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### The Supply and Demand of the Cardiovascular Workforce: Striking the Right Balance.

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## THE PRESENT AND FUTURE

### COUNCIL PERSPECTIVES

# The Supply and Demand of the Cardiovascular Workforce



## Striking the Right Balance

Akhil Narang, MD,<sup>a</sup> Shashank S. Sinha, MD,<sup>b</sup> Bharath Rajagopalan, MBBS,<sup>c</sup> Nkechinyere N. Ijioma, MD,<sup>d</sup> Natalie Jayaram, MD, MSB,<sup>e</sup> Aaron P. Kithcart, MD, PhD,<sup>f</sup> Varsha K. Tanguturi, MD,<sup>g</sup> Michael W. Cullen, MD<sup>d</sup>

### ABSTRACT

As the burden of cardiovascular disease in the United States continues to increase, uncertainty remains on how well-equipped the cardiovascular workforce is to meet the challenges that lie ahead. In a time when health care is rapidly shifting, numerous factors affect the supply and demand of the cardiovascular workforce. This Council Commentary critically examines several factors that influence the cardiovascular workforce. These include current workforce demographics and projections, evolving health care and practice environments, and the increasing burden of cardiovascular disease. Finally, we propose 3 strategies to optimize the workforce. These focus on cardiovascular disease prevention, the effective utilization of the cardiovascular care team, and alterations to the training pathway for cardiologists. (J Am Coll Cardiol 2016;68:1680-9) © 2016 by the American College of Cardiology Foundation.

Cardiovascular disease (CVD) remains the leading cause of mortality in the United States and the world. One American dies from CVD approximately every 42 s (1). Despite substantial progress in the treatment of CVD, the cardiovascular (CV) workforce has become the subject of intense scrutiny in recent years, as the promise of providing high-quality, streamlined care to the growing CVD patient population has come into question (2-8). Without concerted efforts to optimize the CV workforce to meet U.S. public health needs, some forecasters predict that a crisis of staggering proportions may be imminent. Understanding the CV workforce requires understanding the numerous factors that influence both the supply of and demand for cardiologists and CV services (2). Both

fellows-in-training (FITs) and early-career cardiologists are key players in this paradigm, and thus are uniquely positioned to shape the CV workforce.

The most significant factor influencing the demand for cardiologists is the growing burden of CVD in the United States. Indeed, nearly one-third of all deaths result from CVD (1). However, the supply of cardiologists is influenced by workforce demographics, including the geographic distribution of all cardiologists and practice trends of recent fellowship graduates (4). Central to both the supply and demand are the dynamic changes taking place in health care reform. Through the passage of the Affordable Care Act (ACA) of 2010 and subsequent landmark legislation, health care organizations are increasingly focused on the importance of the CV care team in providing care



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**The views expressed in this paper by the American College of Cardiology's (ACC's) Fellow-In-Training Council do not necessarily reflect the views of the Journal of the American College of Cardiology or the ACC.**

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to patients with CVD and spearheading efforts in prevention (9,10). Last, but certainly not least, exploring changes to the pathway of training a practicing cardiologist may represent a compelling opportunity to optimize the CV workforce.

This Council Commentary from the Fellow-In-Training Section Leadership Council aims to identify forces that influence the supply and demand of the CV workforce. It explores the CV demographics and the evolving health care and practice environments that influence the available supply. We also discuss the increasing burden of CVD as the dominant element affecting the demand for CV professionals (Central Illustration). Finally, we propose changes in health care policy and the training pathway for cardiologists as possible solutions to optimize the CV workforce.

## FACTORS THAT INFLUENCE THE SUPPLY OF THE CV WORKFORCE

Several factors affect the supply of the CV workforce, including the demographics of practicing cardiologists, evolving health care reform, and the training pathway to becoming cardiologists. Ensuring that this supply is readily accessible to meet the needs of patients with CVD is a multifaceted problem. This commentary examines each of these factors in turn.

