The Epicenter of Change: Robotic Cardiac Surgery As A Career Choice

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Complete List of Authors:	Torregrossa, Gianluca; University of Chicago Pritzker School of Medicine Amabile, Andrea; Yale University School of Medicine, Cardiac Surgery Oosterlinck, Wouter; KU Leuven University Hospitals Leuven, Cardiovascular Diseases Van den Eynde, Jef Mori, Makoto; Yale University School of Medicine, Section of Cardiac Surgery Geirsson, Arnar; Yale University School of Medicine, Cardiac Surgery Balkhy, Husam; University of Chicago, Cardiothoracic Surgery; Husam Balkhy
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The Epicenter of Change: Robotic Cardiac Surgery As A Career Choice

Gianluca Torregrossa, MD^{1*}; Andrea Amabile, MD^{2*}; Wouter Oosterlinck, MD, PhD³;
Jef Van den Eynde, BSc³; Makoto Mori, MD²; Arnar Geirsson, MD²;
Husam H. Balkhy, MD¹

- 1- Division of Minimally Invasive and Robotic Cardiac Surgery, Department of Surgery, University of Chicago Medicine (Chicago, IL)
- 2- Division of Cardiac Surgery, Department of Surgery, Yale School of Medicine (New Haven, CT)
- 3- Department of Cardiovascular Diseases, University Hospitals Leuven (Leuven, Belgium)

*These Authors contributed equally to this work.

Corresponding Author: Dr. Gianluca Torregrossa, MD
Division of Minimally Invasive and Robotic Cardiac Surgery
Department of Surgery, University of Chicago Medicine
5758 S.Maryland Ave, Chicago, IL 60637,USA.

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Abstract

Building up a career in robotic cardiac surgery can be challenging and requires a broad variety of hard and soft skills. Many pathways can be taken to achieve the same goal, but a standardized training curriculum in robotic cardiac surgery is necessary and should be demanded by the surgical community. In addition to developing technical skills, trainees interested in devoting their career to the evolving field of robotic cardiac surgery could benefit from incorporating enhanced soft and mental skills in their lifestyle.

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Introduction

“Medicine is no profession for the status quo. Cardiac Surgery is no exception. In fact, our work is at the epicenter of change in all aspects”¹. During his Presidential Address at the eighty-fifth Annual Meeting of the American Association for Thoracic Surgery (AATS), Dr. Tirone David provided a spectacular overview on the dramatic changes facing the field of cardiac surgery, emphasizing the fact that surgeons should never forget that change is inevitable and that therefore they must embrace change with a positive mindset, adapting to it quickly and enjoying it.

The development of robotic surgical platforms has indeed paved the way for a new reality in our field. Following the first successful robotic-assisted mitral valve procedure² and robotic-assisted coronary artery bypass³ more than twenty years ago, the robotic approach has been adopted in a growing number of institutions around the world⁴. Although these two procedures continue to make up the majority of robotic cardiac cases, the feasibility and safety of a totally robotic approach has been demonstrated in a broad variety of other situations⁵. Since robotic-assisted totally endoscopic surgery requires a specific skillset, there is an increasing demand for structured and standardized training pathways aiming at preparing the next generation of robotic cardiac surgeons. This Editorial aims at discussing those skills which we believe are imperative to building a successful career in robotic cardiac surgery (Figure 1).

On hard skills development: dedicated training curricula

Aspiring robotic cardiac surgeons should learn cardiac surgery first. As plain as it may sound, it is not possible to provide optimal quality of care via the robotic platform without having previously mastered open skills (and core concepts) in cardiac surgery. Gradually, trainees who become interested in the field should start increasing their exposure by shadowing faculty members who routinely perform their cases minimally invasively or robotically, if

possible. Once the interest becomes predominant, they should look for a more structured training pathway. At the present time, consistent exposure to robotic cardiac surgery is not widely included in cardiac surgery training curricula, and a minimum case log of robotic cardiac procedures has not been adopted as a requirement for board certification. Consequently, young cardiac surgeons with an interest in pursuing a career in robotics can generally follow one of two major pathways: via industry support, or independently from industry.

