

35TH BETHESDA CONFERENCE

Introduction: The Origins and Implications of a Growing Shortage of Cardiologists

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During the past 50 years, many remarkable advances have occurred in our ability to diagnose, treat, and prevent cardiovascular disease. This progress contributed to a dramatic decline in cardiovascular mortality rates. Although there are many reasons to anticipate additional advances, the rate of discovery and diffusion of new knowledge and techniques is related to the resources devoted to cardiovascular research and practice. Many types of professionals, including basic scientists, clinical investigators, and population scientists, contribute to this critical effort. Cardiovascular specialists lead the huge team effort necessary to translate discoveries and innovations into enhanced outcomes. This report focuses on whether our nation is training enough cardiovascular specialists to accomplish these ambitious goals and to care for the growing burden of cardiovascular disease in our aging population. (J Am Coll Cardiol 2004;44:221–32) © 2004 by the American College of Cardiology Foundation

There is increasing concern that the U.S. is facing a serious shortage of cardiologists (1–3). The American College of Cardiology (ACC) Task Force on Workforce, appointed in 2001, undertook a two-year process of literature review, hypothesis generation, research design, data acquisition, and analysis. This intense effort included a Bethesda Conference in October 2003, to reach consensus on the accompanying report. The ACC task force believes the nation is confronting a growing shortage of cardiovascular specialists that will hinder access to care and undermine our vital research effort. To further enhance patient outcomes and accelerate discovery, the U.S. needs an adequate supply of highly trained and productive practitioner and academic cardiologists. These specialists deliver care, advance knowledge, and coordinate sophisticated teams of non-physician professionals dedicated to the prevention, diagnosis, and treatment of cardiovascular disease.

This Bethesda Conference document includes eight working group reports that propose several short- and intermediate-term strategies to help narrow the growing demand-supply gap for cardiologists. Some recommendations are fairly easy to implement at a local practice or institution level. Others will require a series of coordinated actions at a national level. This report concludes with a summary of the task force's recommendations. We hope this effort will catalyze actions by academic medical centers, regulatory organizations, federal policymakers, professional societies, and others that influence the output of cardiovascular specialists. This is critical because the U.S. must produce and maintain a cardiology workforce of sufficient size and sophistication to provide specialized care to a growing number of patients with cardiovascular disease, the leading cause of mortality and morbidity.

This document was approved by the American College of Cardiology Foundation in March 2004. It is endorsed by the following organizations: the American Heart Association, the Association of Black Cardiologists, the American Society of Echocardiography, the American Society of

Nuclear Cardiology, the Heart Rhythm Society, the Society for Cardiovascular Magnetic Resonance, the Society for Cardiovascular Angiography and Interventions, the Society of Geriatric Cardiology, and the Society for Vascular Medicine and Biology.

BACKGROUND

The common wisdom at the end of the 20th century was that the U.S. was producing too many specialists, including cardiologists (4–6). A decade ago the rapid growth of for-profit managed care, with its gatekeeper model and other obstacles to specialty services, was transforming the medical landscape. At the same time, the Clinton administration was promoting an ambitious plan to reform health care delivery that emphasized primary rather than specialty care. In that context, in 1993, the ACC sponsored the 25th Bethesda Conference on “Future Personnel Needs for Cardiovascular Health Care.” The resulting 54-page report, rich in content and insights, addressed six areas: 1) the underserved; 2) academic health centers; 3) partnerships in the delivery of cardiovascular care; 4) the relationship between cardiovascular specialists and generalists; 5) a profile of the cardiovascular specialist—trends in needs and supply and implications for the future; and 6) pediatric cardiology (7).

The 1993 Bethesda Conference report contained a wealth of information and many thoughtful recommendations. It also lent authority to the perception that the output of certain types of cardiologists exceeded the nation's needs. While acknowledging the difficulty of projecting demand in an unstable political and economic environment, the report concluded: “The cardiovascular community should adopt the general concept that the numbers of adult cardiology trainees be decreased” (8). It is important to note, however, that this prescription applied mainly to the rapidly evolving field of interventional cardiology, then just 15 years old:

Table 1. Cardiology Training Programs and Trainees in the U.S. (1950–2002)

Year	Programs	Total Trainees (All Yrs)
1950	19	37
1960	72	142
1972	280	1,260
1980	239	1,492
1990	221	2,310
1994	209	2,419
1995	206	2,354
1996	202	2,309
1997	199	2,238
1998	189	2,138
1999	186	2,175
2000	181	2,106
2001	179	2,160
2002	175	2,223
2003	173	2,117

Source: W.B. Fye, *American Cardiology* (1996), Table A9, p. 346 (to 1990), *JAMA* Graduate Medical Education Issue (1995–2002), and Accreditation Council for Graduate Medical Education, Accreditation Data System. Accessed June 10, 2004. Total programs and residents reported from *JAMA* include programs and resident physicians as of August 1st for each year reported.

“The Task Force recognizes the excessive numbers of interventional cardiologists being trained and the need for more physicians trained in clinical and preventive cardiology” (9). Another section, amplifying the latter point, identified “an increased need for noninvasive cardiologists” (10). Meanwhile, a separate 1993 ACC member survey documented demand; 50% of the respondents had tried to recruit a cardiologist during the prior 12 months (11).

Considering the Bethesda Conference report and other inputs, the ACC Board of Trustees recommended, in 1994, a reduction in the number of adult cardiology training positions, especially interventional positions. The ACC president, Daniel J. Ulliyot, explained, “We project that greater penetration of managed care in health care markets, more emphasis on primary care and the impact of cost-containment strategies on the use and development of technology will all tend to reduce the need for cardiovascular specialists” (12). Between 1994 and 1999, the number of first-year and total adult cardiology training positions fell by 20% and 10%, respectively. The number of trainees has fluctuated since then, but according to the latest published data, the number of first-year and total adult cardiology trainees is still 11% and 13%, respectively, below 1994 levels (Table 1, Fig. 1).