**DEMOGRAPHICS OF THE CV WORKFORCE.** Understanding the current demographics of the CV workforce provides a framework to comprehend the challenges that lie ahead. In 2009, the *Journal* published detailed demographics of the CV workforce on the basis of results from a nationwide survey of employers of cardiologists (11). As of 2009, of the more than 25,000 practicing cardiologists in the United States, approximately 20% were interventional cardiologists, 7% were electrophysiologists, and the remainder comprised general cardiologists, heart failure specialists, pediatric cardiologists, and other CV subspecialists. The median ages of a general cardiologist, interventional cardiologist, and electrophysiologist were 53, 48, and 46 years, respectively. Moreover, nearly one-half of all practicing cardiologists were >55 years of age. Additionally, fewer than 15% of general cardiologists and fewer than 10% of interventional cardiologists and electrophysiologists combined were women (11,12). Importantly, disparities exist across racial and ethnic groups within the CV workforce. Although more than one-quarter of the U.S. population is black or Hispanic, <10% of all practicing cardiologists are black or Hispanic (11). In parallel with population growth in the United States

between 1995 and 2007, an increase in the overall number of practicing physicians was observed. The data collected demonstrated that the total number of U.S. physicians increased by 28.6%. Despite a commensurate increase of 26.3% in the number of primary care providers (PCPs) during this time period, the number of cardiologists grew by only 19.2% (13).

In addition to a growing and aging workforce, the geographic distribution of cardiologists is remarkably heterogeneous (11,14).

For the most vulnerable patients, including those  $\geq 65$  years of age and those residing in underserved areas of the country, fewer cardiologists are accessible. When grouped by quartile, significant portions of the Midwest and Western states have one-quarter to one-half the number of cardiologists per 100,000 patients  $\geq 65$  years of age compared with population-dense regions (13). Geographic maldistribution is more marked in cardiology than in primary care; however, conflicting data exists regarding the specific effect of this heterogeneous geographic distribution on clinical outcomes (13). For example, patients in the lowest quintile of cardiologist density experienced higher 30-day and 1-year mortality for hospitalization related to acute myocardial infarction or heart failure in one risk-adjusted analysis (15). Other research has shown that higher access to specialists leads to increased health care utilization without a significant difference in outcomes (16). Yet, patients living in areas with a low concentration of subspecialists report similar satisfaction in terms of access to subspecialty care compared with individuals living in areas with a high concentration of subspecialists (17,18). Thus, given these conflicting data, evidence guiding the optimal geographic distribution of cardiologists remains unclear.

**EVOLVING HEALTH CARE REFORM.** CV workforce composition is not only influenced by federal and state policymakers, but also by insurance providers. Changes in reimbursement models are anticipated after repeal of the Medicare Sustainable Growth Rate (SGR) formula in 2015 (19). Under the SGR formula, physician reimbursements were adjusted annually, often at a loss, to ensure that the health care expenses incurred by Medicare claims did not exceed the growth in the gross domestic product. Passage of the Medicare Access and CHIP Reauthorization Act (MACRA) in 2015 permanently abolished the unsustainable SGR formula directed at reimbursement cuts.

The shift away from fee-for-service payments directed by MACRA marks a new paradigm of

