

EDITORIAL

Time to Embrace Simulation in Vascular Surgical Training: Little Things Matter

Gathering a European consensus about technical procedures that should be included in future simulation based curriculum in vascular surgery is a major step towards reaching excellence for patient safety. In this issue of *European Journal of Vascular and Endovascular Surgery*, Nayahangan *et al.* identified key opinion leaders, and in particular trainers, across Europe to pinpoint what should be included in such a curriculum and have reported their findings in a well structured and informative way.¹

A number of drivers have led to increased use of simulation in surgical training, with the first and most important, being patient safety. The old apprenticeship model of “see one, do one, teach one” clearly cannot be supported in the current environment in which safety is paramount and the patient’s interests must always come first. Medical errors may lead to complications and even death and, furthermore to increased costs of care and possible litigation. Unexpected deaths often share a common pattern. Multiple, often minor, deviations from the normal procedure have a knock on effect, initiating a cascade of events resulting in major distractions that ultimately lead to major events.² In other words: little things do matter! Learning open vascular and endovascular skills outside an operating theatre, hybrid or angio suite allows trainees to develop skills in a non-threatening environment without distraction. Intra-operative distraction and interruption, for instance, have been described to occur at a rate ranging from 11 to 17 per hour.^{3,4} In those situations, surgical flow is disrupted, a factor that has been demonstrated to be strongly predictive of errors.⁵ Cognitive overload, system, or teamwork failures are mainly responsible for those preventable deaths, which are often not related to failure of technical skills. The importance of this phenomenon is highlighted by the analysis of litigated surgical outcomes, where communication failures have been reported to account for the vast majority of system failures leading to indemnity payment.⁶ Simulation allows trainees to develop both clinical technical and non-technical skills, individually and within a team, in a completely safe environment before cultivating them in the supervised clinical environment.

Some non-technical skills can be delivered at low cost within the workplace, for example vascular image interpretation or duplex ultrasound training. High fidelity virtual reality simulators by contrast, are expensive, require maintenance, software updates, and may quickly become

superseded or obsolete. There are risks that when simulation becomes expensive it becomes more difficult to provide universally. This is particularly an issue with virtual reality and cadaver based simulation. It is vital that all trainees have equal access to simulation. Individual hospitals cannot be expected to provide high fidelity virtual reality simulators for endovascular aneurysm repair or angioplasty training. This type of simulated training may be best provided at dedicated training courses, for example the European Vascular Course in Maastricht, or at the European Society for Vascular Surgery (ESVS) Annual Meeting through the comprehensive programme of workshops run by the ESVS Academy.⁷ In the UK and Ireland simulation training was incorporated into the vascular surgical curriculum in 2015. The ASPIRE Course takes all trainees away from the hospital environment for a residential course every year of the six year training programme.⁸ Two of these courses delivered for the third and fifth years of training focus solely on cadaveric simulation and run sequentially to allow economies of scale and to maximise the use of each cadaver. The Improving Surgical Training project in the UK made two high level recommendations on simulation:⁹

1. “Simulation should be embedded and enhanced within surgical curricula and there should be sufficient resource to ensure availability for all trainees.”
2. “Each phase of training should be preceded by an educational induction where technical and non-technical skills are taught and developed in a simulated environment.”

Vascular trainers and trainees have been provided with knowledge of the vascular surgical procedures that can be trained in a simulated environment, listed in order of priority, as described by Nayahangan *et al.*¹ This process involved identifying which aspects of the curriculum could be provided in a simulated environment and focused on both technical and non-technical skills. Interestingly, open aortic aneurysm repair was not identified as one of the top five procedures that should be included in a future simulation based curriculum. This is somewhat surprising in the current environment where numbers of open abdominal aortic aneurysm (AAA) repairs are falling, and those that are done are often more technically challenging because of adverse anatomical features. Open AAA repair jigs provide good training, and skills can be enhanced further with access to cadaveric laboratories, although at considerable cost. The open aortic station at the European Board Examination has become the station most commonly failed, highlighting the need for dedicated training in this area.

Simulated open AAA repair can address falling case numbers and also enhance patient safety.¹⁰

Clearly, not every training programme across Europe will be able to provide simulation for all procedures immediately. The consensus achieved at the Europe wide needs assessment initiative¹ should act as a blueprint to help develop curricula. A lot of expertise already exists across the continent and it should be used to allow all trainees the opportunity to benefit from simulated training.