As the number of cardiologists being trained declined in response to pressures to rebalance the primary care/specialists mix, it was becoming evident that managed care’s gatekeeper model was unpopular and patients were demanding access to specialty care. Health policy analyst Edward Salsberg explained recently that the plan of growing primary care and shrinking specialty care turned out to be “unrealistic,” in part because it was “not based on the U.S. marketplace” (13). By 2000, there was increasing anecdotal

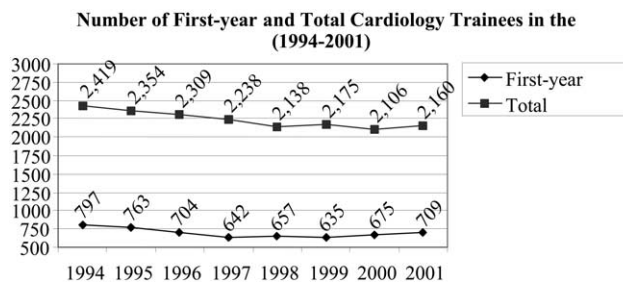


Figure 1. Number of total and first-year cardiology trainees in the U.S. (1994–2001). Source: American Board of Internal Medicine (www.abim.org/Workforce/Fellgen.htm) and *JAMA* Graduate Medical Education Issue (1995–2002). The year listed is the year the first-year trainee entered the program. Total number of residents includes resident physicians on duty as of August 1 for each year reported.

evidence of strong and growing demand for cardiologists in many parts of the country (14,15). The following year, as president-elect of the ACC, I appointed the present task force to evaluate adult cardiology’s physician workforce.

When the ACC task force steering committee first met in March 2002, we reviewed many articles on physician workforce beginning with the 1965 report of President Lyndon Johnson’s Commission on Heart Disease, Cancer, and Stroke, which concluded there was a “critical shortage” of cardiologists (16). We also reviewed the 1981 report of the Graduate Medical Education National Advisory Committee (GMENAC), which predicted the U.S. would have 94% more cardiologists than needed in 1990 (17). When 1990 arrived, however, there was no surplus. The GMENAC report (based on a five-year effort that cost more than \$5 million) illustrates the challenge of projecting physician workforce, especially in a field as dynamic as cardiology, something the ACC task force considered as we discussed our charge.

The task force also reviewed the ACC’s 1993 Bethesda Conference report on workforce and considered four lists of factors that might influence the demand for, and supply of, cardiovascular specialists over the next decade. We decided to focus on the short and intermediate term because forecasting workforce needs has proved to be very difficult. The task force concluded that several potent scientific, social, and demographic “demand catalysts” would outweigh factors (emphasized in the 1993 report) that might decrease demand (Table 2). Active discussions among task force members and consultants led to a strong consensus that the U.S. was facing a serious shortage of cardiovascular specialists.

DEMOGRAPHICS AND DEMAND FOR CARDIOVASCULAR SERVICES

The cardiovascular disease burden in the U.S. is great and growing. Despite a dramatic decline in age-adjusted heart-related death rates over the past two decades, Cardiovascular disease still caused 38.5% of all deaths in the nation in 2001 (18). The incidence and prevalence of cardiovascular disease is projected to increase substantially in the future owing primarily to demographic and lifestyle trends in the U.S.

Table 2. Cardiovascular “Demand Catalysts”

- 1) Population: An aging population with more chronic cardiac patients living longer.
- 2) Metabolic syndrome: The “epidemics” of obesity and type 2 diabetes leading to more cardiovascular disease.
- 3) Superior outcomes: Compelling evidence that heart patients have better outcomes if they receive at least part of their care from a cardiologist.
- 4) Managed care decline: The decline of managed care’s gatekeeper model that blocked access to specialists.
- 5) Consumerism: A better informed public with growing expectations in terms of their personal healthcare.
- 6) Women: Increasing awareness among women that they are more likely to die from cardiovascular disease than from cancer.
- 7) Clinical innovation: Continuing technological and procedural innovations and their rapid diffusion into practice.
- 8) Screening: More widespread use of cardiovascular screening tests that result in more referrals and procedures.
- 9) Subspecialization: Progressive subspecialization within cardiology that results in more “internal” referrals.

Demography projects a very substantial increase in size of our nation’s elderly population. In addition, the current “epidemics” of obesity, type 2 diabetes, and the metabolic syndrome will increase the incidence (19). These two factors will lead to a significant increase in the number of affected persons who will need cardiovascular care. Ironically, our success in reducing the mortality rate from acute cardiac events such as acute myocardial infarction has increased the population of patients with chronic cardiovascular disease, especially heart failure.

The World Health Organization study of the Global Burden of Disease emphasizes that these problems are not limited to countries with developed economies. Even if the public focuses more energy on self-preservation and makes better choices with respect to cardiotoxic habits such as smoking or cardioprotective habits such as exercise and healthy diets, demographers warn that we are confronting an expanding population of older Americans that will require much more cardiovascular care. These sobering predictions support the premise that we will need a larger cardiology workforce to provide the informed and specialized care that has been proven to save and enhance lives (20).

In 2000, Foot et al. (21) reported on demographics and cardiology from 1950 to 2050. These investigators concluded that a shortage of cardiologists was imminent and would be especially problematic in the 2010s and 2020s “when the [baby] boomers reach the prime heart disease ages and the boomer physicians are retiring.” They declared: “Now is the time to confront this challenge. . . . There will be an opportunity during the early 2000s to develop a strategy to attract and retain the children of the boomers into the profession. . . . The opportunity to attract them into the cardiovascular medicine profession should not be missed.” The ACC task force agrees that our nation must seize this opportunity.

