Predicting optimal physician workforce numbers to meet societal needs represents a major challenge and an area of unmet need. Attempts to project these necessities to specialty and subspecialty models are perhaps even more difficult as they deal with smaller treatment populations and often rapidly changing practice patterns.\(^1\) A single unforeseen variable, such as a new clinical trial result, can potentially alter projections dramatically. The most appropriate physician’s role in adjusting workforce numbers is also unclear. We are somewhat conflicted wanting to address public medical needs, facilitate training physicians’ access to having a robust practice, although hoping to remain sensitive to a perception that we might be controlling the open market on the supply side for a possible financial benefit. Procedurally based subspecialties, such as interventional cardiology, are also interested in maintaining adequate individual operator volumes in efforts to facilitate and measure performance competencies.

In 2009, the American College of Cardiology published the “Cardiology Workforce Crisis” survey results and recommendations, concluding that there will be an inadequate supply of cardiovascular specialists to care for new cardiovascular patients in the first half of the 21st century.\(^2\) The drivers for increased demand for cardiovascular services included aging demographics, noting patients surviving longer with cardiovascular disease, economic growth, expansion of insurance coverage, and technological advances. Among the drivers predicting a decrease in cardiologist supply include a possible decrease in cardiovascular training programs, resulting in similar decrease in the production of new cardiologists (attributed to faulty government predictions in the 1980s involving less demand for highly technical specialties). Early physician retirement was also cited as a possible contributor toward this impending crisis. A subgroup analysis reported in 2008 projected a near future shortage of interventional cardiologists approaching almost 2000 physicians based on what was then perceived as the current demand.

**Interventional Cardiology Workforce: Supply**

The present number of practicing interventional cardiologists in the United States is unknown. There exists no complete data set listing all active operators. Best estimates can be drawn from the Medicare billing database reporting in 2008; 6443 interventional cardiologists submitted claims for payment.\(^3\) Medicare data from 2012 suggests this number grew modestly to ≈6600 percutaneous coronary intervention (PCI) providers.\(^4\) Missing from these counts would be physicians practicing exclusively in the military or Veterans Affairs systems, managed care systems, or any low-volume physician submitting <10 claims annually. Another approach would be to look at American Board of Internal Medicine certification data. Since the inception of the Interventional Cardiology training examination in 1999, 2014 data reports 7129 physicians have received Interventional Cardiology Board Certification, 5742 of these certificates currently remain valid. This, of course, does not let us conclude that all valid certificates involve currently active practitioners and does not include the population of noncertified physicians currently practicing interventional cardiology (estimated to be several thousand).

Over the past 10 years, the annual new certification numbers in Interventional Cardiology have remained remarkably steady at 270–300.\(^5\) The number of international medical school graduates taking the initial certification examination has progressively increased. In 2013, more international medical school graduates sat for the examination than did US medical school graduates. During this 10 year period, Accreditation Council for Graduate Medical Education (ACGME)-approved training programs have increased from 83 programs in 2003 to the current 142 programs training 313 interventional fellows.\(^6\) A recent American College of Cardiology survey reports that slightly >20% of the interventional cardiology workforce is aged ≥60. The effect of new changes in healthcare policies and payments and recent policies regarding certification requirements could conceivably hasten retirement plans. It could also be argued that a marked downturn of the overall economy might conceivably delay retirement plans.

Structural cardiovascular interventional operators have increased during recent years, mostly related to the approval of transcatheter aortic valve replacement (TAVR). The Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapy Registry reports an ≈25% increase in TAVR sites in the United States during the past 12 months; however, reliable individual structural interventional physician operator numbers are not available. Operators would include both interventional cardiologists and cardiac surgeons. Although there are no currently available American Board of Internal Medicine certification processes or ACGME-accredited structural heart training programs, a recent Society for Cardiovascular Angiography and Interventions training director survey estimates that there are ≈15 non-ACGME fellowships training 15 to 25 fellows per year. It is estimated...
that interventional cardiologists currently perform roughly 30% of peripheral interventions sharing this arena with other specialties, including interventional radiologists and vascular surgeons.7

**Interventional Cardiology Workforce: Demand**

Past predictions estimating a workforce shortage of nearly 2000 interventional cardiologists were based on the previously observed annualized robust 6% to 7.5% growth rate of interventional cardiovascular procedures noted during the 2001 to 2006 time period.8 However, more recent history tells us that this in fact has not been the reality subsequent to this analysis. A noted marked change in overall coronary revascularization rates was reported during the 2001 to 2008 time period. Data from US hospitals participating in the Healthcare Utilization Project’s Nationwide Inpatient Sample study (a 20% random sample of the US population) reported a 15% decrease in overall revascularization procedures mostly explained by a steady and progressive 38% decrease in coronary artery bypass graft rates during the 8 years. PCI rates initially increased modestly peaking in the 2004 to 2006 sample period and then declined over 10% over the next 2 years (2007–2008).9 A strong and consistent similar signal comes from Medicare payment data, showing peak PCI volumes occurring in 2004 followed by a subsequent steady 25% to 30% decline in volume through 2013, including a 6% decrease during the last reporting year.10 This observed volume decline was initially attributed to reported stent thrombosis safety concerns involving first generation drug eluting stents. There are, however, many plausible explanations for the continued fall off, including a decrease in the incidence of patients presenting with chronic stable and myocardial infarction, subsequent emerging trial data favoring alternative medical or surgical therapy for patients with chronic stable angina, increased use of drug eluting stents rather than bare metal stents, changing practice guidelines, and the development of appropriate use criteria.11,12 Significantly reduced reimbursement for cardiovascular interventional services generated by Medicare CMS decreases in payments, and price bundling might also contribute to this observation.

