the interdisciplinary groups, and rigorous training in research methodology for clinician-investigators.
4. Develop a cost accounting structure for currently unremunerated academic activity.

The American College of Cardiology must

1. Encourage expansion of the National Institutes of Health extramural clinical research budget, and expansion of parallel public funding sources for cardiovascular clinical research.
2. Encourage and participate in provision of parallel patient-oriented research support from quasi-public and nonprofit sources.
3. Develop mechanisms and supporting dialogue to enable and enhance industrial funding for investigator-initiated research, as well as enhanced industry-initiated research.
4. Organize interactions with the nonmedical public to heighten public awareness of the value of cardiovascular research.

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Task Force 3: Teaching

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CARDIOLOGY TEACHING AND THE CHANGING HEALTH CARE SCENE

Teaching is the process whereby knowledge is transmitted from teacher to student. In the medical arena it takes place at multiple development levels (medical student, resident, cardiology fellow, practicing physician and nonmedical health care personnel) and at multiple sites and venues (medical school, hospital, clinic, office, invasive and noninvasive laboratories, professional conferences, bedside rounds and small group discussions). Scholarly teaching is a fundamental objective of the academic cardiology unit (1).

The teaching of cardiology is critically important in an era of rapidly developing new technologies for the diagnosis and treatment of cardiovascular diseases. The clear communication of information to all levels of trainees has major implications in patient care. Scholarly teaching can best be coordinated by clinician-educator faculty in the academic cardiology unit, who have the knowledge base and understanding of the ties between basic and clinical investigation

to balance bias and anecdotal experience with science and evidence- and outcome-based research.

In the academic cardiology program of the future, teaching will be increasingly evidence-based rather than experiential. Teaching evidence-based cardiology within an integrated health care delivery system adds value to the system from the standpoint of payers, community providers and other internal customers. Because cardiovascular disease represents a ubiquitous and costly component of population-based health care, the value of the academic cardiologist as an educator and organizer of evidence-based guidelines and quality management systems should be obvious to health systems and other medical care enterprises. The development of value/outcome standards for the teaching contributions of cardiologists to these systems will be a major objective of the academic cardiology units of the 21st century.

The substrate for clinical teaching of both internal medicine and cardiology has undergone major changes in the past three decades as a result of the Medicare Act of 1965 and the emergence of managed care in the 1980s (2). Although major regional differences exist, these changes

have had considerable impact on the clinical teaching of both internal medicine and cardiology (3,4).

There has been a major shift of clinical care to the ambulatory setting, and fewer admissions to hospitals solely for diagnostic workups. Hospitalized patients tend to be sicker, and the ratio of intensive and "intermediate" care level patients to stable, less complicated patients is high. As a result, the total care of these patients has become more and more fragmented; in the inpatient setting, residents and cardiology trainees have much less opportunity to exercise clinical judgment, consider differential diagnoses and develop long-term management plans. For example, patients with post-myocardial infarction cardiogenic shock are usually taken to the catheterization laboratory early in their course and revascularized either percutaneously or in the operating room rather than remaining in the critical care unit for hemodynamic monitoring and circulatory support. There is an increasing number of inpatients with end-stage congestive heart failure being evaluated for cardiac transplantation—a highly specialized process in which trainees may not actively participate. Disease states have also changed dramatically. Patients with rheumatic valvular disease are rare, whereas patients with coronary artery disease and heart failure predominate in both hospitals and clinics.

The demands of managed health care systems mandate that patients admitted to hospitals stay for shorter periods of time. This rapid turnover results in a disproportionately higher number of admissions compared with several decades ago. The combination of a larger number of admissions, sicker patients and rapid patient turnover increases the workload of academic cardiology faculty and has an adverse impact on the training experience of medical students, internal medicine residents and cardiology fellows.

Faculty time available for teaching has declined in the past 20 years. There are several reasons for this, as indicated above, but increasing clinical effort is the major one. Additionally, the requirements imposed by various health care systems for precise documentation of faculty involvement with patient care has progressively increased (5). Thus, time previously spent by faculty in teaching is increasingly taken up by documentation requirements for reimbursement, and by frequent visits to patients. Furthermore, clinician-educators are frequently required to perform additional activities such as teaching of generalist physicians and nurses, participating in marketing processes and outreach and performing administrative tasks relating to practice issues.

The changes in the clinical spectrum of patients and acuity of illness coupled with reduced faculty time for teaching form the basis for the current concerns regarding the teaching of cardiology (6).

COMPARING TEACHING IN 1998 AND 1978

The leadership view. To obtain information regarding teaching in academic cardiology, a questionnaire was devel-

Table 1. Division Chiefs Survey Results

Question*	Rating				
	1	2	3	4	5
1 (n = 33)	1	2	8	11	11
2 (n = 32)	4	12	13	3	0
3 (n = 32)	5	14	3	5	5
4 (n = 31)	11	15	4	1	0
5 (n = 31)	4	7	9	5	6
6 (n = 31)	2	3	6	10	10

*See text for questions.

oped and distributed to the cardiology division chiefs at the Association of Professors of Cardiology annual meeting in March 1998. A similar questionnaire was distributed to the cardiology program directors at their annual meeting. Respondents were asked to rate these answers from 1 (strongly disagree) to 5 (strongly agree). The questions were:

1. Teaching is strongly emphasized at my institution.
2. Teaching is rewarded at my institution.
3. The time I have allocated to teaching is unchanged from 5 years ago.
4. Teaching is more important than the clinical responsibilities for my faculty.
5. Medical students, residents and cardiology fellows completing training in June 1998 are better trained than their counterparts 5 years ago.
6. I would be interested in having my faculty participate in a course in faculty development to improve teaching skills.

Program directors were asked essentially identical questions (see Tables 1 and 2 for results).

There were some interesting differences between the two groups. The division chiefs believed that time available for teaching had changed over the last five years and that clinical responsibilities outweighed teaching responsibilities, whereas the program directors were split on these two answers. The program directors felt that the recent graduates were better trained than their counterparts five years ago, but the division chiefs were split. Both groups believed teaching was emphasized at their institution but was unrewarded, and both groups were interested in faculty development.

Table 2. Program Directors Survey Results

Question*	Rating				
	1	2	3	4	5
1 (n = 47)	3	1	9	16	18
2 (n = 48)	8	11	17	12	0
3 (n = 45)	8	11	4	12	10
4 (n = 46)	3	10	17	12	4
5 (n = 49)	4	6	13	12	12
6 (n = 46)	2	11	11	11	11

*See text for questions.

Table 3. Dean's Questionnaire

Question 1:

Has the teaching of cardiology (at both the graduate and postgraduate level) changed in the past 20 years?

Yes: 22/29

No: 7/29

Comments:

Many respondents emphasized that cardiology teaching today is more technical and less bedside/clinical. Several respondents stated that because of primary care emphasis, cardiology teaching at their institutions was de-emphasized. There was a wide variance of opinion as to whether changes were for the better or for the worse.

Question 2:

Is the teaching of cardiology now better, unchanged or deficient compared to 1978?

Better: 9/29

Unchanged: 6/29

Deficient: 6/29

6/29 responses were noncommittal, indicating teaching is now different with no evaluation whether it is better or worse. 2/29 responders did not answer this question.

Question 3:

Is teaching in general emphasized/rewarded in your institution? How?

Yes: 13/29

No: 11/29

Equivocal: 5/29

Comments:

There is wide variance among responders, with some emphasizing a complex process of rewarding teaching excellence (faculty rank, promotion, stipends, awards), whereas others stated teachers were rewarded in a manner difficult to identify and quantitate, and still others responded flatly that teaching was not rewarded.

Question 4:

Do you have data to support your answers?

Yes: 13/29

No: 9/29

Subjective/no hard data: 4/29

3/29 did not answer this question.