The task force also reviewed a paper by health policy

analyst and former medical school dean Richard Cooper and colleagues published in *Health Affairs* in 2002 (22). Cooper argued that the U.S. was facing a serious shortage of specialists. His position (and the economic demand model used to support it) fueled the smoldering national debate about workforce. The invited responses published with Cooper’s study were informed and passionate. Some researchers challenged his model and assumptions. Others argued that the solution to a shortage of specialists was to shift more responsibilities to primary care physicians or non-physician clinicians (something that cardiologists have done for years). In response to Cooper’s report, Uwe Reinhardt, a leading healthcare economist, acknowledged that mathematical models used to predict future surpluses or shortages of physicians are problematic because “any of the variables in the equation can change over time, sometimes in unforeseen ways” (23).

Reacting to Cooper’s study, health policy analyst Jonathan Weiner admitted “the track record of U.S. workforce policy has not been stellar” and suggested that “for any forecasting effort, it is more appropriate to question assumptions rather than predictions” (24). Weiner, a long-time proponent of the specialty surplus scenario, speaks from experience. In 1994, he assumed that up to 65% of Americans would be receiving their care from “integrated managed care networks in the near future.” By extrapolating HMO staffing ratios he predicted that in 2000 there would be an overall national surplus of 165,000 patient care physicians and “the supply of specialists will outstrip the requirement by more than 60%.” Claiming his study was “the most complete forecast to date of the expected impact of health reform on national physician workforce requirements,” Weiner emphasized that his forecasts were “surprisingly similar to those developed more than a decade ago by the Graduate Medical Education National Advisory Committee (GMENAC) using an entirely different methodology” (25). We now know that the massive surpluses of specialists that GMENAC predicted for 1990 and Weiner predicted for 2000 did not materialize.

In earlier publications, Cooper and associates outlined the challenges facing those who attempt to predict future physician workforce needs (26,27). The lack of an accepted model for workforce projections fuels the debate. Most workforce researchers have used one or more basic approaches to estimate future physician workforce needs including: 1) HMO staffing patterns, 2) economic demand, and 3) clinical need. Cooper’s model emphasizes economic demand. But Canadian health policy analyst Morris Barer described Cooper’s *Health Affairs* report as a “blizzard of linguistic and conceptual confusion.” He complained that Cooper’s approach allowed him “to dispense with the inconvenience of collecting a lot of detailed data or attempting to understand the dynamics of physician service provision.” Barer argued that “physicians have considerable influence over both what services they provide and the other health care services ‘demanded’ by patients” (28).

Cardiologists *do* influence the diagnostic and therapeutic care of patients in important ways. They have a professional obligation to help their patients navigate the complex and ever-growing maze of tests, procedures, and treatments. During the 1990s, some managed care organizations adopted proprietary guidelines that restricted access to specialty care and reduced a doctor's ability to make clinical decisions (29). Meanwhile, in an attempt to rationalize rather than ration cardiovascular care, the ACC and AHA accelerated their production of evidence-based clinical practice guidelines. Today, patients, physicians, payers, and policymakers benefit from these and other products of cardiology's sophisticated "trial-guideline-education process" (30).

Cooper's argument that the U.S. should produce more specialists reflects, in part, the pragmatic observation that there is little public or political support for restricting access to specialty care, despite concerns about healthcare costs (31). Referrals from primary care to specialists rose from 17.8% in 1997 to 25.5% in 2001, whereas the proportion of primary care physicians reporting problems arranging specialty referrals increased from 4.8% to 7.2% between 1997 and 2001. The waiting time to see a specialist also increased from 6.6 days or more in 1997 to 8.1 days or more in 2001 (32).

Returning to Cooper's 2002 study, it is understandable that there is tension around the issues he raised. Kevin Grumbach, an academic family physician and policy analyst, responded, "Reading the paper by Richard Cooper and colleagues is like watching a television commercial for a sport-utility vehicle (SUV). 'Buy more physicians' is the marketing pitch—and not just any physician, but the four-by-four (as in four years of medical school plus four or more years of residency training), gas-guzzling specialist model that creates an irresistible buying frenzy among American consumers eager to spend their discretionary income." Grumbach continued, "The 'Americans have a right to buy more specialists' view also raises the question of whether people are actually buying anything of benefit" (33).

The question of whether specialists—and here we are considering cardiologists—add value is not only relevant but is *critical* as our nation confronts the growing burden of cardiovascular disease in the context of finite resources. The ACC task force agrees that cardiovascular specialists, like all other healthcare providers, must consider the cost-effectiveness and cost consequences of their recommendations and actions. In recent years, many studies found that outcomes are enhanced significantly when patients with cardiac problems receive at least part of their care from a cardiologist (34–40). For example, a study sponsored by the American Board of Internal Medicine (ABIM) reviewed the care of all patients with acute myocardial infarction admitted to Pennsylvania hospitals in 1993. The investigators concluded: "If cardiologists had treated all of the study's approximately 30,000 patients, we estimate that 802 fewer

in-hospital deaths could be expected when compared with treatment of all patients by primary care doctors" (41).

Several specialties have expressed concern recently about the adequacy of their workforces in the face of an aging American population. Angus et al. (42) concluded that "a shortfall in pulmonologist time will . . . occur before 2007" and this shortfall is projected to "increase to 35% by 2020 and 46% by 2030." Similarly, Rizza et al. (43) warned that "the number of endocrinologists entering the workforce will not be sufficient to meet future demand" and recommended "actions designed to increase the number of endocrinologists in practice in the years ahead." Addressing nephrology, Pogue et al. (44) declared, "Action on several fronts is required to combat the predicted shortfall in full-time nephrologists." Similar concerns have been raised about anesthesia (45), general surgery (46), and geriatrics (47).