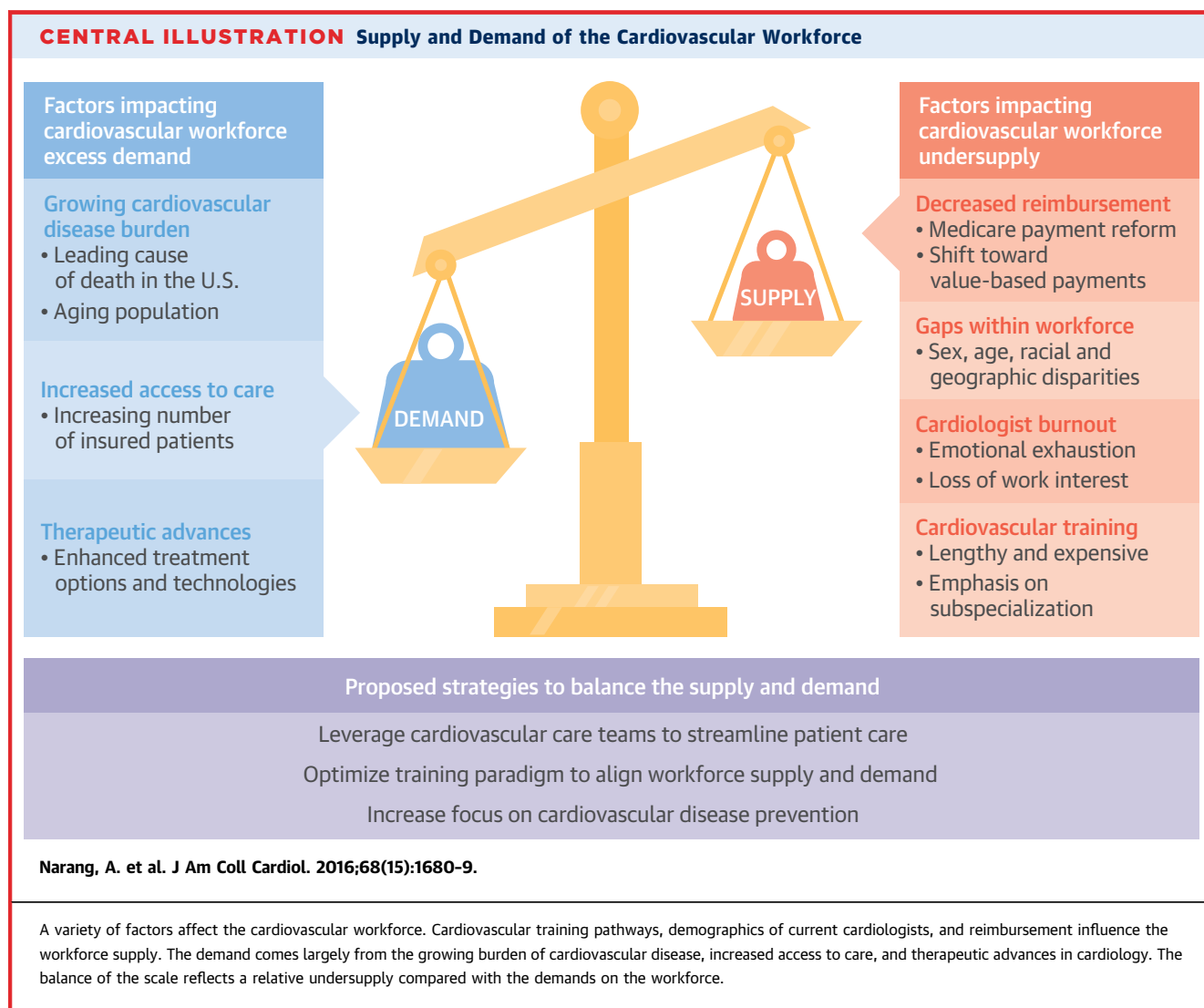
## ABBREVIATIONS AND ACRONYMS

- ACA = Affordable Care Act
- APN = advanced practice nurse
- CV = cardiovascular
- CVD = cardiovascular disease
- FIT = fellow-in-training
- MACRA = Medicare Access and CHIP Reauthorization Act
- PA = physician assistant
- PCP = primary care provider

reimbursement. Physicians are now incentivized to participate in a variety of pay-for-performance programs, including merit-based incentive payment systems and alternative payment models. This will likely result in a direct effect on CV practice models throughout the nation. Even before MACRA, a survey performed by the College in 2012 of over 2,500 unique cardiology practices across the country showed a transition to hospital-based employment. In 2007, physicians owned nearly three-quarters of practices; by 2012, this figure had diminished to 60%. Concurrently, there was an increase in hospital-owned practices, from 8% to 24%, and a decrease in the proportion of cardiologists practicing in physician-owned groups, from 59% to 36%. The most cited reasons for these changes were related to physician reimbursement (20).

Coupled to changes in reimbursement, MACRA promotes and rewards value over volume in the care of patients. Through quality reporting systems and the use of electronic health records, reimbursements can be adjusted negatively or positively, as determined by performance thresholds. Although not formally incorporated into the didactic curriculum of most training programs at this time, merit-based incentive payment systems and alternative payment models will soon become embedded within the lexicon of FITs and early-career cardiologists, as their respective institutions grapple with these new paradigms. With changing reimbursement schemes, it becomes increasingly important to monitor shifts in cardiology practice models, especially with the current generation of fellowship trainees graduating in the coming years. As residents decide on specialty

**CENTRAL ILLUSTRATION** Supply and Demand of the Cardiovascular Workforce



- Factors impacting cardiovascular workforce excess demand**
- Growing cardiovascular disease burden**
    - Leading cause of death in the U.S.
    - Aging population
  - Increased access to care**
    - Increasing number of insured patients
  - Therapeutic advances**
    - Enhanced treatment options and technologies

- Factors impacting cardiovascular workforce undersupply**
- Decreased reimbursement**
    - Medicare payment reform
    - Shift toward value-based payments
  - Gaps within workforce**
    - Sex, age, racial and geographic disparities
  - Cardiologist burnout**
    - Emotional exhaustion
    - Loss of work interest
  - Cardiovascular training**
    - Lengthy and expensive
    - Emphasis on subspecialization

**Proposed strategies to balance the supply and demand**

- Leverage cardiovascular care teams to streamline patient care
- Optimize training paradigm to align workforce supply and demand
- Increase focus on cardiovascular disease prevention

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A variety of factors affect the cardiovascular workforce. Cardiovascular training pathways, demographics of current cardiologists, and reimbursement influence the workforce supply. The demand comes largely from the growing burden of cardiovascular disease, increased access to care, and therapeutic advances in cardiology. The balance of the scale reflects a relative undersupply compared with the demands on the workforce.

training, reimbursement may be 1 factor that motivates fellowship applicants in their career choice, and thereby potentially influences the supply of the future CV workforce.