Question 5:

Has your institution established procedures for faculty development to help faculty improve/adjust teaching to changes in clinical care?

Yes: 17/29

No: 7/29

Equivocal or just beginning: 5/29

A similar questionnaire was mailed to the deans of 143 medical schools in the U.S. and Canada. There were 30 responses. The questions and responses are tabulated in Table 3. The following main points by the responders are particularly relevant:

1. Cardiology teaching today is more technical and less clinical/bedside.
2. Cardiology teaching has been de-emphasized as primary care training has been emphasized.
3. There was a wide variance of opinion as to whether these changes were for the better or worse.
4. Almost as many responders indicated that cardiology teaching today is deficient as indicated it had improved compared with 1978. An equal number of responses were noncommittal.
5. Again there was a large variance among responders with regard to whether teaching was appropriately rewarded. Almost an equal number indicated that teaching was/was not emphasized in their institution. The consensus was

that teachers were rewarded in a manner that was difficult to identify and quantify.

6. Some responders admitted to having no hard data to support their answers.
7. The majority indicated that faculty development programs were in force in their institutions.

Similar responses were obtained from a survey of those attending this Bethesda Conference (Table 4).

The view of the teachers. The learning process has changed in the past decade as less time is spent at the bedside and on core knowledge base acquisition. Although there are wide institutional differences, as a result of expansion of the core curriculum, cardiology material has been de-emphasized in some medical schools, and involvement of cardiology educators in the core teaching setting may not be as prominent. At the postgraduate level the case management approach de-emphasizes the physical examination and history taking at its worst, and at its best, *assumes* that

Table 4. Bethesda Conference Attendee Survey

Question*	Rating (%)				
	1	2	3	4	5
1 (n = 42)	2.4	16.7	31.0	33.3	16.7
2 (n = 42)	19.0	40.5	28.6	9.5	2.4
3 (n = 41)	36.6	24.4	19.5	12.2	7.3
4 (n = 44)	56.8	20.5	20.5	0	2.3
5 (n = 42)	21.4	21.4	21.4	21.4	21.4
6 (n = 41)	4.9	14.6	7.3	24.4	48.8

*See text for questions. The Bethesda Conference attendees felt that teaching was emphasized but not rewarded at their institution. Most felt time for teaching had changed and that clinical responsibilities were more important. There was no uniformity in the quality of training now and 5 years ago. The majority favored faculty development.

knowledge of history taking and bedside examination skills are present (7,8). Wide-ranging discussions generated by a mixture of medical students and interns and residents are often lost because the groups are divided, medical students in one group and house staff in another. In some institutions, the small group (two to four students) physical diagnosis sections have disappeared.

There have been lengthy discussions about the low scores achieved on questions testing knowledge about physical findings on the Cardiovascular Board examinations. The candidates themselves often argue that it is more cost-efficient (and accurate) to order a cardiac echo than to spend time with bedside maneuvers to discriminate a murmur. The American Board of Internal Medicine emphasizes physical findings by requiring the trainee to be observed taking a history and performing a physical examination, as well as by providing a number of questions about physical examination findings on the Cardiovascular Boards. Despite this emphasis by the American Board of Internal Medicine, it appears that some training directors do not emphasize clinical skills sufficiently. Naturally, clinical skills include more than a physical examination, and extend to accurate and thorough history taking as well. There are other important clinical skills in areas emphasized by the American Board of Internal Medicine (9) that are frequently neglected because of the emphasis on technological teaching.

The creation of post-training period examinations, often called certifying or proficiency examinations, by groups that are not part of the "official" educational process or certification mechanism is a new development. For example, the North American Society of Pacing and Electrophysiology offers a proficiency examination in pacing called the NASPEXAM. The American Society of Echocardiography provides an examination in echocardiography. The American Society of Nuclear Cardiology offers an examination in their specialty. Most of these societies are careful not to call this examination a "certification" examination, to avoid the legal ramifications. In addition, although not the thrust of this report, several of these groups offer examinations for technicians as well.

Table 5. 1989-1997 Cardiovascular Disease Equated Means and Standard Deviations

Year	Cardiovascular Disease		
	n	Mean	SD
1997	1,838	501	104
1995	1,582	500	97
1993	1,012	490	100
1991	1,500	491	102
1989	1,519	483	108

Reference: American Board of Internal Medicine, unpublished data, 1998.

Recognizing the desire of clinicians to have such certification, the American Board of Internal Medicine has created the Institute of Clinical Evaluation (10). This is a body now separate from the American Board of Internal Medicine (and therefore separate from the American Board of Medical Specialties and its rules and restrictions) that will offer certification in a variety of "niches." The Institute of Clinical Evaluation has purchased the American College of Cardiology electrocardiography examination and will administer it in 1999. In addition, the Institute of Clinical Evaluation is working with multiple organizations and is considering certificates in several other areas.

Teaching ability is perceived by many faculty to be variable. Inadequate teaching does occur and is difficult to document in the absence of standard evaluation techniques. Moreover, objective teaching evaluations are difficult to obtain. Student and house staff evaluations may not be true indicators of a teacher's effectiveness; and faculty are rarely called upon to evaluate their colleagues' teaching effectiveness. Educational research for the development of standardized evaluation techniques is necessary.

Objective data to support the views noted above by teaching faculty are not available. To the contrary, available data from the American Board of Internal Medicine cardiovascular subspecialty examination (Table 5) indicate that the mean scores achieved by candidates have improved modestly between 1989 and 1997. It is not clear, however, whether this improvement in scores is related to changes in content and changes in the level of difficulty of the certifying examination and may have been influenced by the increase in training program requirements from two to three years.

FACTORS AFFECTING TEACHING

Because of the previously mentioned time constraints, the attending physician who is focused upon specific aspects of patient care must assume knowledge on the part of the house staff/trainee to expedite rounding on patients and not have to provide "remedial cardiology." On the other hand, there is no question that one can teach at the same time as one does clinical care, provided that the house staff/trainee is following along; the pace is necessarily rapid and the experience therefore may be suboptimal. However, it should

not be assumed that seeing patients is somehow a different activity from teaching about them during the encounter (rather than later, in a conference room).

Reduction of inpatient base is not necessarily a drawback. The cardiologist is the only practitioner to whom the clinic/hospitalist dichotomy does not apply, because the cardiologist is apt in each area. Indeed the cardiologist must follow the patient from hospital to clinic and back to follow the natural history of disease and results of therapy.

Cardiologists have become progressively specialized and divided into groups such as the electrophysiologist, echocardiographer, interventionalist and so forth. Unless a patient with a particular problem in the area of expertise of the subspecialist is presented on rounds, the attending physician's teaching information base may be limited. The emphasis on technology over basic clinical skills is widespread. Teaching is left not uncommonly to technology-based cardiologists; each emphasizes his/her own discipline to the detriment of general knowledge acquisition and with resulting transmission of various biases. For example, the interventionalist promotes primary angioplasty over thrombolysis, the echocardiographer promotes stress echo over other forms of stress imaging. This type of teaching lacks balance and supports the concept that the cardiologist is a technician. Protocols which do not allow the faculty or trainees the opportunity to formulate or alter diagnostic or treatment algorithms are probably detrimental. It is difficult to know whether management by protocol has really impacted the academic center.

The role of the cardiology fellow in teaching is not well defined. Certainly service needs have reduced the available teaching time for fellows as well as faculty. All fellows are not equally skilled in teaching. Therefore, fellowship programs should foster teaching skills, as these skills will be important regardless of the fellow's subsequent role in formal academic medicine or practice. There is a role for "Fellows Conferences" with house staff and medical student teams that occur on a regular basis. Fellows could provide some of the core knowledge that may otherwise not be provided (such as the physiology of heart failure) or could serve as a resource for providing, for example, up-to-date clinical trials material. Just as research time is protected, this fellow educator time would have to be protected.