Reflecting on two decades of workforce debate and reacting to Cooper's article, three officers of the Association of American Medical Colleges (AAMC) stated recently that "all available market indicators, limited as they are, suggest that a shortage of physicians, particularly of specialty physicians, may well exist in some regions of the country. The conclusion seems inescapable that the projections of oversupply made in 1980 by GMENAC and those made in the early 1990s using HMO staffing patterns were seriously in error" (48). In October 2003, the Council on Graduate Medical Education (COGME) reversed its long-standing prediction of a surplus and now predicts a shortage of 85,000 physicians by 2020. In its report, COGME advocated for a 15% increase in medical school graduates to help address the shortfall they predict will develop between now and 2020 (Fig. 2). In addition, the report called for a change in the distribution of residency positions between primary care and specialties to better reflect market demand (49).

A recent survey of medical school deans and state medical society executives found that the majority of those surveyed perceive a current shortage of physicians in numerous specialties and subspecialties, including cardiology (50). Furthermore, the American Medical Association (AMA) adopted a new policy statement in 2003 that physician shortages do exist in some areas of the country, as well as in some specialties (51). Massachusetts, with several academic medical centers that train thousands of specialists annually, is already "experiencing a critical physician shortage" in five specialties, including cardiology, according to a recent study that also revealed that "physicians have been forced to react to these labor market shortages by increasing work hours (48%), adjusting professional staffing (37%), and altering the services they provide (31%) (52).

The current shortage of specialists documented by various surveys and reports is almost certain to get worse over the next several of decades. Internal analysis of workforce trends and disease prevalence by the ACC indicate that the demand among patients most likely to benefit from a cardiologist's care will require significant increases in patient loads by all cardiovascular specialists if nothing is done to

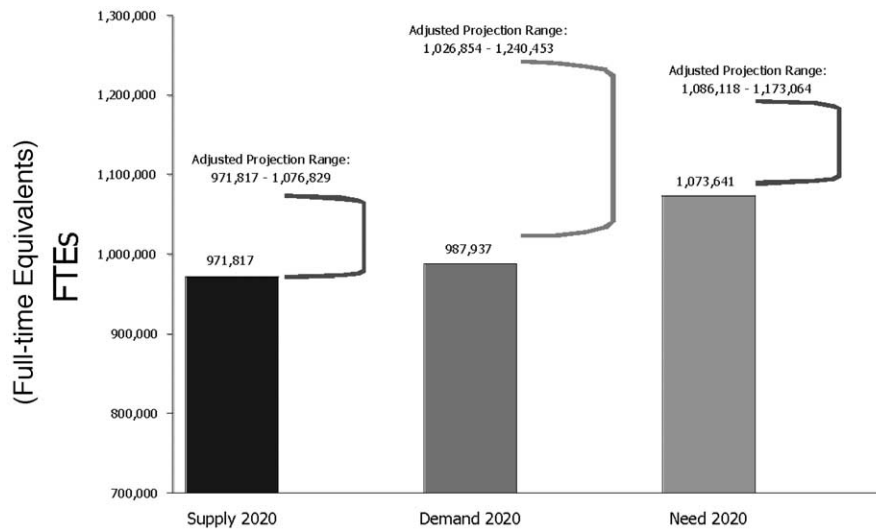


Figure 2. Projected physician supply, demand, and need in 2020. Source: Draft Report—Physician Workforce Policy Guidelines for the U.S. 2000–2020. Presentation to the Council on Graduate Medical Education, Center for Health Workforce Studies. School of Public Health, State University of New York at Albany, September 2003.

address the current and predicted shortages (Fig. 3). Indeed, ACC member survey data reveal that cardiologists have already used a variety of approaches to respond to increased patient loads (Table 3).

ACC SURVEY OF THE MARKET FOR CARDIOLOGISTS

Wennberg et al. (53) estimated that in 1996 there was an average of 6.3 cardiologists per 100,000 U.S. residents, but the numerator varied from 2.7 to 11.3 across “hospital referral regions.” The age-adjusted (population and physician workforce) supply of cardiologists is predicted to remain relatively constant until 2005, after which increases in the elderly population will result in a decrease in the adjusted supply of cardiologists to approximately 5.0 per 100,000 by 2020. This trend is expected to continue through 2040 as the baby boom generation ages.

Many factors determine the market for cardiologists in specific locations, and there is no central mechanism to influence their distribution (54). Today, there are jobs for practitioner and academic cardiologists in most regions of the U.S. About 40% of the nation’s hospitals with 100 or more beds are seeking cardiologists, and about one-half of these institutions believe it is “very hard” to recruit them (55). The ACC Practice Opportunity Line, a Web-based

job database, included 638 listings in February 2004 (56). The number of journal ads for cardiologists has increased dramatically in the past five years. Several practices are trying to recruit more than one doctor. A dramatic example is a 2002 advertisement indicating that the Ochsner Heart and Vascular Institute in New Orleans, a group of 27 physicians, was seeking 13 additional specialists in electrophysiology (2), echocardiography (1), non-interventional cardiology (4), interventional cardiology (2), vascular medicine (2) and heart failure and transplantation (2) (57).

Seeking more data, the ACC task force developed four

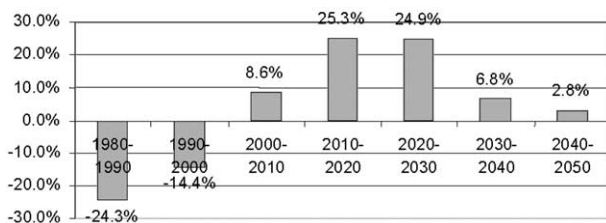


Figure 3. Estimated population 65 years old and older with cardiovascular disease per cardiologist (1980–2050). Source: ACC Workforce Analysis, Internal Task Force on Workforce Report, 2003.

