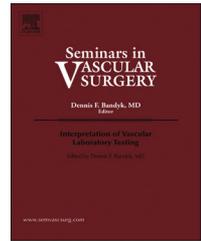


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The role of industry in vascular surgery trainee education

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ABSTRACT

Vascular surgery is a specialty discipline highlighted by a lifelong learning process from which new endovascular devices and techniques will continue to emerge. Industry partnerships can provide a safe learning environment for trainees, with a focus on maximizing learning opportunities during fellowship or residency. Unlike other surgical specialties, vascular surgery empowers its trainees to become competent in both open and image-guided endovascular interventions, requiring two unique skill sets to become a contemporary vascular surgeon. Due to the rapid growth of technology and innovations, industry partnerships enhance and maximize the learning experience of the trainee by often providing the products, education, research support, and financial assistance. This can come in the form of innovative and educational activities, including simulation, exposure to thought leaders, attendance at conferences and workshops, and one-on-one assistance with cases. In this article, we review the role that industry can serve in vascular education to support budding vascular surgeons through exposure and repetition as they lay down the fundamentals of their careers.

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1. Introduction

The endovascular revolution was launched in 1990, when Dr Parodi performed the first endovascular abdominal aortic aneurysm repair [1]. In the 26 years that followed, the shift of the additional skills required for a competent vascular surgeon added significantly to the base skill set required, which in turn forced a new paradigm for vascular trainees. The field embraced endovascular solutions for all their traditional operations, and literally every year new graft technology, new deployment systems, new platforms, new sizing parameters, and new indications are brought to market for every aspect of vascular surgery. With this surge of novel endovascular techniques, vascular fellows and residents, along with their program directors, have a unique challenge to master not only what is already in the field but what is to

come—discarding old data or devices and replacing them with updated technology quickly, safely, and efficiently so patients can immediately benefit. This daunting task would be even more challenging without the support of industry in vascular surgery education.

Before the 0+5 training programs, vascular surgeons of this era came from a general surgery background through fellowships only, which initially struggled with ensuring adequate training in both open and endovascular techniques over a short period [2]. Fortunately, this was recognized just over a decade ago, when most programs increased to 2 years for traditional fellowship, and with issues related to work force and interest in vascular surgery, the addition of integrated vascular surgery residencies provided learners even more time to gain competency in vascular and endovascular surgery [3,4]. This need for increased education

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and training comes with a cost, however, both in terms of infrastructure and finances. While trainees are supported primarily by Accreditation Council for Graduate Medical Education funds, the overwhelming amount of technology and skills that vascular surgeons need to master requires additional support.

Because industry initially partnered with academic medicine in the form of research grants in the 1970s [5], the US government support for biomedical research and development has decreased significantly, while industry increased their contributions from 32% to 62% [6]. Although these partnerships are critiqued due to concerns for conflict of interest, there are ways to appropriately utilize these collaborations in a synergistic way that continues to encourage education and research. Moving forward, conflict of interest and full disclosure are important in maintaining some separation of the business and educational sides of our industry partners.

2. Exposure to industry

Vascular trainees often begin their journey with little to no exposure to endovascular training and a relatively short period in which to acquire skill and comfort. Before a trainee can even start understanding endovascular procedures, it is imperative they have a grasp of the building blocks and technical fundamentals. Once competency of the fundamentals has occurred, the trainee can go to the next stage, which involves practicing or repeating the approaches until ultimate mastery.

One of the major contributions of industry is its support both educationally and financially for trainees to gain exposure to endovascular technology and open surgical techniques before they enter formal training by our national society meetings [7]. Industry partners have long funded, through grant support, educational activities at these meetings that allow attendance by multiple learner groups. Identifying what the appropriate level and purpose of each type of meeting is an important current project at the level of the Association of Program Directors in Vascular Surgery to ensure that needs are aligned with offerings.