The academic reward for teaching continues to be difficult to assess despite acknowledgment of its value (11). Objective measurements of teaching effectiveness are difficult to obtain due to the lack of adequate standards for teaching evaluations. Educational research in this area is limited, and more is needed.

Financial support of faculty with major teaching time commitments is a problem. Specific budgets to support teaching have not been developed in many institutions (despite the fact that teaching is a major *raison d'être* of medical schools). This has limited the capability of divisions of cardiology, departments of medicine and pediatrics and schools of medicine to support teaching activity. Therefore,

many clinician-educators are required to spend more and more time in patient-related activities to "cover their salary."

The financial cost of education in the 21st century must be clearly defined (12). State support of medical school graduate education needs to improve. Postgraduate (specialty and subspecialty) educational costs must be borne by all health care payers and not Medicare alone. Institutional support of postgraduate education (trainees' salaries and faculty support) must be standardized, as these trainees provide valuable services to their institutions and will be a valuable resource to the community. To pursue these changes, the academic cardiology unit must develop accurate cost-accounting methods for its teaching activities.

Training programs which do not have a strong commitment to education as opposed to service should be eliminated. The Residency Review Committee must be increasingly stringent in this activity and be supported by the medical community.

CORRECTIVE MEASURES

Better transition to an outpatient model. Over the past several years, an increasing proportion of clinical cardiac care has been conducted in ambulatory care settings rather than in hospital inpatient facilities. This is evident by the 10% to 20% decrease in the number of bed days of care over the past 2 years. Increasingly, specialized cardiac care is being provided to ambulatory patients, and procedures such as transesophageal echocardiograms and cardiac catheterizations are now routinely performed on an outpatient basis. In addition, the recent proliferation of chest pain units to evaluate patients with acute chest pain often obviates the need to admit patients who, in the past, were admitted to a telemetry or coronary care unit.

Thus, strategies must be developed to educate medical students, house staff and cardiology fellows in this changing health care arena. It is important for the academic cardiology unit to determine what clinical sites are most appropriate to be used in teaching different segments of the curriculum so that students and trainees are able to practice in settings where patients actually receive their care. The issues for cardiology teaching are the same for general medical education, that is, 1) Where should the sites be located? Should they be centralized or dispersed? 2) What resources will be required? and 3) What are the finances of the ambulatory sites and how should these costs be split among the various involved parties which include the cardiology unit, the departments of medicine or pediatrics, the medical school, the hospital and the insurer?

Enhanced prestige of teaching. A faculty appointment in the cardiology division of most medical schools includes an obligation to teach. Teaching efforts are generally monitored by the departments of medicine or pediatrics and/or the cardiology division, although the process is not well defined and varies widely from institution to institution. In the case of volunteer faculty, this appointment usually offers

no compensation. Thus, rewards for teaching must be developed and must be administered with fairness and equity.

For full-time faculty paid by the medical school, a different issue arises, namely, the protection of income of faculty who teach extensively and who therefore give up valuable research and clinical practice time. Because the clinical faculty now have increased demands on revenue generation, they have less time to teach medical students, house staff and cardiology fellows. This is especially true in cardiology divisions, which often generate large amounts of money and which are called upon to support not only themselves but also less "profitable" divisions within the parent department. Some studies have suggested that faculty who are simultaneously seeing patients and teaching students and trainees have decreased clinical productivity. Although this is not unexpected, it becomes a difficult issue because of increased demands for greater efficiency and cost containment, particularly by managed care programs. Thus, for full-time faculty members, the time spent teaching represents a true opportunity cost. It is becoming increasingly difficult to subsidize the teaching faculty as departmental and divisional surpluses disappear, yet not to do so endangers not only the academic mission, but also the entire definition and role of the profession.

Innovations in teaching methods and evaluation techniques. There is widespread perception that cardiology teaching today emphasizes technology to the detriment of basic clinical skills (see above). It is therefore necessary for program directors to take bold and innovative steps to redress this anomaly. Ideally, clinical cardiology teaching should be the responsibility of the "general" or "clinical" cardiologist who would teach the "approach" to diagnosis and management of cardiovascular disease. A specific aspect of the patient's diagnosis/management could subsequently be turned over to a technology-based cardiologist who would (in this setting) have the opportunity to impart his knowledge to the trainees.

The academic cardiology unit of the future must also embrace new ways of conducting "teaching" and "work" rounds. A major issue is that of continuity of patient care and teaching experience of faculty. The "occasional" teaching attending physician experience will gradually diminish and teaching will be conducted by faculty dedicated to this activity. Similarly, new ways of conducting efficient and effective teaching rounds need to be tried and implemented. Combining effective teaching with efficient patient care will be the measure of a successful teaching program in the future.

The lack of adequate patient volume with characteristic valvular physical findings (see above) can be and should be corrected with the more widespread use of modern teaching tools: audio tapes, video tapes, "Harvey" mannequins, interactive computer software and so forth. Although many of

these aids are available, their use has not been integrated in the day-to-day teaching of clinical cardiology (13,14).

Finally, each training program could conduct its own examination of the clinical skills of the trainees akin to the "in service" examination internal medicine residents are required to take. Such an examination would help the trainees ascertain their weaknesses and help the program director assess the quality of the training program.

Financial support. Graduate medical education funding has traditionally been financed from a variety of sources including Medicare, training grants and faculty practice plans. With the exception of Medicare, it is often difficult to quantitate the precise magnitude of such support. In fiscal year 1996, for example, Medicare spent \$6.6 billion to support costs related to training students and residents. Medicare payments to support graduate medical education are divided into two major components: direct and indirect graduate medical education. Direct graduate medical education funds are payments made by Medicare directly to teaching hospitals based on 1984 historical costs to cover the salaries for residents, supervisory personnel and other associated costs to maintain a residency program. A payment is made for each full-time resident; for some subspecialty residents, the payments are down-weighted to provide disincentives for this type of training. Indirect graduate medical education funds are not based on identifiable costs. Rather, they are intended to support teaching hospitals and to compensate them for the higher costs that training programs incur. Thus, indirect graduate medical education payments are meant to compensate for the fact that sicker patients are generally admitted to teaching hospitals, that additional tests are often ordered and that special care units are required. Hospitals are paid indirect graduate medical education costs through annualized Division of Research Grants payments. In addition, Medicare payments provide funds to pay supervisory physicians (Part A) and for services rendered directly by full-time and private practice physicians.

In some cases, Medicare payments are capitated, in that hospitals receive a per capita prepaid premium. This is a negotiated rate unrelated to actual services consumed, and this payment usually includes the graduate medical education funds. The Institute of Medicine, in its April 9, 1997 report, identified several issues for future funding by governmental programs. These points include 1) continued desirability of graduate medical education funding, 2) the need for relative neutrality of the payments in trying to shape the workforce, 3) the need for each payer to contribute proportionately to support graduate medical education, 4) the need for reasonably consistent payments across different institutions, and 5) the need for transition to any new distribution scheme to be gradual and nondisruptive (15).

The Institute of Medicine's plan is also noteworthy in that it suggested the use of a defined fund to support

graduate medical education which is separate from the Medicare Division of Research Grants payment system and from capitation. Further it does not attempt workforce restructuring, it sets a uniform price per trainee and it is more responsive to possible future changes in health care delivery.

In contrast, private sector payers are under pressure to control costs; this has caused many such payers to deny payment for training costs, thus putting teaching institutions at risk. Further, this attempts to shift the burden of educational costs to government payers like Medicare, and the Department of Veterans Affairs Healthcare System at a time when their resources are being reduced.