Table 3. Change in the Day-to-Day Operation of ACC Members’ Practices in Response to Patient Load/Effort to be More Efficient

	%
Number of patients seen	
Increased	58
Stayed the same	33
Decreased over the past 3 years	9
Response to patient load	
Hired non-MD personnel	57
Allowed non-MDs to take on more patient responsibilities	38
Hired more clerical help	30
Increased use of patient self-management (e.g., Internet, printed material)	10
Employed innovative strategies to recruit cardiologists	2
Contracted with locum tenens firm	2
Volunteered other actions	
Longer hours/more time in office	28
Used electronic systems for scheduling/medical records	12
Increased staff	12
Added more work for existing staff	8
Use outside providers	7
Improved efficiency	7
Spent less time with patients	7

Source: ACC Membership Survey, 2002.

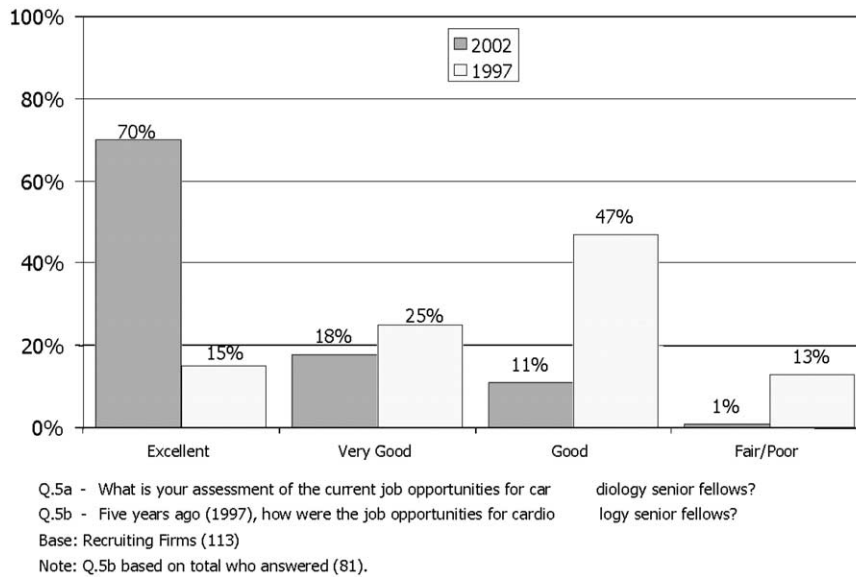


Figure 4. Assessment of current job market for cardiology senior fellows. Source: ACC Cardiology Workforce Study 2002.

questionnaires to assess the job market for cardiologists. A five-year time frame was chosen because long-term workforce predictions are notoriously inaccurate, and many ACC members, looking for help to manage their growing workloads, encouraged us to focus on the short-term. During the summer of 2002 surveys were sent to: 1) senior cardiology trainees, 2) cardiology training program directors, 3) recruiting firms, and 4) a sample of domestic ACC members. The responses revealed a high degree of concordance among the four groups with respect to perceptions of the current and projected five-year markets for cardiologists (58).

The ACC survey revealed that:

1. The supply of qualified candidates for existing cardiology training slots is adequate.
2. Training directors find it very easy (66%) or somewhat easy (29%) to fill their first-year cardiology training slots.
3. Recruiters believe the job market for trainees is excellent and has improved significantly in the past five years (Fig. 4).
4. Recruiters find it very difficult (76%) or somewhat difficult (21%) to fill cardiology positions (Fig. 5).
5. 83% of training program directors believe job opportunities for their senior cardiology fellows are excellent.

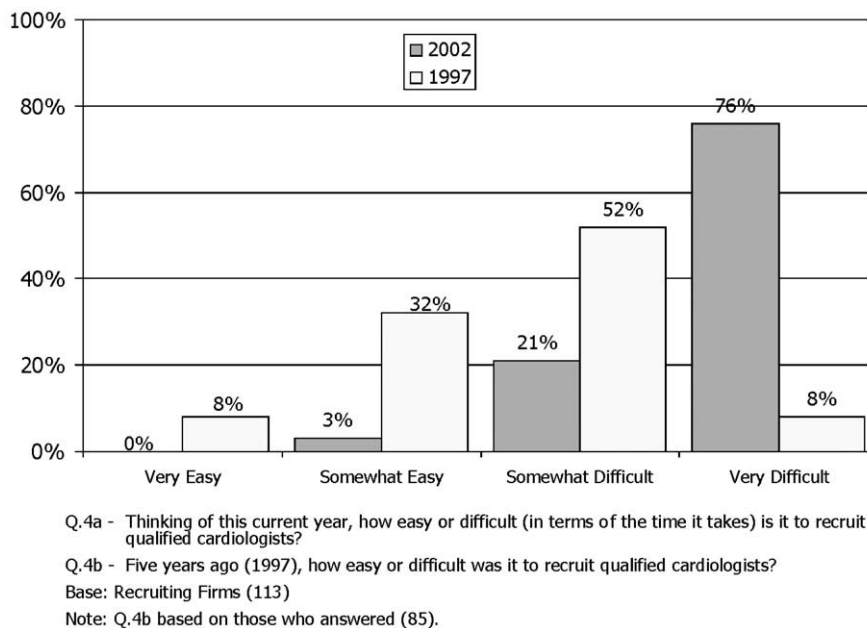


Figure 5. Ease or difficulty in recruiting qualified cardiologists (current vs. 1997). Source: ACC Cardiology Workforce Study, 2002.

Table 4. Trends in International Medical Graduate Cardiology Trainees

Year	International Medical Graduate (% of All Trainees)		
	General Cardiology Trainees (%)	Clinical Cardiac Electrophysiology (%)	Interventional Cardiology (%)
1996	36.6%	18.5%	NA
1997	40.0%	33.7%	NA
1998	42.0%	44.6%	NA
1999	41.2%	48.4%	39.7%
2000	38.6%	37.2%	55.8%
2001	36.7%	43.0%	49.1%
2002	32.9%	41.7%	42.1%

Source: Graduate Medical Education Issue, *JAMA* (1997–2003).