**TRAINING FUTURE GENERATIONS OF CARDIOLOGISTS.** The pathway toward becoming a practicing cardiologist has evolved significantly. The influx of graduating FITs, both within general cardiology and its myriad subspecialties, creates a steady supply of physicians within the CV workforce. Understanding the current training paradigm and the challenges this poses to the CV workforce may reveal potential strategies to optimize the training process.

The demographics of cardiology FITs provide insight into the future of the CV workforce. An analysis of the 2013 to 2014 academic year reported a total of 2,598 general cardiology fellows (a 20% increase from 2005), with the majority of funding coming from Medicare (11). Women compose only 21.6% of general cardiology fellows (21). Presently, approximately 800 first-year cardiology fellowship positions are available each year; a similar number of fellows graduate each year and are eligible to enter the workforce (21-23). Whether the modest increase in FITs in the past decade suffices to ensure that Americans have adequate access to CV specialists remains unclear (24).

In recent times, increasing emphasis has been placed on further specialization after completing a general cardiology fellowship (25,26). Between 2011 and 2015, applications to interventional cardiology programs increased by over 30% (27). Additionally, fellowships in advanced heart failure and transplantation, structural heart disease interventions, and multimodality imaging now attract considerable interest from trainees. Little data is currently available on how this emerging tendency for fellows to pursue subspecialization will affect access to CV care. It is conceivable that subspecialists may have a greater role in seeing patients for general CV conditions if a shortage of general cardiologists emerges in the future. This downstream effect could have unforeseen implications on the workforce as a whole. A data-driven approach through periodic assessments of the career paths and preferences of fellowship graduates may prove illuminating.

Although fundamental competencies in research design and analysis is an expectation for all fellowship graduates, training future generations of academic cardiologists is a priority for many research-oriented fellowship programs (28). After years of stagnant funding from the National Institutes of Health, the proposed 21st Century Cures Act in 2015 is anticipated to secure an additional \$9 billion in

funding over the next 5 years (29). The effect of increased research funding on the career preferences of FITs and the supply of clinical cardiologists also remains uncertain.

**BURNOUT IN CARDIOLOGY.** Strategies to maintain a healthy working climate for the entire CV team are necessary to circumvent burnout. Symptoms of burnout may include emotional exhaustion with loss of work interest, depersonalization, development of a cynical and negative attitude, and reduced appreciation of personal or professional accomplishments (30). Compared with the general population, physicians are more prone to experience burnout (31), and cardiologists are at particularly high risk. In 1 survey, one-half of cardiologists reported burnout (32). High-quality patient care depends on a healthy CV workforce. Strategies to prevent burnout and protect health care providers from emotionally and physically taxing responsibilities should begin early in training. This could translate into a more productive supply of cardiologists, who are energized to take care of the most complex patients.

## **FACTORS THAT INFLUENCE THE DEMAND OF THE CV WORKFORCE**

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**CVD IN THE UNITED STATES.** CVD accounts for more than 17.3 million deaths globally per year, totaling more than \$317 billion in direct and indirect health care expenditures and lost productivity (1). By 2030, over 40% of the U.S. population is projected to have CVD and the direct medical costs are projected to triple, approaching \$1 trillion (33). Although these statistics are sobering, several encouraging trends exist. Death rates attributable to CVD decreased by 38% between 2003 and 2013. Additionally, the incidence of adult smokers decreased from 24.1% in 1998 to 16.9% in 2014 (1). Between 1980 and 2000, 44% of the decline in death rates from coronary heart disease was due to risk factor modification, whereas 47% of the decline was attributable to advances in therapies (34). However, decreasing overall mortality is not synonymous with reduced prevalence of CVD. Between 2012 and 2030, the prevalence of heart failure is projected to increase 46%. Similarly, the prevalence of atrial fibrillation is expected to increase between 2- and 4-fold (1). Despite some successes, CVD remains the leading cause of death in the United States, and demand for cardiologists remains high (35).