In the former pathway, preclinical training can be initiated for residents, fellows or junior faculty using the da Vinci® System (Intuitive Surgical, Sunnyvale, CA) in dry- and wet-lab courses. Besides its headquarters in Sunnyvale as well as the training facilities in Atlanta (Atlanta, GA, USA) and Houston (Houston, TX, USA), Intuitive has recently founded several robotic training centers outside the United States, such as IRCAD 2 (Strasbourg, France), RAIN (Naples, Italy), RPA (Sydney, Australia), and IRCS-World Laparoscopy Hospital (New Delhi, India). After an online video-based course, candidates receive hands-on training at the surgical console. After having completed a set of requirements, candidates obtain the da Vinci® System Training Certificate, which helps demonstrate their experience to employers and hospitals. The eligibility criteria for this achievement are listed in Table 1.

In the latter pathway, aspiring robotic cardiac surgeons must apply for a position in a center which itself can provide simulator and other pre-clinical training facilities, including dry- and wet-labs. Both pathways converge when the surgeon's skillset has been built, and clinical training can be initiated. During this phase, guidance by expert robotic surgeons is mandatory. If not available at their own center, trainees should visit experienced centers to receive advanced training. For the established young surgeon looking to begin a robotic cardiac program and after completing the above preliminary steps, involving the entire team is crucial: a dedicated robotic training should be offered not only to surgeons, but also to the tableside assistant, scrub nurses, anesthesia and perfusion teams. Consistency in the team of people

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101 trained to work together during a robotic procedure is another important prerequisite to
102 building a successful robotic cardiac program.

103 Dedicated robotic cardiac surgery fellowships and courses are also currently available
104 at an increasing number of institutions (Table 2). Nevertheless, no clearly outlined career track
105 has been established and the opportunities remain hard to find. The current lack of standardized
106 training poses several challenges. First, the current training model largely relies on the
107 availability of mentors who are motivated to guide young surgeons through their first robotic
108 experiences. The number of mentors is limited due to the limited number of institutions
109 routinely providing robotic-assisted cardiac surgical care, and this likely represents an obstacle
110 to the large-scale development of the field of robotic cardiac surgery at current times. In
111 addition, the quality of performances of neither the mentee nor the mentor is monitored by a
112 central organization, which should be a necessary prerequisite to ensure equal and diffuse
113 education. Finally, important financial constraints may be posed by the perceived high cost of
114 robotic systems, simulators, dry- and wet-lab facilities in case these have to be bought *ex novo*
115 by individual hospitals in the absence of dedicated subsidies. However, Cohan *et al.* have
116 recently demonstrated that initiating a robotic program can be cost-neutral as well as maintains
117 integrity in clinical outcomes⁶.

119 *On hard skills development: besides the robotic console*

120 Even after reaching a satisfying confidence with the robotic console, it is essential to
121 keep training on simulators in order to enhance technical dexterity and boost visual feedback
122 perception, thus strengthening one's confidence further. Robotic cardiac surgeons at any stage
123 of their training may also find it useful to shadow robotic colleagues from different specialties.
124 Spending time in different operating rooms may help in grasping core concepts at a deeper
125 level and give birth to new ideas on how to solve technical issues in the field of interest.

In addition to that, young robotic cardiac surgeons may want to build a detailed video-library of personal cases to be reviewed on a regular basis, which can be used to reinforce the memory of technical steps at earlier career stages and to teach trainees at later career stages, in addition to troubleshooting any complications which may occur.

Nonetheless, it is also mandatory to preserve open skills in order to maintain a busy surgical practice and to be ready in the management of any undesirable robotic complications requiring conversion. Therefore, even if the young surgeon is interested in committing to a fully robotic cardiac practice, continuing to take call and dealing with general cardiac emergencies will be necessary to maintain critical open surgical skills. Another effective way to maintain open skills is to continue to teach younger trainees in wet-lab settings on a regular basis (e.g., weekly wet-labs on coronary anastomosis performed on animal models).