- 77% of training program directors would expand their first-year slots by an average of 1.8 positions if funds were available to support these additional positions.
- Senior trainees who had accepted positions were extremely satisfied (28%), very satisfied (42%), or somewhat satisfied (28%) with the opportunity. Only 2% were “not satisfied.” The majority of their training directors agreed that job opportunities for them were excellent.
- Senior trainees ranked “ultimate income potential” 8th among 18 factors that might influence their job search (see Working Group 7, Fig. 2 for more detail).

INTERNATIONAL MEDICAL GRADUATES

There is a long-term trend that fewer U.S.-trained medical students are becoming cardiologists. In 1970, 18% of cardiologists in the U.S. were international medical graduates (IMGs) (59). Between 1996 and 2002, the percentage of trainees in cardiology programs who were IMGs averaged about 40% (Table 4) (60). Not surprisingly, a similar trend has occurred in internal medicine residencies (61). For decades, IMGs have filled the gap between the number of U.S. medical graduates and first-year residency positions (23,62). But IMGs seeking U.S. training now face higher expectations with regard to clinical skills and language proficiency. They also face more restrictive immigration policies after the September 11 terrorist attacks (63). The steady supply of talented IMGs that the U.S. has depended on for decades to meet the demand for physicians is threatened by our nation’s understandable concern about terrorism and the resulting new policies and procedures designed to reduce the threat. In this challenging context, there is renewed interest in expanding the capacity of U.S. medical schools to better align our nation’s production of, and demand for, physicians (64,65).

WOMEN AND UNDERREPRESENTED MINORITIES

In contrast to the large number of IMGs entering cardiology, AAMC data reveal that African-Americans, Hispanics, and female graduates of U.S. medical schools are significantly underrepresented in cardiology training programs compared with the general population (66). The issue

of underrepresented minorities in cardiology reflects a larger social phenomenon that is not unique to specialty medicine. Cohen et al. (67) concluded recently that, “the long-term solution to achieving adequate diversity in the health professions depends upon fundamental reforms of our country’s pre-college education system.” This observation does not justify inaction. The report of Working Group 3 includes several suggestions to help cardiology attract more underrepresented minorities. The task force also reaffirms the recommendations of the 25th Bethesda Conference with respect to providing care to underserved populations (68).

The dynamics of women choosing (or rather *not* choosing) careers in cardiology are different from the problem of attracting underrepresented minorities (69). In 2003, 49.7% of the new entrants to U.S. medical schools were female (70). Importantly, the percentage of female graduates has more than tripled in the past 30 years (71). The ACC task force is concerned that too few women choose cardiology as a career. The report of Working Group 2 contains a number of concepts we must embrace actively and actions we must take immediately if we hope to compete with other specialties for this growing pool of potential cardiologists.

One challenge we must confront if we hope to recruit more women to our specialty is cardiology’s “macho” image. This is also an issue with male U.S. medical graduates. Reflecting larger social trends, medical graduates are making career choices based partly on perceptions of which specialties are more “family-friendly” or offer a more “controllable lifestyle” (72). Cardiology is perceived as very demanding in terms of hours worked and intensity. This impression is supported by AMA data showing that cardiologists report more hours of practice per week (60 h) than any other physician category (73). Cardiologists’ workloads in some contexts have risen to levels that are not sustainable or desirable from a personal or a quality perspective. Today, U.S. trained medical students are very aware of the issue of work hours owing to recent American Council for Graduate Medical Education (ACGME) mandates (74,75). They also have access to published survey results that compare career satisfaction across specialties (76).

Many young doctors and physicians-in-training indicate that they hope to have a better balance between their professional and private lives than they perceive many practitioners do today (77). In a recent paper on dissatisfaction with medical practice, Zuger noted that, “. . . all [medical] students are now exposed to the breakneck pace, payment dilemmas, and paperwork of outpatient medicine. . . . The key to restoring a sense of contentment to the medical profession may lie in the hands of educators who encourage students to have more accurate expectations of a medical career than did the generations trained during the tumultuous past 50 years” (78). The inescapable conclusion is that patients’ access to physicians will be affected by changing societal attitudes and professional expectations. If cardiology hopes to attract more U.S. medical graduates—especially women—we must respect this new social

reality that demands a better balance between personal and professional time during training and throughout one's career. Changing societal work expectations will result in more cardiologists choosing to work part-time at certain stages of their careers. As Working Group 2 explains, we must encourage innovations such as job sharing, creative scheduling, and decreased "on-call" responsibilities so as to provide a more flexible and welcoming environment if we hope to compete with other specialties already perceived to offer these benefits. We must also expose potential cardiovascular specialists to the broad spectrum of activities that cardiologists undertake to prove that "family friendly" alternatives already exist within our specialty in many contexts.

INTERVENTIONAL CARDIOLOGISTS

Percutaneous transluminal coronary angioplasty (PTCA), invented by Andreas Grüntzig in 1977, changed cardiology in many profound ways (79). Within five years this innovative balloon-tipped catheter procedure designed to open narrowed or blocked coronary arteries had diffused to virtually every U.S. hospital with an open-heart surgery program. Between 1979 and 1985 the number of PTCAs performed in the U.S. skyrocketed from 2,000 to 82,000 (80). It is important to understand that this explosive growth of PTCA did not result from the gradual infusion into practice of new cardiologists who had completed formal 12-month interventional fellowships. Rather, it reflected the fact that during the early and mid-1980s, many of the nation's thousands of invasive cardiologists transformed themselves into interventionalists by attending brief demonstration courses or by being mentored by a local colleague who had already done so. In 1997, more than 6,534 physicians at 1,003 hospitals billed Medicare for percutaneous coronary interventions (PCIs) (81).