Data are less robust regarding volumes in the emerging structural heart arena. The Food and Drug Administration has only approved TAVR for the past 3 years, with expanding indications as technology and the procedure mature. The Transcatheter Valve Therapy Registry (currently mostly TAVR) indicates slightly over 9000 commercial cases submitted in 2013, a number which is on track to increase by ≥50% in 2014. The only currently FDA-approved mitral device is not commercially available at this time. Peripheral vascular interventions performed by cardiologists have realized a decrease in both renal and carotid volumes reflecting recent trial results and limited reimbursement.11,12

**Distribution of the Workforce**

Timely access to an interventional cardiologist is necessary for a patient to receive high quality and timely care, especially in an acute myocardial infarction setting. Data analyzing population cardiovascular outcomes relative to the density of interventional cardiologists is not available. However, a patient hospitalized for an acute myocardial infarction living in an area with a low density of general cardiologists has been shown to be associated with increased 30 day and 1 year mortality.13

It is also reasonable to assume that for practitioners to maintain their interventional procedural skills, performing these procedures with some consistent regularity and frequency intuitively makes sense. The ACCF/AHA/SCAI 2013 Update of the Clinical Competence Statement on Coronary Artery Interventional Procedures acknowledged that in an era of decreasing PCI volumes, revising the previously suggested minimal 75 PCI per year suggested benchmark to a 100 PCI per 2 year recommendation.14 An analysis of 2008 Medicare fee-for-service PCI data (378,000 PCIs) matched with Physician Provider Identifier numbers reported significant variation in individual operator PCI volumes. A majority of the over 6400 practicing interventional cardiologists (61%) performed ≤40 Medicare fee-for-service PCIs.3 Overall, Medicare fee-for-service PCIs are thought to represent roughly half of all PCIs performed in the United States, with some expected geographical variation relating to population age distribution throughout the country. PCI numbers have continued to decline because this analysis noting California’s Office of Statewide Health Planning and Development has reported an almost 25% decline in volume from 2008 to 2013.

“Prediction is very difficult, especially if it’s about the future.” Niels Bohr

The available data offers no convincing mandate, suggesting either a workforce surplus or shortage of interventional cardiologists. The challenges in ascertaining these workforce needs underline the complexity of the issue, an issue with many moving parts subject to frequent change. It seems that more likely we have a distribution problem resulting in underserved rural areas and glutted physician markets in populated urban areas. It is important to get these workforce data right and provide this information in accessible, understandable formats to all stakeholders. The overlap and incompleteness of currently available data compounds this problem. We can only make educated guesses at overall workforce and utilization numbers by using several sources, such as payer records, industry sales data, and some state registries in the few states where they exist. The growth and the continued expansion of a uniform transparent database, such as the National Cardiovascular Data Registry, is encouraging; however, there still exist several nonparticipating hospitals. This is an area where the practicing interventional cardiology community could advocate full enrollment with easy and open access to general workforce information. These data would facilitate future expansion of PCI centers directed toward areas of geographic and patient need and hopefully prevent redundant expansion of already underutilized services in markets without incremental need. Physicians would be able to make better-informed decisions when choosing practice locations.

Attempts to adjust the number and size of interventional training programs to address workforce shortages or oversupply have not worked out well in the past, and there is little reason to think it will work in the future. Training programs should concentrate on educational quality. For example, any contemplated changes in PCI training procedural volume requirements should be driven by educational and competency factors rather
than be artificially adjusted to meet market needs. Programs struggling to meet these teaching and procedural benchmarks might reevaluate their mission. Collaborative efforts from the major professional societies and accreditation entities, having available more objective measures on the changing landscape of cardiovascular medicine, are indeed warranted to face the challenges of the US interventional workforce with the ultimate common goal of providing the best care for our patients.

Disclosures

None.

References


Key Words: healthcare access ▪ health policy ▪ health services research ▪ percutaneous transluminal coronary angioplasty
Interventional Cardiology US Workforce: Current Challenges
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Circ Cardiovasc Interv. 2014;7:733-735
doi: 10.1161/CIRCINTERVENTIONS.114.002136
Circulation: Cardiovascular Interventions is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-7640. Online ISSN: 1941-7632

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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