Medicaid represents a federal-state partnership that delegates management authority to each state. The current practices for supporting graduate medical education vary widely. For example, New York State provides \$500 million annually, whereas California does not use its Medicaid funds in this manner. Thirty-seven of the 50 states do contribute to graduate medical education support. Since private payers have not isolated the educational support, the costs are distributed as a part of the gross premium. In most states private payers pay a higher premium to teaching hospitals as a means of supporting graduate medical education.

Capitated care, which is becoming increasingly widespread, has a definite impact on academic cardiology, even though an academic cardiology unit may have several intrinsic advantages over a nonacademic system. The main advantage is perceived quality of care, which, according to the Healthcare Advisory Board, is the single most powerful tool for attracting cardiac admissions and for building program volume. Thus, important factors in operating a successful academic cardiology program include the presence of high quality physicians, the presence of a physical plant with state-of-the-art facilities, a commitment to research which ensures access to state-of-the-art devices and the availability of investigational drugs.

In summary, it appears that the nation and most state governments are prepared to support graduate medical education at a reduced level, but in return, will demand more accountability for the expenditures and require that emphasis on specialization and academic development be balanced with programs designed to support "public goods." In the current era, these usually are represented by a need to increase the output of generalists, to reduce the output and distribution of selected specialists, to redistribute patient care and medical education to ambulatory care and other community sites and to increase the representation of minority and other socially disadvantaged populations in the medical profession.

For academic cardiology, these changes need not portend a loss of its stature, importance or survival. Rather, academic cardiology is recognized and appreciated for its many tremendous accomplishments, credibility and visibility. Thus, it has an opportunity to position itself to use its

talented workforce to integrate better the continuum of patient care, research and education through a network or system that incorporates the resources of the core academic center, ambulatory care sites (urban and rural) and appropriate community health care sites. Academic cardiology, of all of the medical subspecialties, is probably better prepared and able to respond to the evolving changes in medical education than are most other medical subspecialties.

CONCLUSIONS

Effective teaching is fundamentally important to the future of academic cardiology. Recent changes in the delivery of health care have had major impact on the capability of clinician-educators to function as effective teachers. This has occurred in the setting of increasing complexity of the specialty which in itself mandates the need for high quality teachers with sufficient time to impart new information and techniques. Innovative strategies will be required to resolve this problem.

RECOMMENDATIONS

The academic cardiology unit must:

1. Promote and develop excellence in teaching.
2. Provide balance between cognitive/clinical and technical skills.
3. Develop and incorporate methods of evaluating effectiveness of teaching.
4. Insure that the training curriculum of medical students, residents and fellows includes appropriate cardiovascular content and is periodically reassessed.
5. Develop appropriate incentives to enhance the academic value of teaching. Such incentives include financial, professional (promotion) and personal rewards.
6. Develop and support appropriate promotion criteria for clinician-educators.
7. Guarantee faculty sufficient time and resources (e.g., conference space, teaching materials and so forth) devoted to effective teaching at all educational sites.
8. Develop and implement innovative teaching tools and methods.
9. Work with other components of the health care delivery system to insure an adequate patient base for education.

To assist academic units to accomplish these goals, the American College of Cardiology must take a leadership position in:

1. Educating the lay public, government, political establishment, media, payers, industry and health care providers on the importance of medical teaching and education.
2. Helping to identify the costs of education.
3. Developing a national forum to "teach the teacher."
4. Working with other groups to identify and ensure an adequate and stable funding base for medical education (e.g., all payer pool).

5. Assisting academic units with the development of innovative teaching and evaluation techniques.

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Task Force 4: Faculty

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THE FACULTY OF THE ACADEMIC CARDIOLOGY DIVISIONS IN THE 21ST CENTURY

Age-adjusted cardiovascular mortality has declined by 50% over the past 50 years. This remarkable accomplishment has been driven by the research and teaching of academic faculty. However, cardiovascular disease still accounts for 50% of morbidity and mortality in the U.S. Since cardiovascular disease is particularly prevalent in the elderly, the number of patients who will require cardiac care will increase in the 21st century. The rapid progress in understanding molecular and cellular pathophysiology provides unprecedented opportunities to bring improved care to patients.

Although the profile of the academic cardiology faculty varies considerably between institutions, certain principles and aspects pertain to all. Advances in cardiovascular research require major participation by academic cardiologists. Important basic science work is often performed in cardiology sections. Academic cardiologists frequently play a critical role in translating basic science advances into clinical applications. Depending on faculty interest, available resources and financial support, divisions will vary with respect to their activities in basic, translational and clinical trial research; but each division will have to participate in

research to bring current cardiovascular advances to patients, trainees and their community.

The academic cardiologist is essential in the cardiovascular educational process. He/she must remain committed to teaching trainees various problem-solving concepts and approaches, as well as critically appraise current practice and advances in the field. The faculty of cardiology divisions must foster a research environment and offer the highest standard of clinical care. An adequate number of patients is crucial to this mission. Fiscal support for time spent performing both teaching and research must be identified.

The impact of the socioeconomic forces and changes over the past decade on academic cardiology faculty has been remarkable. The daily activities of most academic faculty have been modified considerably; in general, time and effort formerly dedicated to research, scholarship and professional development have been shifted to patient care duties. In brief, academic faculty are now expected to perform research and to teach as before while increasing their clinical workload to nearly the same level as our colleagues in nonacademic practice and at a far lower remuneration. This represents a serious threat to the stability of academic divisions and to the survival of academic cardiology.

This section of Bethesda Conference #30 focuses on many of the problems of academic faculty in cardiology

(e.g., inadequate salaries, job insecurity, promotion and tenure, depressed morale), potential solutions for such problems and a prospectus for a successful future for academic cardiology faculty and divisions.

**THREATS TO SALARY STABILITY,
JOB SECURITY AND MORALE**

There can be little doubt that academic specialists in general, and cardiologists in particular, have felt the world closing in on them both financially and with respect to job security. Trainees lament that their options are limited compared to the past, and faculty feel threatened at every turn from decreasing reimbursement, increasing overhead, enhanced documentation requirements and restricted access to primary care colleagues. In many academic centers, faculties have experienced “rightsizing,” falling compensation or threats of both.

How this situation has come about is not difficult to ascertain. From 1988 to 1993, there was double-digit inflation in the cost of health care to employers and government agencies. This escalation in cost could not be sustained if company and government budgets were to be balanced. This led to a demand for decreasing health care costs. The result of this demand was the rapid growth of managed care. Implementation of managed care carries a number of direct consequences for all physicians and particularly for academic practices where the costs of teaching and research have been borne in part by clinical revenue. The number of dollars available for a unit of clinical work (e.g., clinic visits, electrocardiograms or angioplasty) is decreasing rapidly. Second, as more and more patients are managed by primary care physicians and access to specialists becomes limited, the number of services provided by specialists decreases. This leads to a diminished need for cardiologists in managed care markets, as noted in California and other regions of the country with high managed care penetration. This has occurred at the same time that there has been significant growth in the number of cardiology fellows.