**INCREASED ACCESS TO CARE.** The passage of the ACA in 2010 may have been the turning point of a complex transformation in modern health care. Since its inception, nearly 20 million uninsured Americans

have gained insurance under ACA provisions, with more than 15 million people securing insurance from the start of open enrollment in 2013 to 2015 (36-38). Precedent for health care reform (and the ACA) comes from Massachusetts, whose universal health insurance law was enacted in 2006. During the first 7 years after the law was implemented, over 400,000 Massachusetts residents gained health insurance. The overall uninsured rate in Massachusetts dropped to 3.9%, substantially lower than the national average (39). Because the pool of practicing cardiologists in Massachusetts did not change significantly, it may not be surprising that wait times for appointments with specialists also remained high, at nearly 30 days, further suggesting that the present workforce may not be adequate to meet demands (40). An increased number of patients with insurance coverage will likely add to the demand for the care provided by CV specialists.

#### STRATEGIES TO BALANCE SUPPLY AND DEMAND OF THE CV WORKFORCE

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Many forecasts have predicted that our CV workforce supply is inadequate to meet the demands of patients with CVD. The 2009 survey projected a shortage of more than 4,000 cardiologists in the coming decade, including 1,685 general cardiologists, 1,941 interventional cardiologists, 650 electrophysiologists, and over 127 pediatric cardiologists (11). The American Association of Medical Colleges released a report in 2015 anticipating a shortage of up to 90,000 physicians, encompassing 12,000 specialists, by 2025 (although further stratification by subspecialty was lacking) (41). Moreover, given the aging cardiology community, limited growth in fellowship positions, increasing burden of CVD, and evolving health care reform, striking the right balance of supply and demand in the CV workforce entails careful consideration of many factors. Three specific solutions are proposed: 1) increasing the focus on CVD prevention; 2) utilizing a CV care team; and 3) adapting the training pathway of future cardiologists (Table 1).

**FOCUS ON PREVENTION.** The widespread availability of high-quality CV preventive care is an important public health need. An increased focus on preventing CVD and its complications can enhance CV care delivery, and may subsequently mitigate the burden on the CV workforce. Patients without risk factors for CVD have a longer median survival (nearly 10 years) and considerably lower lifetime risk for development of CVD, as compared with patients with more than 2 risk factors (5.2% vs. 68.9% in men, 8.2% vs. 50.2% in women) (42). Achieving risk factor control through

guideline-directed medical therapy has been shown to be effective (43).

Unfortunately, the prevalence of patients with a low-risk CV profile has dwindled from 10.5% in the early 1990s to 7.5% a decade later (44), which may be due, in part, to rising rates of obesity, diabetes, and dyslipidemia (45,46). Population health forms 1 of the 4 key strategic themes of the College. The College has developed a Population Health Policy and Health Promotions Committee charged with improving primary prevention of CVD through health promotion and expanding population health initiatives (47). Future investigations on the effect of primordial, primary, and secondary prevention measures on the CV workforce are needed (48). Moreover, investigating the economic effect of such measures and how this influences the future of the CV workforce is important.

**UTILIZING THE CV CARE TEAM.** Streamlining the care of patients with CVD is an important step to ensure that the finite resources available are sufficient to meet the growing public health need. Leveraging a comprehensive CV care team is the key to optimizing the CV workforce. FITs and early-career cardiologists should continue to serve as ardent advocates to empower members of the care team in caring for patients with CVD.

An inclusive team of professionals working in synergy with cardiologists and other physicians is a proven model of high-quality care to patients with CVD (49). As delineated in the 2015 ACC Health Policy Statement on Cardiovascular Team-Based Care and the Role of Advanced Practice Providers, these teams often include several key members beyond cardiologists and cardiac surgeons: advanced practice nurses (APNs); physician assistants (PAs); and pharmacists (40). Additional members of the care team may include dietitians, physical and occupational therapists, social workers, case managers, and genetic counselors. The growth of the CV care team can fulfill unmet needs in patient care, and represents an important, growing component of the CV workforce. The CV care team has been identified as a means to improve quality and safety of patient care, broaden physician productivity, and improve job satisfaction (50). Moreover, the team-based approach harnesses the unique skills of the individual members to ensure delivery of efficient, effective care in the midst of a complex health care environment. The care team allows each team member to contribute on the basis of his or her unique skill sets, while leveraging the resources and expertise of a multidisciplinary collaboration. A well-functioning CV team, bolstered by a patient-centric approach, is essential to ensure that