Based in part on concerns about the potential for suboptimal outcomes of PCIs performed by low-volume operators, the ACC's 1994 workforce statement encouraged a reduction in the number of interventional cardiologists trained. The Society for Cardiac Angiography and Interventions took a similar position (82). Meanwhile, during the 1990s, interventional training became much more rigorous (83,84). Today, many of the early first generation interventionalists have retired or stopped performing PCI. This trend will continue, and within a decade most of the interventionalists active before 1985 will no longer perform PCI. Meanwhile, procedural volumes continue to grow: 547,000 patients had a PCI procedure in 2000, a 260% increase since 1987 (18).

The ABIM introduced an examination for added qualification certification in interventional cardiology in 1999. Understandably, the number of cardiologists taking this test declined dramatically after the first year (Table 5). The requirements for admission to the exam became more stringent recently with the elimination of the so-called practice pathway after the 2003 exam. In a few years the

Table 5. The ABIM Examination for an Added Qualification Certificate in Interventional Cardiology

	1999	2000	2001	2002	2003	Total
First-time test takers	2,526	871	551	570	630	5,148
First-time test takers certified	2,108	627	388	359	473	3,955
Total test takers certified	2,108	753	521	489	636	4,507

Source: American Board of Internal Medicine, www.abim.org/subspec/examdata.htm. Accessed January 31, 2004.

number of candidates taking the test should reach a steady state that reflects the number completing ACGME-accredited interventional fellowships. As of March 2004, there were 114 ACGME-accredited programs in interventional cardiology and 229 positions were filled (85). Given today's strict program accreditation criteria and training requirements, the number of trainees passing the ABIM exam will likely fall from the 2003 number of first-time test takers (630) to fewer than 300 per year unless more positions are approved and funded.

The demand for interventionalists continues to be stimulated by a series of procedural innovations, technological advances, and clinical trial results (86). For example, the proven benefit of PCI over thrombolytic therapy for acute myocardial infarction has led some to recommend that the procedure be offered in many more community hospitals (including those without open heart surgery programs) (87). Others have argued that a more efficient system of regional care be developed (88). If either approach were implemented fully, it would influence the demand for interventional cardiologists. Formal regionalization of specialized care has been advocated for decades, but market and other social forces have restricted the adoption of this model to a few fields such as trauma (89).

Clinical cardiac electrophysiology (EP) evolved much more gradually than PTCA. The introduction into practice of the implantable pacemaker (1960), the implantable defibrillator (1980), and catheter ablation (1982) catalyzed EP, but the market for these procedures was much smaller than for PTCA (90). The demand for electrophysiologists has increased recently, however, as clinical trial results and government reimbursement decisions greatly expanded the potential market for implantable devices (91,92). Like interventional cardiology, the current output of electrophysiologists is unlikely to meet this growing demand (Table 6).

Table 6. The ABIM Examination for an Added Qualification Certificate in Clinical Electrophysiology

	1999	2000	2001	2002	2003	Total
First-time test takers	69	69	64	89	88	379
First-time test takers certified	45	47	49	69	78	288
Total test takers certified	67	77	75	90	102	411

Source: American Board of Internal Medicine, www.abim.org/subspec/examdata.htm. Accessed January 31, 2004.

TEAM CARE FOR PATIENTS WITH CARDIOVASCULAR DISEASE

Considering the great and growing burden of cardiovascular disease in our aging population, it is important to distribute the work of preventing, diagnosing, and treating cardiovascular disease rationally. Berry et al. (93) articulated a pragmatic approach to help address the growing supply-demand mismatch that confronts several specialties and populations of patients: “Specialist physicians should do less of what generalist physicians can do, generalist physicians should do less of what non-physician providers can do, and non-physician providers should do less of what non-clinical staff can do. Each caregiver also should do less of what appropriately instructed patients and families can do for themselves.” For this logical algorithm to succeed, however, each person in the continuum of care must be well trained, well informed, and have prompt access to professionals with more specialized knowledge and experience (94).

The ACC has consistently encouraged active collaboration among primary physicians and cardiologists in the care of patients with cardiovascular disease (95,96). Table 3 shows that ACC members are utilizing a team approach to respond to workforce demands. Although individual cardiologists may choose to provide some primary care services to their patients for various reasons, this practice continues to decrease in cardiology and other medical subspecialties (97). The ACC workforce survey revealed that current trainees want to practice cardiovascular medicine. They do not want to function as the primary care physician for patients with heart disease. In fact, senior trainees ranked the ability to practice pure cardiology as one of the most important factors they considered when choosing a job; this was deemed more important than starting income, ultimate income potential, frequency of being “on call,” or vacation time.

Despite widespread agreement that general clinical cardiologists play a vital role in cardiovascular care, the survey shows that trainees continue to gravitate to procedural cardiology: 75% of respondents wanted to devote 50% or more of their effort to a cardiology subspecialty. Only 13% wanted to practice “mainly general cardiology,” and only 3% wanted to practice 100% general cardiology. Data from the ABIM certification exams support this notion. Recently trained cardiologists want credentials to document their additional subspecialty training and experience. This reflects, in part, a trend that more hospitals and third-party payers are requiring formal recognition (by a specialty board or other certifying body) before they grant a physician specific privileges or reimburse him or her for performing specific procedures. In 2003 there were 710 first-time test takers for the general cardiovascular disease exam. The same year there were 630 first-time interventional test takers and 88 first-time EP test takers (98). Admittedly, the large number who took the interventional exam recently reflects

Table 7. ACGME-Accredited Cardiology Training Programs and Total Trainees (2003–2004)

	General Cardiology	Electrophysiology	Interventional
Approved programs	173	78	114
Approved positions	2288	173	269
Filled positions	2117	120	229

Source: Accreditation Council for Graduate Medical Education, Accreditation Data System. Accessed March 31, 2004.

the elimination of the popular “practice pathway” after 2003.