A few examples will highlight the concerns. Figure 1 shows the stages in market development for managed care in a geographic region. In early markets, the number of catheterizations performed per 1,000 covered commercial lives (age <65 years) is approximately 2.4, with \$90+ available per covered member per month. Under these market conditions, one cardiologist who performs cardiac catheterization would need about 18,000 covered lives to stay busy full time. As can be seen, as the managed care market “matures,” the changes become dramatic. At end stage, where there are fully integrated systems taking full risk capitated contracts, the number of catheterizations falls to only 1 per 1,000 insureds, dollars available are cut in half and 58,000 people are needed to keep a single catheterizing cardiologist busy. Thus, there is a perceived diminished need for cardiologists. This, coupled with the fact that there

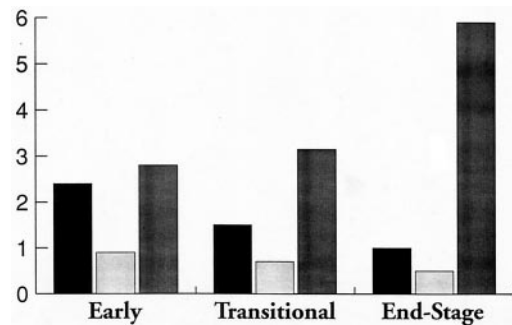


Figure 1. Stages in market development for managed care. **Black bars:** catheterizations per 1,000 population. **Light bars:** Dollars × 100 available per covered patient per month. **Dark bars:** Population × 100,000 needed to support a catheterizing cardiologist.

is rapidly decreasing reimbursement, has led to considerable anxiety on the part of cardiology faculty and fellows.

These changes have forced academic units to begin to cost-account faculty time in terms of research, teaching and clinical services. The goal is to make each component pay for itself, since clinical revenue can no longer subsidize teaching and research.

One consequence of decreasing reimbursement is an increase in the amount of work performed by faculty to help maintain economic stability. This has resulted in the shift to more clinical and less research faculty in departments of medicine and divisions of cardiology. Faculty are being asked to increase their clinical workload to emulate their colleagues in private practice but without the same personal remuneration. Figure 2 shows concrete examples of what the Division of Cardiology at Duke has done over the past 6 years. From 1992 to 1997, charges which can be taken as a surrogate for patient care activity (price increases over this time have been in the 1% to 3% per year range) have increased an average of 8.3% per year for a total increase of 49.8%. Therefore, with approximately the same number of faculty, Duke cardiologists did 38% to 45% more clinical work over a span of 5 years. Over that same period of time, total receipts fell 6.3%. These results are typical of those observed across the country and are obviously very disheart-

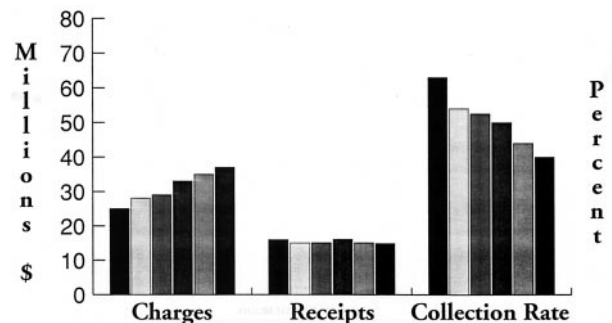


Figure 2. Work versus pay. **Bars (left to right):** 1992, 1993, 1994, 1995, 1996, 1997.

ening to cardiology faculty. In many academic institutions this has led to flat or decreasing salaries and even decreases in faculty size. If we look nationally at the trends in salaries for cardiology at academic centers, the recent past has shown little growth in compensation and, in some cases, actual decreases.

These changes have led divisions of cardiology to reassess the role and appropriate size of their faculty and their mission. Programs have now limited the number of recruits, and in some cases downsized. To meet our tripartite mission of teaching, research and clinical care, it will be necessary to find new revenue streams and to decrease expenses. In the past, divisions of cardiology have been financial generators for departments of medicine. This model is rapidly changing as cardiology income declines.

All of these forces have resulted in declining faculty morale. This situation has contributed to increased faculty turnover in recent years. To preserve the mission of academic cardiology, it is essential that we improve the morale of our faculty. However, it would sound foolish to inform faculty that "all is well." Nevertheless, academic life is still filled with many positive experiences: the intense satisfaction of the faculty member who has just won her hard-earned RO1 grant, the pleasure of hearing that your promotion has been approved and the joy of interacting with eager and enthusiastic medical students and house staff. We as faculty need to develop a level of personal equanimity that enables us to accept the bad news around us and put it into appropriate perspective. Academic cardiology will survive; our patients, our profession and our nation require it. We must remember that we practice the most advanced and sophisticated medicine in the world, that cardiovascular research plumbs new and exciting depths almost on a daily basis and that our students are as intelligent and dedicated as ever. We can and will overcome present circumstances.

THE APPROPRIATE NUMBER OF CARDIOLOGY FACULTY FOR THE FUTURE

Over the past 20 years, there has been a substantial increase in the number of full-time and part-time faculty members in academic cardiology divisions throughout the United States. The major impetus for this increase in faculty was the emergence of subspecialty disciplines within cardiovascular divisions as a result of advances in technology. The areas that required specialized training and developed into subspecialties were echocardiography, nuclear cardiology, clinical/interventional electrophysiology, coronary/valvular interventional cardiology, heart failure/transplant cardiology, preventive (risk factor modification) cardiology and vascular medicine. Certificates of added qualification are or will be granted by the Cardiovascular Board of the American Board of Internal Medicine for electrophysiology and interventional cardiology, since these subspecialties require an addi-

Table 1. Number of Full-Time Cardiology Division Faculty in Academic Medical Centers: Trends From 1992 to 1996

	No. Institutions*	No. Faculty/Institution
1992-93	93/115 (81%)	15.71
1993-94	101/115 (88%)	16.19
1994-95	109/116 (94%)	17.22
1995-96	82/114 (72%)	18.54
1996-97	77/115 (67%)	18.17

*Number of institutions reporting data/total number of institutions in the Association of Professors of Cardiology. (Data from the Association of Professors of Cardiology Financial Database Project.)

tional year of fellowship beyond the standard 3-year cardiology fellowship training program.

To staff these new disciplines, full-time academic cardiovascular divisions needed more attending physicians to provide clinical services, conduct research and train the next generation of subspecialists. In addition, cardiology fellows who were tracking to become "general cardiologists" needed a liberal exposure to these specialized areas.

The Association of Professors of Cardiology has been monitoring the number of full-time cardiology division faculty in academic medical centers since 1992. Table 1 shows the number of faculty members per institution. Between 1992 and 1997, the number of faculty per institution grew from 15.71 to 18.17 (Table 1).

Another stimulus for the increase in the number of cardiology division faculty during the past 20 years is the increased emphasis on the research mission of academic medical centers. Many cardiology divisions actually changed their name from "cardiology divisions" to "cardiovascular divisions" after incorporating vascular medicine and vascular biology into their academic mission. Research faculty in cardiology divisions sought to participate in the revolution in molecular biology and molecular genetics as it applied to cardiovascular disease. The advances in molecular biology stimulated increased recruitment of basic science faculty to academic cardiovascular divisions. Many division chiefs in academic cardiology sought to develop programs for the training of MD investigators in molecular and cellular biology. Many of these newly trained individuals remained on the faculty of their respective institutions or were recruited to academic centers elsewhere. Other stimuli for the growth of research faculty included expansion of clinical trials and technology development and assessment.

Unfortunately, a recent study has shown that faculty at medical centers in competitive markets publish fewer scientific articles compared to clinical investigators in less competitive markets (1). The junior faculty members in the highly competitive markets had greater clinical responsibilities and, hence, less protected time for research.

The question that can now be asked is "how many faculty do we really need?" The answer is at present unclear. The total number of board certified or eligible cardiologists in the U.S. has grown considerably during the past 25 to 30

years. In 1970, there were 4,616 clinically active cardiologists practicing in the United States, or 2.2/100,000 population. By 1993, the number of cardiologists in the United States had risen to 14,125, or 5.7/100,000 (2). Today in the United States, there are approximately 7.0 cardiologists per 100,000 population. Despite the well known constraints of managed care, the number of patients seen by cardiologists continues to grow. Contrary to intent, it is possible that despite managed care, the referral of patients with cardiovascular disease to cardiologists by primary care physicians might continue to increase. Americans clearly want freedom of choice of physician including access to cardiologists. Additionally, as the American population ages, cardiovascular-related illness will increase. An increasing emphasis on quality and increasing population at risk for cardiovascular disease might thus lead to a greater demand for cardiologists, thereby placing pressure on academic cardiology divisions to train more cardiologists. However, given the conflicting forces, it is impossible to predict accurately whether the demand for cardiologists will increase, decrease or remain the same in the future.