**TABLE 1 Opportunities to Optimize the CV Workforce**

	Opportunities	Advantages	Disadvantages
CVD prevention	<ul style="list-style-type: none"> <li>Enhance focus on CVD prevention during fellowship</li> <li>Foster collaboration between cardiologists and primary care specialties on preventive health</li> </ul>	<ul style="list-style-type: none"> <li>Reduce burden of CVD and its complications through prevention</li> <li>Encourage collaboration across multiple specialties (i.e., cardiology and primary care)</li> </ul>	<ul style="list-style-type: none"> <li>Large-scale prevention efforts can incur high costs</li> <li>Limited opportunities available for fellows to participate in non-ACGME training programs in CVD prevention</li> </ul>
CV care team	<ul style="list-style-type: none"> <li>Provide multidisciplinary training during fellowship to facilitate close collaboration with entire CV care team</li> </ul>	<ul style="list-style-type: none"> <li>Enhance exposure to a variety of practice settings to allow for a better understanding of the role and synergy of the CV care team</li> </ul>	<ul style="list-style-type: none"> <li>CV team members may be placed in situations where they feel uncomfortable caring for complex patients</li> </ul>
Distribution of cardiologists	<ul style="list-style-type: none"> <li>Provide loan forgiveness to encourage graduating fellows to practice in underserved areas of the country</li> </ul>	<ul style="list-style-type: none"> <li>Provide financial incentives to improve geographic distribution of CV workforce</li> </ul>	<ul style="list-style-type: none"> <li>More research needed to determine whether current distribution of cardiologists associated with differential outcomes</li> <li>Source of funding uncertain</li> <li>Efficacy of current loan forgiveness programs uncertain</li> </ul>
Duration of training	<ul style="list-style-type: none"> <li>Enable select high-performing fellows to start advanced subspecialty training early</li> <li>Combine internal medicine and cardiology training to abridge overall training time</li> </ul>	<ul style="list-style-type: none"> <li>Continue to attract highly competitive residents to pursue cardiology fellowship to help reduce the burden on existing CV workforce</li> </ul>	<ul style="list-style-type: none"> <li>Mastery of knowledge and skills in general cardiology may be difficult to achieve in currently allotted 3 years</li> <li>More data needed to evaluate performance metrics from shortened training</li> <li>Opportunity costs for “fast track” program include limited exposure to principles of general medicine and decreased time for research and teaching</li> </ul>
Number of fellowship positions	<ul style="list-style-type: none"> <li>Increase funding for additional fellowship positions</li> </ul>	<ul style="list-style-type: none"> <li>Increase supply of cardiologists to reduce the strain on existing CV workforce</li> </ul>	<ul style="list-style-type: none"> <li>Increased public funding may have adverse economic consequences (i.e., require higher taxation or decreased spending on other priorities)</li> <li>Private sources of funding may introduce bias and unintended consequences</li> </ul>
Health care policy	<ul style="list-style-type: none"> <li>Incorporate training on health care policy and law into standardized fellowship curriculum</li> </ul>	<ul style="list-style-type: none"> <li>Inform understanding of the evolving practice environment to facilitate providers’ ability to navigate complex health care environment</li> </ul>	<ul style="list-style-type: none"> <li>Limited time exists in training curricula to incorporate additional “orphan” topics</li> </ul>
Burnout	<ul style="list-style-type: none"> <li>Empower fellows with resources during training to cope with stress</li> <li>Establish a culture of healthy work-life balance to prevent burnout</li> </ul>	<ul style="list-style-type: none"> <li>Build and instill stress management skills throughout training to prevent burnout and promote productive, healthy careers</li> </ul>	<ul style="list-style-type: none"> <li>Source of time and funding for stress management training uncertain</li> </ul>

A number of possibilities are worth exploration to ensure stability of the future CV workforce. These include efforts directed toward CVD prevention, utilizing the CV care team, ensuring sensible distribution of cardiologists, and restructuring the fellowship training process.  
ACGME = Accreditation Council for Graduate Medical Education; CV = cardiovascular; CVD = cardiovascular disease.

the CV workforce is well-equipped to care for the aging population (51,52).

A recent study using the College’s PINNACLE Registry underscores the success of a collaborative care delivery model utilizing APNs and PAs, in addition to cardiologists. In an outpatient setting, no difference was found in the quality of care delivered by APNs and PAs compared with cardiologists for patients with CAD, heart failure, or atrial fibrillation (53).