Additionally, vascular surgery offers a wide range of surgical territories and technologies including imaging, devices, and intra-operative navigation that make it potentially attractive for current medical students. Pre-clinical vascular skills and simulation courses, as well as a high level simulation based education programmes in vascular surgery, stimulate medical students' interest for vascular surgery,^{11,12} attracting the best trainees and contributing to the future of the specialty.

Ultimately, however, simulation does not change the competencies required by a vascular surgical trainee on completion of training, rather it offers alternative ways of achieving these skills and complements supervised clinical practice. The Patient Safety Movement Foundation advocates on its website (www.patientsafetymovement.org) that reaching zero preventable deaths in hospitals is not only the right goal, but an attainable one with the right people, ideas, and technology. There is now a wealth of literature supporting the use of simulation in surgical education. If many pieces of the puzzle already exist, a safe patient journey, like every journey, begins with one step. Building this consensus is a first step, in the right direction. We must all embrace simulation to improve patient safety and enhance learning.

REFERENCES

- 1 Nayahangan LJ, Van Herzele I, Konge L, Koncar I, Cieri E, Mansilha A, et al. Achieving consensus to define simulation-based education in vascular surgery: a European-wide needs assessment initiative. *Eur J Vasc Endovasc Surg* 2019;**58**:284–91.
- 2 Carthey J, de Leval MR, Reason JT. The human factor in cardiac surgery: errors and near misses in a high technology medical domain. *Ann Thorac Surg* 2001;**72**:300–5.
- 3 Healey AN, Sevdalis N, Vincent CA. Measuring intra-operative interference from distraction and interruption observed in the operating theatre. *Ergonomics* 2006;**49**:589–604.
- 4 Wiegmann DA, ElBardissi AW, Dearani JA, Daly RC, Sundt 3rd TM. Disruptions in surgical flow and their relationship to surgical errors: an exploratory investigation. *Surgery* 2007;**142**: 658–65.
- 5 Wahr JA, Prager RL, Abernathy 3rd JH, Martinez EA, Salas E, Seifert PC, et al. American heart association council on cardiovascular surgery and anesthesia, council on cardiovascular and stroke nursing, and council on quality of care and outcomes research. Patient safety in the cardiac operating room: human factors and teamwork: a scientific statement from the American heart association. *Circulation* 2013;**128**:1139–69.
- 6 Morris Jr JA, Carrillo Y, Jenkins JM, Smith PW, Bledsoe S, Pichert J, et al. Surgical adverse events, risk management, and malpractice outcome: morbidity and mortality review is not enough. *Ann Surg* 2003;**237**:844–51.
- 7 Eiberg JP, Vila R, Van Herzele I, on behalf of the ESVS Academy. The ESVS Academy is growing. *Eur J Vasc Endovasc Surg* 2019;**58**:1–2.
- 8 Vascular Society of Great Britain and Ireland: ASPIRE training programme [1 May 2019]. Available from: <https://www.vascularsociety.org.uk/search/?q=aspire>.
- 9 Royal College of Surgeons of England [1 May 2019]. Available from: <https://www.rcseng.ac.uk/careers-in-surgery/trainees/ist/>.
- 10 Jenkins MP, Boyle JR, Rudarakanchana N. How can we ensure vascular surgical trainees become competent in open aortic surgery in the future training environment? *Eur J Vasc Endovasc Surg* 2019;**57**:617–8.
- 11 Lee JT, Son JH, Chandra V, Lilo E, Dalman RL. Long-term impact of a preclinical endovascular skills course on medical student career choices. *J Vasc Surg* 2011;**54**:1193–200.
- 12 Lee JT, Qiu M, Teshome M, Raghavan SS, Tedesco MM, Dalman RL. The utility of endovascular simulation to improve technical performance and stimulate continued interest of preclinical medical students in vascular surgery. *J Surg Educ* 2009;**66**:367–73.

Jonathan Robert Boyle

Cambridge Vascular Unit, Cambridge University Hospitals,
UK

Alexandre Ghuysen, Vincenzo d'Orio

CARE Simulation, Department of Public Health, Liege
University, Belgium

Melina Vega de Ceniga*

Department of Angiology and Vascular Surgery, Hospital de
Galdakao-Usansolo, Bizkaia, Spain

Nabil Chakfé

Department of Vascular Surgery and Kidney
Transplantation, University Hospital of Strasbourg, France

*Corresponding author.

Email-addresses: melinavega@hotmail.com,
melina.vegadeceniga@osakidetza.eus
(Melina Vega de Ceniga)