Similarly, the number of faculty members needed for the provision of high quality specialty care, state-of-the-art research and training of the next generation of general cardiologists, subspecialty cardiologists and internal medicine residents is unknown. Certainly, there will be increased utilization of nurse practitioners and physician assistants in response to cost-cutting and cost-effective care norms. Of interest are data provided by the American Board of Internal Medicine showing that the number of first-year cardiology fellows decreased from 858 to 736 between 1992 and 1996 at a time when the number of full-time faculty members per academic training institution actually increased (see Table 1) (3).

CHALLENGES TO PROMOTION AND TENURE

During the last two decades, academic health centers have become increasingly dependent upon clinical activity for revenue. In addition, competition for peer-reviewed research grants has increased. These changes have led to fundamental changes in faculty composition and activity.

Faculty engaged in clinical activities are under increasing pressure to achieve clinical productivity. Because peer-reviewed research funding is increasingly competitive, such awards are now limited mostly to applicants who spend at least 75% of their time on research.

Given the current situation, it is not surprising that the nation's academic health centers have struggled to confront complex issues of faculty evaluation, recognition, promotion, financial compensation and retention. The traditional evaluation and promotion strategies of earlier times are no longer applicable to the current needs of academic health centers and the activity patterns of their faculty. The incentives to forge a long-term academic career have changed. Thus, there are a number of difficulties in the evaluation, promotion and retention of faculty.

New Promotion Tracks

In response to the changing nature of the faculty, academic health centers have modified their promotion tracks. Details vary among institutions, but the general strategy is as outlined below. In essence, the traditional tenure promotion track has proved insufficient to cover the new activity patterns of current faculty. The system has been supplemented with additional tracks.

Investigator track. This track, which has existed for decades, predominantly recognizes research productivity as judged by peer-reviewed grant funding and publications. For the most part, faculty who engage in more than a token amount of clinical activity are not able to achieve the necessary research credentials to be competitive in this track. Consequently, this track has often become the "basic science" or bench research track. However, at some institutions this track can include a highly productive clinical investigator. Cardiologists who predominantly perform research should be expected, after a 3- to 5-year start-up period, to generate most of their salary through research grants. The remaining salary would come from endowment or institutional resources or the income of his/her modest clinical activities. Resources would generally be made available for space, equipment, personnel and investigator salary support over the first 3 to 5 years. The basic investigator who is not able to achieve these financial guidelines cannot expect to continue in the faculty ranks of most divisions or must reduce research effort to the level of research support.

In addition to funding his/her own research program and most of the salary stipend, the basic investigator is expected to collaborate closely with the academic clinical faculty of the division and other university faculty to enhance the research prowess of the program and the division, and to provide a research training program for cardiology fellows, graduate students and postdoctoral associates. The basic investigator, like the clinician, must be supported for his/her teaching effort.

Clinician-scholar (clinician-investigator) track. This track evolved in the 1980s and currently has become the predominant promotional track for clinical faculty. Individuals on the clinician-scholar track are expected to be outstanding clinicians who contribute heavily to the institution's teaching activity. The clinical faculty member should be expected to do more than see patients and/or do procedures. He/she should participate in multicenter trials and ideally, eventually direct or codirect one or more of these, generate a modest number of clinical reports and teach students, house staff and fellows during part of his/her day-to-day clinical activities. These expectations impart and justify the term "academician" irrespective of whether he/she is on the tenure track. The professional satisfaction of the teaching role and study participation also serve to attract faculty members to the division. These faculty members are typically loyal to the academic mission, excellent teachers of

clinical and bedside cardiology, extremely hard working, respected clinicians and superb role models. Most divisions will fail to thrive clinically, investigatively, academically and financially without many faculty members serving in these clinical roles and without a large patient population under its care.

Valid and rigorous evaluation of performance on this track has posed a complex challenge to institutions, since it is often difficult to develop rigorous methodologies to evaluate clinical and teaching performance. The number of clinical faculty needed to develop a successful division will vary widely depending on the location of the institution, resources available, potential referral base, interaction with referring physicians and local centers, Health Maintenance Organization or managed care contracts (awarded and under negotiation) and so forth. For most divisions, the academic clinicians could constitute 50% or more of the total faculty. For divisions that are community-based and draw on practicing clinicians to cover the teaching needs or the few divisions that are extremely well funded for research, the central role and number of the geographic full-time academic clinicians might be lower.

Clinician-educator track. In response to the increased need for clinical activity by fully affiliated faculty, some academic health centers have developed a third promotion track. The principal mission of faculty on this track is to engage in clinical practice and teach. Responsibilities for scholarship are subsidiary. Whereas this track enables institutions to hire, promote and retain clinical faculty who do not publish, the relationship of this track to the clinician-educator track is often less clearly defined. At times there is competition for referrals between faculty on the two tracks.

Affiliated clinical faculty. Traditionally, academic health centers have had an abundance of affiliated clinical faculty. These individuals are generally in private practice and are not employed by the institution. They may have limited teaching responsibilities and are not subject to the appointment and promotion requirements of the full-time faculty. The fraction of the institution's clinical activity and teaching provided by these individuals varies depending upon the overall organization of the medical center but in general is not substantial. Criteria differ among institutions for appointment and promotion of affiliate faculty. Occasionally, long-term affiliate faculty leave private practice and join one of the above-mentioned academic tracks, thereby becoming employees of the academic medical center.

Challenges to Meeting Promotional Requirements for Fully Affiliated Faculty

Requisites to be a successful academic cardiologist. The traditional successful academic cardiologist was said to be proficient in three areas: research, clinical skill and teaching. Each of these entities requires separate skills, and there is

incomplete overlap between them, that is, development of successful research productivity does not necessarily confer excellent clinical skills or teaching proficiency. Success in the research arena, basic or clinical, requires training, creativity and the application of a sufficient fraction of the individual's time to generate data, analyze it and prepare manuscripts reporting the results. Success as a clinician requires sufficient experience to acquire the requisite clinical acumen and skills, an ongoing clinical practice and continuous self-education to maintain and extend proficiency. Success as an educator requires the motivation to teach, in-depth knowledge of the subject and the acquisition of the necessary skills to communicate concepts to students. Real success in all three areas is probably no longer realistic; even excellence in two areas is difficult to achieve.

Research requirements. Successful research requires funding. It is no longer possible to conduct important research in one's spare time using borrowed facilities. Consequently, it is necessary to secure funding to support both the costs of the research and the faculty member's salary. Securing research funding requires the development of requisite credentials and the production of credible proposals to funding organizations. Consequently, an individual in the early stages of his or her career must devote the majority of their time and effort to acquire such skills and credentials. Such an effort allocation is not consistent with the time needed to develop and maintain top-flight clinical credentials. Accordingly, individuals who seek successful careers as investigators must devote the majority of their time to that activity.

Clinical demands. Individuals who pursue clinical career tracks in cardiology must confront three axioms:

- Clinical cardiology is sufficiently complex and demanding that one cannot achieve and maintain proficiency without practicing actively.
- The salary support for academic clinicians is derived almost exclusively from their clinical revenues.
- Clinical cardiology practice is punctuated with frequent emergencies which make it difficult to compartmentalize one's time.

Consequently, academic clinical cardiologists must engage in relatively high volume clinical practice. Such activity patterns tend to demand a large fraction of an individual's time and may be difficult to differentiate from the activity patterns of many clinicians in nonacademic practice.