In addition to cardiologists, PCPs are central in sharing the role for providing preventive care and unloading the pressures faced by the CV workforce.

PCPs are often the first point of contact for patients with CV problems, including hypertension, diabetes, smoking cessation, and obesity (54). Data from the Centers for Disease Control and Prevention indicate that up to 50% of primary care visits are for CV problems (55). Cooperative efforts between the College and primary care societies are essential in meeting the challenge of preventing complications from CVD.

Similarly, collaboration between general cardiologists and CV subspecialists carries the utmost importance. The general cardiologist’s burgeoning role to coordinate care between various subspecialists



(i.e., interventional cardiology, heart failure, among others) and the PCP will be necessary to safeguard patients from duplicative and unnecessary testing. The current generation of FITs is training in an era of competency-based milestones, with a focus on interpersonal and communication skills, practice-based learning and improvement, and systems-based practice. Thus, having the benefit of training in a health care environment whose fabric is interwoven with multidisciplinary teams, recent graduates may help spearhead the establishment of robust CV care teams.

**CHANGES TO THE TRAINING PARADIGM.** Exploring changes to the existing training pathway may allow for a better alignment between the supply of and demand for cardiologists. The Accreditation Council for Graduate Medical Education (ACGME) sets minimum curricular standards and expectations for the approximately 190 accredited U.S. fellowship programs in CV medicine. The most recent iteration of the ACGME training requirements, approved in 2012, prescribes a 24-month minimum of combined inpatient and outpatient clinical experience (56). Similarly, the College publishes more detailed curricular recommendations in the form of a Core Cardiovascular Training Statement (COCATS). The latest iteration (COCATS 4), published in 2015, outlines comprehensive training guidelines in all facets of clinical cardiology on the basis of core competency domains recently set forth by ACGME (57,58).

With the transition toward competency-based milestones, as delineated in COCATS 4, opportunities exist to reconsider the length of training to achieve successful competency. Due to ACGME requirements stipulating that general fellows have 24 months of clinical cardiology training, the final 12 months of fellowship vary considerably. With competency-based domains, some fellows may be ready for unsupervised practice in fewer than 3 years, whereas other fellows may need more than 3 years (59). Consideration may be given to allowing fellows who achieve early competence to commence subspecialty training during the third year of general cardiology fellowship (with credit given toward satisfying subspecialty training requirements).

Another option to shorten general cardiology training would be to fast-track highly qualified internal medicine residents. Presently, the option of completing internal medicine training in 2 years (instead of 3) is reserved for aspiring physician-scientists who subsequently pursue post-doctoral research fellowships. Opening this track to nonphysician scientists may allow increased numbers of clinical cardiologists to enter practice. During internal