In addition to allowing access to many national meetings, most of the societies, and particularly the Society for Vascular Surgery, partner with industry to create educational experiences to recruit surgically minded students and general surgery residents. These programs include dedicated simulation sessions with hands-on training so future trainees can gain exposure, opportunities for mentorship and networking, and lectures on various vascular surgery topics. At the Society for Clinical Vascular Surgery, there are separate incoming fellows programs, fellows programs, and programs for young faculty, all with various agendas and a mix of hands-on, didactic lectures, panel discussions, and what to expect for each learner level. Particularly for the young trainee, gaining exposure to wires, catheters, grafts, stents, and other basic building blocks of endovascular approaches can alleviate some of the initial anxiety associated with learning a new skill [7].

Industry can also provide a forum where global thought leaders can be exposed directly to trainees at an early stage. Trainees need to be exposed often to mentors from outside of their home institution to truly grasp the multiple types of solutions that our specialty thrive on. Active and spirited debates about the decision to approach something endovascularly versus with open techniques give trainees unique perspectives. Sessions with thought leaders discussing the pros and cons of different approaches are often highly rated educational experiences. When industry supports a lecturer who fairly debates the utility of a device or technique, it highlights the merits of a particular technology [7]. Industry also heavily supports regulatory clinical trials to show that the endovascular approach is safe and effective for the disease process. Multiple studies are performed across the globe comparing one technology to another to provide the safest options for use and aid in appropriate patient selection, and some of these important studies that serve as the basis for training would not be feasible without industry support.

3. Repetition of skills and simulation

Once the vascular trainee has begun training and gained initial exposure, repetition is paramount to success and ultimate mastery. For both open and endovascular procedures, preoperative planning is paramount, and, especially for endovascular, can be creative and complex in multiple facets and includes understanding imaging software, device selection, sizing, deployment steps, and actual implementation in the hybrid operating room. To become facile with these elements, repetition is necessary and herein lies another contribution of industry to vascular surgery education in the form of simulation. Medical simulation systems allow surgeons to gain experience and confidence in a realistic, safe environment, while providing the opportunity to practice a number of technical and problem-solving skills in a short period of time. Simulation training has been shown to improve residents' endovascular techniques [8,9], and could ultimately be a great tool for evaluation; however, creating and maintaining these laboratories with realistic machines and educators who can provide sound feedback can be costly and time-consuming [10,11].

Industry has embraced simulation and hands-on approaches and therefore maintains involvement in training by introducing new products and providing a safe training environment in which to enhance skill. The augmenting of trainee education is done in a one-on-one platform where industry partners can actively participate in the planning and sizing of endovascular devices, and certainly support simulation exercises that allow for actual practice runs of cases. These simulated training sessions done on high-fidelity platforms, table-top demonstrations, or even on cadavers, are invaluable to trainees, as they serve as repetitive, practice sessions that cause no harm to patients and are safe spaces for a trainee to master techniques.

During a simulation session, learners are encouraged to independently plan and carry out each step of a procedure. They may encounter problems with any portion of the procedure, including catheter positioning, guide-wire

placement, or difficulties in selecting balloon size—challenges they may not have faced in the operating room. Simulation faculty can help to foresee potential pitfalls and teach trainees how to troubleshoot those concerns intraoperatively from their experience with different operators. This is invaluable experience that affords trainees the opportunity to learn from others' mistakes. Errors in case simulations also highlight certain problems that the trainee may not have appreciated, such as the need to think about procedures in an organized way and the need to plan ahead. Simulation may also reveal bad habits, such as the excessive use of fluoroscopy, without the detrimental impact of being radiated. Although simulation takes place in a risk-free environment, it is not a stress-free environment. Something as simple as having the mentoring physician stand quietly behind the trainee, observing the simulated procedure, can introduce a level of stress that helps the trainee accept the reality of the exercise. Obviously, the advantages of this educational experience would be wonderful for all learners to have full and unlimited access, but the cost of these sessions can often be prohibitive. This again is where industry partners can share in the financial impact to individual programs and, therefore, in partnership really augment the educational environment. For example, at the Top Gun fellows' competition [12], trainees certainly have appreciated the value of such a training model, both endovascular and open skills, and these sessions allow trainees to also see how they fare compared to their peers [7].