Faculty assessment and performance improvement. Although cardiology faculty members may initially be uncomfortable with the concept of assessment of performance, formal evaluation of all areas of the mission are becoming more common. Such assessments can be used to recognize clinical achievement with appropriate reward, and to point out opportunities for improvement. A number of clinical benchmarks can be employed in this analysis. For example,

the relative value units (RVUs) generated by an academic cardiologist will approach those of a practicing cardiologist with modifications for teaching and research effort.

Research metrics (grant dollars and publications) are more standardized for the promotion process than are those employed for clinical effort. However, evidence of independent investigation is becoming less important in the current era, with collaborative investigational projects the commonest form of biomedical research. Much work remains to be done with respect to evaluation of educational performance, although standardized student evaluations and quantitation of educational time and effort are becoming more common. Service to a variety of university, community and national organizations must be recognized.

Such formal evaluations can improve mentoring and lead to valuable discussions of the individual faculty member's goals and how these relate to those of the department and of the institution.

Forces acting on faculty. RESEARCH FACULTY. A research faculty member's entire career depends upon his/her research productivity. Such an individual's performance evaluation will be heavily influenced by research funding and publications. Consequently, such an individual has little incentive to participate in teaching activities or to develop teaching skills. A research faculty member has two principal career hurdles: to establish a successful program which has consistent productivity and sustained funding; and to maintain that output over a career. The latter is perhaps the more daunting challenge since it requires sustained creativity.

CLINICAL FACULTY. A faculty member in the clinician-educator track must achieve clinical excellence and produce sufficient scholarly output so that he/she can be distinguished from a nonacademic clinician. Currently, clinician-educators are subject to substantial clinical productivity requirements. These demands reduce the time available to engage in scholarly work. Thus, there are many clinician-educators who are devoting virtually all of their time and energy to clinical activity and are not able to achieve requisite scholarly production.

Faculty Development and Counseling

For faculty to develop a long-term, successful and satisfying career, considerable mentoring and faculty development are essential. Many academic institutions lack effective programs in this area. All too often, new faculty are left on their own, floundering as they attempt to develop their careers. In addition, some cardiology faculty will require training in nonclinical areas such as informatics, decision analysis, educational theory, leadership and business management practices. The latter two areas are particularly relevant for divisional leaders.

Aligning Faculty Incentives With Mission and Goals

Faculty need to be organized and perform as a business unit, with defined business lines (teaching, research, patient care)

integrated and managed to accomplish objectives supporting the mission and vision of the division. Faculty need to be intimately involved in all aspects of divisional planning and decision making.

Total compensation including salary supplements or incentive bonuses for faculty should reward productivity and be aligned with what is of value to the division and the institution. Incentive plans for highly productive faculty should be based not only on financial performance (i.e., total revenue generation minus expenses), but on RVU generation with significant credit given to evaluation and management RVUs. Some institutions have introduced "multiplier" factors, whereby new patient visits and new consultations are assigned a higher value for incentive plan calculations than the standard RVUs assigned to those Current Procedural Terminology (CPT) codes. Other creative approaches to motivate faculty performance might include salary supplements for obtaining extramural research funding or receiving teaching awards. Incentives can also be created to attract and retain new and current faculty. For example, the division could create an equity fund with contributions made per year of faculty service. This is comparable to approaches undertaken in private practice groups where members of the group buy into the practice. Such a plan represents a cumulative investment by the faculty member that can be withdrawn at retirement or when the faculty member leaves the institution. Other creative incentive packages should be developed to motivate excellence in teaching and research.

Supplemental Funding of Teaching and Research

Although much of cardiology teaching occurs as part of day-to-day clinical activity (e.g., ward rounds, reading echocardiograms), dedicated time must often be set aside for the delivery of more didactic education. The three- to five-year start-up period for the new faculty member with a primary focus on cardiovascular research is not sufficient to generate an adequate income (clinical or research) to support that salary line.

Funding for these teaching and research activities remains a challenge and a serious threat to the mission and future of cardiology divisions. To date, these monies have been largely obtained from divisional clinical income. Clinical income has decreased to the level where these monies are no longer adequate or even available for teaching and research. Negotiating a reduction in cardiology financial support rendered to the departmental budget should be readdressed for the purpose of redirecting these dollars to the teaching and research mission of the cardiology division. Other sources of funding must include departmental and medical school teaching and start-up funds. Adding release-time salary support to grants (including industrial grants) should be encouraged. Endowments need to be considered for ongoing funding for teaching and research and are likely to become the major solution in the future.

ACADEMIC PEDIATRIC CARDIAC CENTERS

The configuration and needs of academic programs along pediatric cardiac service lines differ in some important features from adult cardiac programs. These features relate to the special demography of pediatric cardiovascular disease and to issues of child health care.

The most prominent cardiac problem in childhood is congenital heart disease. These defects are relatively rare, approximately 1% of the population at birth. As a rough estimate, 3% to 5% of children will see a pediatric cardiologist at some time, but the majority of these visits are related to evaluation of nonpathologic cardiac complaints or findings such as an innocent murmur. The rare, significant cardiac anomalies are often highly complex and require teams of cardiovascular specialists with differing skill sets such as echocardiography, electrophysiology, interventional catheterization and cardiovascular surgery. As a result, pediatric cardiologists and cardiac surgeons are congregated in high resource centers associated with medical schools or stand-alone children's hospitals. Service needs in the rest of the country are provided by outreach from the academic center rather than by collaboration with community subspecialists.

Due to the rare nature of congenital heart disease, only 800 to 900 board certified pediatric cardiologists are practicing in this country at the present time. Although approximately half of practicing pediatric cardiologists are in office-based practices, they are usually associated with an academic medical center through some formal or informal relationship. Although workload for pediatric cardiologists has risen to the point that research and educational objectives are not being met, the number of jobs offered at academic centers are limited, usually as a result of inadequate financial resources.

There is a strong partnership between pediatric cardiologists and cardiovascular surgeons, since the dominant patient groups require close collaboration in the planning of medical and surgical intervention and in perioperative and postoperative management. Other groups that collaborate in patient care are neonatologists, obstetricians (maternal fetal medicine specialists), intensivists and adult cardiologists.

Due to the complex nature of congenital disease, there is little overlap in duties between pediatric cardiologists and general pediatricians, thus there is no competition between groups.

Clinical service reimbursement for congenital cardiac care is based on Medicare reimbursement for acquired disease. The time and overhead costs of this care are not appropriately represented, and there is little opportunity to compensate by increased volume of care since disease is rare. Therefore, income of pediatric cardiologists is roughly 55% of that of adult cardiovascular specialists. Moreover, income of pediatric cardiologists often heavily subsidizes departments of pediatrics, because income from other pediatric

specialists and subspecialists is even more limited. As a result, there is a critical lack of resources to use as start-up or bridging funding for basic or clinical science.

The combined factors of restricted financial resources and the time requirements for outreach as well as extremely complex care result in low research productivity. In addition, trainees are often attracted to the field by the dramatic clinical appearance of heart disease in the newborn and the gratifying therapeutic results. Thus, the field does not favor individuals who are willing to restrict their clinical effort to the 10% to 20% necessary to be grant competitive. As a result, of 117 National Institutes of Health grants in areas related to pediatric cardiology, only nine awards of any type are held by eight pediatric cardiologists.

The number of pediatric residents choosing subspecialty training is decreasing. Debt burden is a significant factor in discouraging trainees from pursuing an academic, research-based career when incomes are low. Thus, the outlook for funded investigators in the field is bleak and likely to worsen in the future.

Another consequence of a field based on the management of rare, complex disease is that the numbers of patients necessary to achieve excellence and the spectrum of experiences required to support training make the academic centers very sensitive to competition from other groups. Academic pediatric cardiology groups require a large population (at least 1 million) to support the necessary experience in technical procedures. Surgical mortality for congenital heart disease has been directly related to patient volume in several large studies. In addition to complex disease, academic centers need significant patient volume with a low severity of disease on which to base training of generalist pediatricians.