On soft skill development: the mentor-mentee relationship

As physicians and surgeons, our career is built up through a constellation of people we have the fortune to find along our journey – role models who are at the same time knowledgeable, approachable and trustworthy. These people act as teachers, mentors, and coaches and they not only care about our patient management ability and technical skills development, but also provide insightful suggestions and help with career paths, personal development, networking, research projects and job openings. The mentor-mentee relationship must be nurtured, respected and based on open communication and mutual trust. Mentors tend to guide mentees in many aspects of their lives that are not just career-related, and it is not uncommon for mentors and mentees to share similar background interests which contribute to solidifying the relationship. As a consequence of this, a successful mentor-mentee relationship is also the mentee's responsibility – who must generate enthusiasm in the mentor, inspire reliability, and show a steady willingness to improve and learn with dedication.

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On soft skill development: mental skills training

Developing a strong set of mental skills in the early stages of training has several positive effects on the quality of care provided, on career advancement, and on physical and mental health. As recently discussed by Spoon *et al.*, mental skills training has been shown to enhance surgical performance and to reduce operator stress and burn-out⁷. We recommended that residency and fellowship programs apply existing models of mental training with the aim of incorporating (at least) six essential mental skills in the personal and professional growth of their trainees: mental toughness (i.e., the ability to thrive in demanding situations), arousal (the minimal level of anxiety necessary to achieve assigned tasks in stressful situations), attention focus (the ability to concentrate attention on a specific stimulus in order to optimize the performance), visualization (the ability to picture oneself performing the task prior to the event), internal monologue (the ability to maintain positive thoughts during stressful events and mistakes) and cohesion (the strength of interpersonal connection amongst team members in reaching a common goal). Combining these attributes in approaching new challenges can facilitate maintaining a positive and confident approach in training. The ability to communicate in a clear and open way between the surgeon and the team is also crucial.

Another interesting perspective was recently proposed by Maddaus, who formulated the “Resilience Bank Account” strategy for optimizing performances in high-stress environments such as the daily cardiac surgery practice and training⁸. He compared developing and maintaining specific daily habits (i.e., sleep, exercise, meditation, gratitude, self-compassion and connection) to the process of making daily small deposits of money into one’s bank account. Instead of impacting on one’s personal finances, deposits made by practicing these habits end up strengthening one’s resilience, thus improving physical and mental health, self-regulation and flexibility over time.

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3 176 Flexibility is indeed an essential characteristic that young robotic cardiac surgeons must
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6 177 possess and safeguard, since they embraced a field in continuous development.
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8 178 In the aforementioned AATS Presidential Address, Dr. David concluded stating that “[Future
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10 179 surgeons] will be the ones who will develop new therapeutic approaches to treat patients with
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12 180 cardiothoracic diseases. They will be making the changes in our specialty. Change is good.
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15 181 Change is necessary. Change is progress”. Undeniably, surgeons interested in devoting their
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17 182 career to robotic cardiac surgery must be ready to change quickly, take on new challenges, and
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19 183 embrace the process itself, sustained by their passion and their desire to ultimately benefit the
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21 184 most important person in this equation: the patient.
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Table 1

Criteria for the Certificate of da Vinci® System Training for Residents and Fellows

Table 2

Currently available robotic fellowships and specialization courses.

Accessed July 18th, 2021

Figure 1

Tips to building a successful career in robotic cardiac surgery.

