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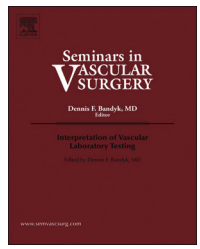

Perspectives on the future of vascular surgery training

1. Changing world before us

Teaching our trade to the next generation of vascular surgeons has remained a heartfelt commitment of program directors, teaching faculty, and vascular surgeons for many years. We mostly enjoy our professions and want to extend that joy to the next generation of vascular surgeons. While atherosclerosis remains rather constant, the population that we treat may actually be changing. Our population is aging and the burden of vascular disease is also growing. The US and world populations are aging, with a greater proportion older than 65 years. Peripheral artery disease also accompanies those aging patients, impacting 20% of patients older than 70 years of age. The expectations of our patients are also changing—they seek less invasive therapies with prompt results and often come to us with a plethora of Internet medical "expertise." Now, the next generation of vascular trainees is also a bit different. They seek efficient and pertinent training and education. They are a savvy bunch that want a different work–life balance compared to the aging work force of today's vascular surgeons. The task for training programs of the future is to remain pertinent, relevant, and efficient for our trainees and our patients.

The next generation of surgeons treating the aging population are also different. Our resident and fellow workforce is filled with "millennials"—those born between 1980 and 1999. They are a tech-savvy group, with skills to find information on short notice. They have different interests in finding the right medical specialty that matches their skills and interests. They then seek their own work–life balance [1]. While this balance might be different from our own, we should not on the younger generation look with disdain and mourn the loss of the "good ole days." We have a talented group of intelligent individuals who have a different set of priorities. The next generation of physicians and vascular surgeons have different expectations on many levels; they may have a different set of personal and professional goals. Their outlook may well solve some of our current problems of professional "burnout." Too many of us share signs and symptoms of burnout that can lead to shortened work life, damaged personal and professional relationships, and even shortened lifespans [2]. New reports also show that this next generation of doctors has reduced productivity, as they balance their work and personal lives. Thus, not only will we need more productivity to treat the ravages of vascular disease, we will need more vascular physicians per unit to produce the same treatment output that currently exists—or at least find ways to treat more in the same amount of time—improve efficiency.

2. Choosing the best training paradigms

Our world is working toward efficiency in many areas. We seek instant delivery from Amazon and we are developing focused efforts in "personalized" medicine. Let us consider these same principles for surgical training—rapid delivery and focused training. The integrated training pathway delivers the medical school graduate to a board-eligible vascular surgeon in 5 years rather than the traditional 7-year route. This pathway represents a faster, more efficient training paradigm that presents a surgeon to a more focused vascular practice—both efficient and focused. The integrated pathway is new and creates some skepticism. As the integrated training program has matured over the last 12 years, we have gained insights into training the next generation of vascular surgeons. There have been some bumps in the road. There has been attrition. The dropout rate for general surgery is 20%—we have better marks to date, but we should still seek an attrition rate of 0% [3]. We should be able to identify the right candidate for our specialty, we should counsel them early in their medical career, and then recruit them to the program that best matches them. Consider the minimally invasive surgery training program in Houston (program) that developed a screening questionnaire in the application process [4]. These questions helped matched candidates who had a profile that fit their training program. While the total volume of applicants decreased with this screening system, their "match" to the best candidate helped assure the trainee's success after arrival. Is this a method to eliminate attrition completely? We can learn from our training brethren to improve our selection of medical students for matching into an integrated system to improve the graduation rates of this efficient, focused pathway.

What are the problems, the stressors for our current trainees? First, they may have embraced a different set of goals. The millennials (whom I embrace, because all four of

my adult children carry that label) value their "play" time as much as their "work" time [5]. While this priority may create concern among some of the "baby boomers," such a priority structure may actually improve many aspects of our society. Our current workforce is ravaged with burnout that actually threatens our own productive life. We may work abundant hours for 20 years, but this can negatively impact our total work life expectancy if we are ravaged with suicidal ideations, shortened work lifespans, and crumbled personal lives. The millenials may have it right and we are too arrogant to acknowledge their wisdom! Regardless, this difference creates some opportunity for us to make adjustments to our workforce. The younger generation carries a greater debt burden than we did years ago. They are more prepared to handle the electronic record without the anger and disdain that many of us verbalize. Millenials might actually be the solution to many of our problems!