To preserve excellence of clinical service, education and research in pediatric cardiac academic centers, the following needs must be addressed:

1. Patient care reimbursement must be matched to the real costs of service delivery in this complex patient population.
2. Patient access to academic medical centers must not be restricted, because of the extreme sensitivity of clinical outcomes and educational needs to patient volume. The organization of integrated health systems should be carried out in a way that will regionalize procedural care to high resource centers.
3. Specific funding and/or debt forgiveness will be required to build sufficient research strength within pediatric cardiology.

Training in adult cardiology is increasingly focused on the care of acquired heart disease. As a result, relatively little attention is paid to congenital heart disease in adults. Concurrently, increasing numbers of children with congenital heart disease are surviving to adulthood and require care. Accordingly, steps should be taken to assure that there is an appropriate reservoir of adult cardiologists with sufficient

expertise in congenital heart disease to care for these patients.

WOMEN IN ACADEMIC CARDIOLOGY

Women currently make up 5% of practicing adult cardiologists and 10% of adult cardiology trainees. In pediatric cardiology, the proportion of women is much higher. Forty-nine percent of current pediatric cardiology trainees are women. Work profiles of women and men were recently described by Limacher et al. in a study sponsored by the American College of Cardiology (4). A number of important differences between a sample of 964 female American College of Cardiology members (including pediatric cardiologists) and an age-matched sample of 1,199 male members were found in this study. They are summarized below.

Women are more likely to describe their primary or secondary role as clinical/noninvasive. Women practiced clinical cardiology as a primary role in 79% of respondents versus 58% of male respondents. They described themselves as echocardiographers more often (31% vs. 19%); and they more often described themselves as researchers (12% vs. 8%).

Only 8% of women cardiologists practice part-time. Seventy-six percent of women had children; only 1% had on-site child care facilities.

Factors that need to be considered in recruiting and retaining women include 1) assuring equality, 2) advancement judged on merit, and 3) flexibility in scheduling responsibilities. Women faculty share concerns about salary with their male counterparts, but they are also more interested in being able to negotiate hours and support staff. Women faculty also have special interests in administrative duties, and national recognition.

The pattern that emerges is that women have greater family responsibilities and they must work harder to achieve academic development and national recognition. As more women have entered medical school and the generalist pool from which cardiologists are recruited, these issues will assume greater importance. Potential corrective measures include more formal mentoring, further problem identification and leadership training/faculty development.

Since women more often enter academic cardiology, it is important to consider methods for addressing their interests and goals with academic career development. This effort will be rewarded because of the work profile of women which emphasizes clinical cardiology and research and also is responsive to increasing patient demand for women physicians.

MINORITIES IN ACADEMIC CARDIOLOGY

Minorities, as defined and monitored by the Association of American Medical Colleges, include Blacks, Mexican Americans, mainland Puerto Ricans and American Indians.

Minorities are dramatically underrepresented in academic cardiology. In addition to underrepresentation in medical

training, low percentages of minorities enter medical faculty. In 1997, 1,770 or roughly 11%, of matriculants to U.S. medical schools were minorities. This is about half the proportion expected if representation in medical training parallels representation in the U.S. population. In addition, despite yearly U.S. minority medical school graduates in excess of 1,000 for the last two decades, only 2,303 minorities are current members of faculty in majority medical schools. There are additionally 1,000 minority faculty at historically Black and Puerto Rican medical schools.

Diversity in ethnic and cultural background, as well as gender of physicians and medical faculty is critical to achieve high quality care for all U.S. populations and to articulate all perspectives in discussions and priority setting in medical research and health policy. Minority physicians play a key role in improving access for minorities and the economically disadvantaged, and they provide cultural competence. Furthermore, the burden of cardiovascular diseases is disproportionate in minority populations, with excess cardiovascular morbidity and mortality in U.S. minority populations. Cardiology training programs should seek qualified minority candidates, facilitate identification of suitable mentors and target faculty training and development for minority candidates.

RECOMMENDATIONS:

Academic medical centers

- a. Faculty need to be organized and perform as a "business unit" with specific activity lines, that is teaching, research and patient care, which are integrated and managed in order to accomplish the divisional/departmental mission and objectives. Faculty input and involvement is essential in defining these goals and their implementation.
- b. Create different financial incentive packages for faculty members dependent on their predominant area of concentration: clinical, teaching or research. Thus, individuals who concentrate on research might receive a salary bonus dependent on successful grant applications; clinicians would be rewarded for productivity; and educators would receive incentives for recognized excellence in teaching.
- c. Institutional salary support for faculty time spent teaching students, house officers and fellows. A variety of formulae already exist in different academic institutions for teaching support to faculty salaries.
- d. Support protected research time for faculty members. It is particularly important for junior faculty members to be supported. Substantial quantities of protected time are essential to develop incipient research careers. Ultimately, endowed funds would seem the most secure method for achieving this goal.
- e. Revise promotion and tenure guidelines for academic institutions to recognize increased clinical demands. Thus, clinical investigator and clinical educator tracks

should be implemented. Tenure and promotion decisions should be made in an environment where clinical demands on faculty time are recognized.

- f. Time must be preserved and programs must be created for faculty development. Such programs include research mentoring, teaching effectiveness, professional development (e.g., continuing medical education), leadership and administrative skills. However, not all faculty will need development or coaching in each of these areas. Additional skills and processes worthy of consideration include organizational dynamics, best business principles and practices, team-based functional units, essentials of citizenship in an academic division and related areas.

The American College of Cardiology

- a. The American College of Cardiology should appoint an ad hoc committee whose charge is to develop evaluation instruments for promotion and incentives for cardiology faculty in the following areas: 1) teaching, 2) clinical activity, and 3) service. Guidelines and applicable benchmarks are desperately needed in these areas.
- b. The American College of Cardiology should develop an information clearinghouse detailing specific implemented strategies of various academic institutions concerning 1) faculty development, 2) faculty compensation, 3) assessment of faculty performance, 4) product lines, and 5) new approaches to health care delivery, including physician extenders, hospitalists, full-time clinical faculty and so forth.
- c. The American College of Cardiology should continue to educate the lay public, politicians and media in support of efforts that seek to ensure appropriate reimbursement for patients with congenital heart disease. This would allow the clinical care of these complex patients to be supported without cross subsidy from other endeavors. Supporting the academic faculty who care for these patients would allow for the development of a career track in congenital heart disease within adult cardiovascular medicine and would stabilize the faculty of pediatric cardiology programs who care for many of these complex patients.
- d. The American College of Cardiology should lobby the

National Institutes of Health to establish an appropriate number of research training and career development awards for pediatric cardiologists.

Academic cardiology leadership

- a. Academic leadership should recruit more women into sections of cardiovascular medicine and address the special needs and concerns of women in academic cardiology. Underrepresentation of women will continue unless training programs adopt policies to reduce barriers to women selecting and successfully completing training in cardiology. Programs should facilitate identification of suitable mentors for women and adoption of policies for family leave during training.
- b. Academic leadership should encourage the recruitment, and address the needs, concerns and retention of underrepresented minorities in academic cardiology. A variety of innovative programs, for example, National Institutes of Health minority supplemental grants, exist to support recruitment and retention of minority faculty. Mentoring of minority faculty members is essential to foster appropriate professional growth and development.
- c. Clinical faculty need a certain amount of protected time to develop some academic productivity. The quantity of time is usually modest, and academic productivity should be broadly defined. It may include development of teaching syllabi, computerized teaching aids, case reports and case series and so on.

TASK FORCE 4 REFERENCE LIST

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