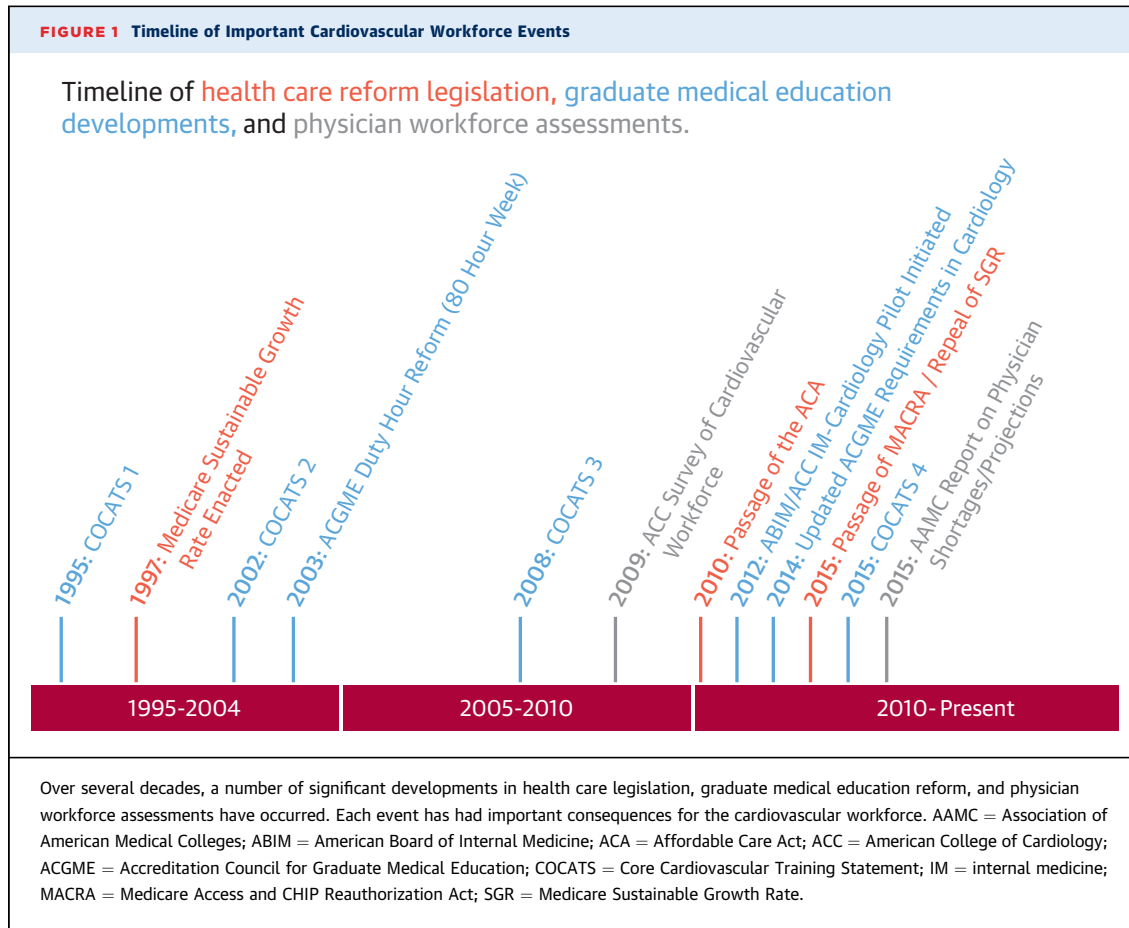
medicine residency, these residents could bolster their training with additional rotations in inpatient and outpatient CV services. These fast-track residency positions could conceivably be reserved for those committed to careers in general cardiology, or could attract others to pursue specialization beyond general cardiology through “savings” of an additional year of training. A joint pilot program between the College and the American Board of Internal Medicine examining a blended internal medicine residency and cardiology fellowship (total of 5 years) is currently underway at 4 academic medical centers (Vanderbilt, Mount Sinai, Indiana, and Oklahoma) (60). Data from this pilot is eagerly awaited, and will have important ramifications.

There are, of course, many critiques of the aforementioned proposals to shorten the training pathway (61). With the rapid expansion of knowledge and technological innovation in cardiology, the standard 3 years of training may simply not be enough to master fundamental principles of general cardiology (Figure 1).

As the number of patients eligible to receive specialist care through health care reform grows, the available pool of cardiologists and members of the CV care team should similarly be augmented to provide access to care. Whether this is accomplished by increased funding for more fellowship positions (through Medicare or other novel funding mechanisms) or an abbreviated training pathway, a concerted effort warrants consideration.

Unfortunately, a limited evidence-base exists to justify sweeping reforms in the training pathway for cardiologists. Nonetheless, educational leaders should give careful consideration to creative solutions that modify the existing pathway and may better equip the future CV workforce. Importantly, any changes should be monitored and adjusted in an iterative and data-driven fashion.

**FINANCIAL CONSIDERATIONS.** In the current training format, most trainees take a minimum of 10 years from the start of medical school to become licensed, independent cardiologists. Pursuing subspecialty training adds an additional 1 to 3 years. With increasing medical school costs, the mean debt for graduates of American medical schools is >\$170,000 (62). Prolonged training decreases lifetime earning potential and influences not only decisions on what specialty to pursue, but also other important personal considerations, such as when to start a family or purchase a home. As a result of large debts, some trainees seek additional skills to increase their marketability. Differential salaries on the basis of



geographic locations make practice location relevant. As financial models transition from “volume to value,” incentives toward choice of specialty and practice location may evolve. Careful consideration of how the changing health care climate influences the job market, career decisions, and CV workforce for young cardiologists is paramount.

**CONCLUSIONS**

The CV workforce is an ever-changing, heterogeneous community of professionals dedicated to the care of patients with CVD. Its availability to meet the growing challenges of the American public depends on many elements that drive its supply and demand. Strategies to optimize the workforce rest in adapting to the changing policy environment, focusing on CV prevention, harnessing the potential of the CV care team, and balancing training paradigms. Critically

examining the effect of the many changes in the health care environment is a prerequisite to striking the right balance of the CV workforce.

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**KEY WORDS** cardiovascular care team, demographics, fellowship, prevention, training pathway