4. Research support

Industry interest in education also comes in the form of research support, as they often partner with academic institutions by supporting trials or development of medications or devices, or in providing grants and scholarships in support of research [5,13]. By partnering with the industry, researchers and learners can get seed funding or confirmatory projects that might be more challenging through traditional funding mechanisms [14]. Vascular surgical society meeting partnerships with the industry support research by providing scholarships and grants for learners to attend and present their work, and again to help with early concept ideas, particularly to assist young faculty researchers. This again highlights the interest our industry partners have in both research and education. Without grants like these, many government and noncommercial resources are unable to allow young, previously nonfunded investigators to get started in a research career [13].

5. Conclusions

In summary, vascular surgery education and lifelong learning are unique in that the skills required of the vascular trainee

change dramatically in very short periods of time. Vascular surgery is heavily technologically based with the endovascular revolution and continued refinement of open procedures that are dwindling in number. Providing a safe, reliable, and effective method by which to efficiently educate vascular trainees is imperative to the success of the profession. Industry partners, therefore, serve as an important adjunct in providing the products, education, research, and financial assistance necessary for trainees to engage in innovative and education activities. This fosters the maximal learning experience and provides resources to our budding vascular surgeons as they lay down the foundations of their careers by educating them on new techniques and maximizing their time in training by enhancing the learning process with simulation and one-on-one tutorials and exposure to thought leaders that may contribute to their educational experience.

REFERENCES

- [1] Veith FJ, Marin ML, Cynamon J, et al. 1992: Parodi, Montefiore, and the first abdominal aortic aneurysm stent graft in the United States. *Ann Vasc Surg* 2005;19:749–51.
- [2] Reed AB. Advanced training in vascular surgery: how does it need to change? *Semin Vasc Surg* 2006;19:191–3.
- [3] Yan H, Maximus S, Kim JJ, et al. General surgery resident vascular operative experience in the era of endovascular surgery and vascular fellowships. *Am Surg* 2015;81:1093–6.
- [4] Lee JT, Teshome M, de Virgilio C, et al. A survey of demographics, motivations, and backgrounds among applicants to the integrated 0+5 vascular surgery. *J Vasc Surg* 2010;51:496–503.
- [5] Bauer EA, Cohen DE. The changing roles of industry and academia. *J Invest Dermatol* 2012;132(3 Pt 2):1033–6.
- [6] Moses III H, Martin JB. Academic relationships with industry. *J Am Med Assoc* 2015;285:933–5.
- [7] Verhoeven E, Lee JT, Benenati JF, et al. A model for industry-supported physician education. *Endovasc Today* 2012;15–8.
- [8] Dawson DL. The benefits of simulation training for fellows and residents. *Endovasc Today Suppl* 2005:20–2.
- [9] Robinson WP, Doucet DR, Simons JP, et al. An intensive vascular surgical skills and simulation course for vascular trainees improves procedural knowledge and self-rated procedural competence. *J Vasc Surg* 2017;65:907–915.e3.
- [10] Munz Y. Role of industry in development of surgical simulation centres: A medical education perspective. *Surgeon* 2011;9(suppl 1):S28–9.
- [11] Duran C, Shames M, Bismuth J, et al. Validated assessment tool paves the way for standardized evaluation of trainees on anastomotic models. *Ann Vasc Surg* 2014;28:115–21.
- [12] Bismuth J, Lumsden AB. The fellows top gun challenge. *Endovasc Today* 2009:1–2.
- [13] DuVal G. The benefits and threats of research partnerships with industry. *Crit Care* 2005;9:309–10.
- [14] Chen J, Pickett T, Langell A, et al. Industry-academic partnerships: an approach to accelerate innovation. *J Surg Res* 2016;205:228–33.