Confronted with chronic workload-workforce mismatches, many private and academic cardiology practices have hired non-physician clinicians (e.g., nurse clinicians, clinical nurse practitioners, and physician assistants) to complement the care provided by cardiologists. In recent years both the number and the types of non-physician clinicians employed by doctors, clinics, and hospitals have increased dramatically (99). Many U.S. cardiologists already depend on these specialized healthcare professionals to help them document histories, perform tests and procedures, provide follow-up, and educate patients.

Team care—and many different models have been invented to address specific local needs—can enhance efficiency, increase patient satisfaction, improve physician morale, and lead to better outcomes (100). The ACC task force supports models of cardiologist-led teams of non-physician clinicians to help provide care to an expanding population of patients with known or suspected cardiovascular disease. Reflecting this philosophy, the ACC Board of Trustees approved a new membership category in 2003, the “Cardiac Care Associate.” The board’s historic action acknowledged the vital importance of the team concept as part of a strategy to improve access to high quality cardiovascular care. The biggest obstacle to expanding this team care model is that there is also a growing shortage of nurses (101–104).

INCREASING THE PRODUCTION OF CARDIOLOGISTS

The most obvious solution to the shortage of cardiologists is to increase the number trained. This will be difficult, however, because the output is strictly controlled by the ACGME and most academic medical centers are stressed financially. Moreover, the 1997 Balanced Budget Act froze the number of postgraduate medical education positions funded by Medicare to the number then in place. “This policy has effectively halted growth in residency positions,” according to Kevin Grumbach, “since almost no hospitals and training programs have indicated a willingness to increase positions without receiving more Medicare GME dollars” (105,106).

Despite an adequate supply of qualified candidates (many of whom are IMGs), a significant number of unfilled training positions exist, especially in general cardiology and electrophysiology (Table 7). The ACC task force surveyed cardiology training program directors to better understand

this finding. Of the factors that might contribute to unfilled positions (e.g, inadequate funding, faculty support, or clinical material), inadequate funding was cited most often. Working Group 1 identified several innovative approaches to help fund more training positions. One model, already used in a few locations, is that a private practice subsidizes an individual's cardiology and/or cardiology subspecialty training with the requirement that he or she join that group at the completion of their fellowship.

Considering the evident need to increase our nation's cardiology workforce (especially general clinical cardiologists) and to attract more U.S. medical graduates (especially women) to the specialty, the ACC task force concluded that the time and specific steps required to become a board-certified cardiovascular specialist should be reevaluated. The very long and highly structured course of postgraduate specialty and subspecialty training that evolved during the second half of the 20th century reflects the extraordinary explosion of knowledge, technology, and techniques that define our discipline (79). The training requirements mandated by the ACGME and ABIM are aligned and reflect, in large part, expectations developed by cardiology representatives responsible for a series of "Core Cardiology Training in Adult Cardiovascular Medicine" (COCATS) documents (107).

Today, a U.S. medical graduate whose career goal is to become a board-certified cardiologist must first complete a three-year general internal medicine residency and pass the ABIM general internal medicine exam (in addition to completing an ACGME-accredited cardiology fellowship). Some, perhaps many, outstanding medical students and residents choose not to become cardiologists because they do not want to delay the start of their "goal" specialty training three years after medical school graduation. Faced with a similar situation (and a critical shortage of applicants for their residency programs), the American Board of Thoracic Surgery recently made preliminary certification by the American Board of Surgery optional (108,109). Compelling reasons exist for cardiovascular specialists to learn a certain "core" of knowledge of general internal medicine, but the career path to cardiology must be cleared of unnecessary obstacles. Some ACGME and ABIM requirements implemented in recent decades do not reflect the realities of contemporary cardiology practice or the needs of the public. For example, all candidates for the ABIM general internal medicine examination (an obligatory stop on the career path to becoming a board-certified cardiologist) must document proficiency in paracentesis, arthrocentesis, and lumbar puncture, procedures totally irrelevant to cardiologists.

The growing cardiologist shortage and the steady shift to pure specialty practice (rather than a blend of cardiology and internal medicine, common a generation ago) provides the ABIM with an opportunity to invent a 21st century version of the "short-track" approach ABIM experimented with in the 1970s. Working together, the ABIM, ACGME, COCATS, and ACC should invent a combined five-year program (e.g., two years of core internal medicine, one year

of cardiovascular medicine, and two years of clinical cardiology). Depending on the trainee's career goals, the final three years of training could be customized and extended if he or she wants to become an interventionalist or an electrophysiologist. The report of WG 8 includes recommendations that would provide more training and certification options, alternatives that reflect the contemporary needs of our patients and profession (110). As pragmatic new training paradigms are developed and piloted, we should also make a greater effort to retain experienced cardiologists contemplating retirement (111).

ACADEMIC PROGRAMS

Our nation's academic medical centers, vital factories of new knowledge and physicians, face several significant obstacles as they consider whether and how to increase their output of cardiovascular specialists. Academic cardiologists share practitioner cardiologists' concerns about the twin challenges of increasing workload and decreasing reimbursement. Hill and Kerber warn, "These issues threaten to jeopardize an entire generation of cardiovascular practitioners and investigators and may adversely affect American preeminence in cardiovascular medicine" (112). This problematic situation was exacerbated by the recent ACGME mandate regarding the 80-h workweek limit for trainees.

Today, academic cardiologists are under growing pressure to generate income from clinical activities for their financially challenged institutions. As academics see their "protected" time for research decrease and their clinical duties increase, more will choose to enter private practice (113). If we hope to maintain the momentum of discovery, with its promise to reduce the cardiovascular disease burden, the U.S. must continue to invest heavily in academic medical centers and cardiovascular research. Basic research and clinical investigation are vital if we hope to eliminate atherosclerotic cardiovascular disease and its many deadly complications. Until then, we must produce more well-trained cardiologists who will devote themselves to prevention, early and accurate diagnosis, and cost-effective treatment. This Bethesda Conference report includes many specific recommendations to help achieve this important goal with its profound implications for the cardiovascular health of our nation and the world.

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