Certainly, more training seems to lead logically to a better craftsman, a better technical surgeon with better judgment and, overall, a better clinician. Thus, it seems we all would choose the vascular surgeon who has had 7 years of training rather than 5 years of training. Actually, I would prefer the surgeon who trained for 10 years rather than 7 years. However, our system cannot support the extended training of yesteryear. Since the Bell Commission of 1984, we have reduced our working hours for training, and we have observed a contraction of the trainee exposure to all aspects of surgery. The training hours are reduced, the material for the discipline has increased, and the trainees get less exposure to a broader range of material. We have improved our efficiencies in other areas of the world, we now can improve our efficiencies in the vascular training world. We have the opportunity to focus the training on vascular disease and chose the other areas of medical interest that appropriately augment the vascular education. The integrated program is well positioned for that role.

3. Preparing for the future

We can produce more surgeons by embracing our new training paradigms and considering the pertinent matters to the current graduates seeking specialized training. For years, we have used a time-based training pathway to assumes that a graduate can be trained in 5 years (or 2 additional years via some pathways). But considering the exponential growth of medical knowledge, the increasing documentation requirement, and the shortened work week, our programs then need to improve the efficiency of training. What can be omitted? Where is the "value" in the current steps of our model? How can we direct our energy to high-yield learning opportunities to improve the efficiency of the training model? We can eliminate unneeded, low-yield rotations. We can facilitate the "skills" assessment with simulation and observation (see article by Irfan et al [6]). Consider some of the progress of the Association of Program Directors in Vascular Surgery. The Association of Program Directors in Vascular Surgery has a group of dedicated educators who have developed a training assessment tool for fundamentals of vascular surgery. This program used both computer simulators and plastic models to emulate endovascular and open vascular repairs. Trainees can use these models for practice prior to the "real world" of the operating room and improve their skills. These stations offer trainees a planning tool and an opportunity to improve their skills in a low-pressure environment with essentially no risk to the patient. Ultimately, the program directors hope to develop these simulators into assessment tools that provide educators with an objective means to evaluate trainees. These evaluations then could be incorporated into the training pathway where residents and fellows could have objective assessment to assure some element of competency before advancing in the training pathway and even ultimately to certification as a vascular surgeon. While the system is not yet validated, the foundation is being set so that we can have a more objective assessment tool to improve our training and certification process. This mechanism could well establish a pathway for the "vascular skills examination" that is discussed by Irfan et al in this issue. These methodologies offer us more standardized training curricula to aid the educator and assure the community about a "finished product" in vascular surgery. Ultimately, such a tool may become an educational standard and even a useful tool for credentialing bodies.

As we consider the advantage of the shorter pathway from medical school to vascular certification, we can continue to support the traditional pathway of 2-year Accreditation Council for Graduate Medical Education fellowships. Many of us are late to discover our inner soul. We meander in the realm of surgical disease as we marvel in the many areas that so impact our patients. Only later in the educational process do we discover the joy of treating vascular patients. Thus, the postgraduate year 3 resident may seek vascular specialization later in the training career and should be welcomed into our fold. The traditional pathway of a 2-year fellowship will remain a viable and important pathway for years to come. We have our surgical principles built in general surgery, our roots run deep in this surgical family and we should remain a part of that world. We can welcome the surgery resident who discovers a passion for vascular disease and continue to embrace the one who seeks our trade. Considering these same principles of integrated vascular training, we should embrace the additional challenge of taking a general surgery resident and, in 2 years, making such a candidate a viable and sustaining member of the vascular community. This pathway has been part of our heritage since 1984 and still needs to be in our domain for future years.

There seems to be so many patients, yet so little time to train the next generation of vascular surgeons [7]. We have the knowledge base, we have the skill set, and we have the motivation. The task before us is instead focused on the best method to bring the next generation of vascular surgeons to the best position to treat those patients in the most efficient manner. Whether one has the role of a program director guiding the resident and fellow to the final stages of training or the practicing community surgeon inspiring a young student to the medical field, I encourage all to embrace our new world of vascular training.

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