226 **References**

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Nr	Criterion	Specification
1	Completion of da Vinci System Online Training, for Surgeons, Residents, and Fellows (recommended)	Video-based training, which includes topics such as system component overview, instruction in the use of system components, da Vinci® instruments and accessories, and advanced technologies.
2	Completion of da Vinci System Overview In-Service Training	Hands-on training, which includes system component overview, docking, port placement, da Vinci instrument overview, Surgeon Console overview, emergency procedures, and powering off the system.
3	Completion da Vinci System Online Assessment	The above training activities are prerequisites for the da Vinci System Online Assessment. A training certificate can be printed upon completion of the assessment.
4	Performance of da Vinci Procedures in Primary Role of Console Surgeon (Minimum of 20) and Primary Role of Bedside Assistant (Minimum of 10)	/
5	Solicit Letter of Verification of da Vinci System Training and Procedures Completed from Chief of Surgery or Program Director	/
6	Submit Copy of Online Training Certificate, Case Log, and Letter of Verification to Intuitive Representative	/

Table 1 - Criteria for the Certificate of da Vinci® System Training for Residents and Fellows

357x222mm (72 x 72 DPI)

Name	Institution	Link
Fellowships		
STS/TSF Advanced Robotic Cardiac Surgery Fellowship	Society of Thoracic Surgeons The Thoracic Surgery Foundation	https://thoracicsurgeryfoundation.org/roboticcardiacfellowship/
AATS Foundation Cardiac Surgical Robotic Fellowship	Cleveland Clinic, Emory University at Midtown, New York University, West Virginia University, Mayo Clinic	https://www.aats.org/aatsimis/AATSWeb/Foundation/Programs/Programs/Cardiac_Surgical_Robotics_Program/Cardiac_Surgical_Robotics_Program.aspx
Advanced Robotic Cardiac Surgery Fellowship	Division of Cardiothoracic Surgery, Emory University School of Medicine, GA, USA	http://www.surgery.emory.edu/training/ct-surgery-residency-fellowships/advanced-robotic-cardiac-surgery-fellowship.html
Minimally Invasive CT Surgery Fellowship	Department of Cardiovascular and Thoracic Surgery, West Virginia University, WV, USA	https://medicine.hsc.wvu.edu/cardiovascular-and-thoracic-surgery/fellowships/cardiothoracic-surgery-residency/minimally-invasive-ct-surgery-fellowship/
Resident Robotic Surgery Training	Department of Cardiothoracic Surgery, Weill Cornell Medicine, NY, USA	https://ctsurgery.weillcornell.org/education/resident-robotic-surgery-training
Training courses		
STS Workshop on Robotic Cardiac Surgery	Society of Thoracic Surgeons (Annual event)	https://www.sts.org/meetings/live-courses/2020-sts-workshop-robotic-cardiac-surgery-agenda
Robotic Training Courses at ORSI Academy	ORSI Academy, Belgium	https://www.orsi-online.com/en/training
IRCAD 2	University Hospital of Strasbourg	https://www.ircad.fr/inauguration-de-lircad-2-2/
Robotic Academy Intuitive Naples (RAIN)	GRIO Inter Hospital Robotic Group (Antonio Cardarelli Hospital, Naples, Italy)	http://www.centrodibiotecnologie.org/en/rain/
RPA Surgical & Robotic Training Institute	Royal Prince Alfred Hospital, Sydney, Australia	https://www.slhd.nsw.gov.au/rpa/robotic/about.html
(ICRS) Robotic Surgery course	International College of Robotic Surgeons, World Laparoscopy Hospital	https://www.laparoscopyhospital.com/roboticsurgerytraining.html

Table 2 - Currently available robotic fellowships and specialization courses.
Accessed July 18th, 2021

373x270mm (72 x 72 DPI)

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1. Master cardiac surgery first, then learn robotic cardiac surgery.
 2. Keep training on simulators even when you think you have gained enough confidence.
 3. Spend some time in the operating room of robotic surgeons in different specialties.
 4. Build your own video library of robotic cases, review it frequently with a critical eye.
 5. Strive to maintain your open skills.
 6. Find the right mentor(s), and make sure you are the right mentee.
 7. Develop strong mental skills.
 8. Build a resilient attitude and a good work-life balance.
 9. Be ready to change quickly and enjoy the process.
 10. Keep reminding yourself of what your driving force is.
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Figure 1 - Tips to building a successful career in robotic cardiac surgery.

159x74mm (144 x 144 DPI)