

Training in Cardiovascular Surgery in Brazil. A New Concept

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Teaching surgery as always been a challenge, for those involved in it. Since the beginning of the new era of Medicine, teaching surgery has been a matter that has continuously been changing. The old amphitheaters, in which a surgical operation was performed in front of hundreds of doctors and/or students, has been replaced by operating rooms with an observation deck and these by more sophisticated apparatus.

Cardiovascular surgery, despite being a new specialty, in surgery, it has always had a solid education, when we take into account training. As part of the evolution in cardiovascular surgical training, different programs have been created to improve the way teaching is conducted. In the last years a great number of new techniques and technology have appeared and so not only new surgeons have to be trained, but also the older ones should be, so as to achieve a standard that should be high, independently of the ones who offer it. In Brazil, being a continental country, there are difficulties to achieve this goal, especially to the fact that there are different ways depending on the regions and subsettings. To go behind these problems, multicentric papers and cooperation are needed [1]. Groups also distinguish itself depending on the way they embrace these new innovations and the way they deal with educating people to be able to perform these technologies. A minority will try it, at first – the techies, some will get ahead and will lead most – the visionaries, the majority will stick with the hear or will hold on – the pragmatists and the conservatives and those who will never get to these new technologies, due to lack of interest or due to inability – the skeptics.

As said by Victor Frankl, when we are no longer able to change a situation, we are challenged to change ourselves and most of the times this is due to the fact that the chains that restrain us from evolving are much more mental than physical. We will try to present the pathways we are pursuing, to change the way cardiovascular surgery is taught in Brazil, so that we can discuss, which are the best routes, always having in mind that life is a local matter and that in some cases a multidisciplinary approach is imperative [2].

Before a new program of education is started, for a new technology or surgical technique two questions should be made:

1. Which surgeon has the greater capacity to perform these procedures?
2. What training is necessary to be able to perform these new procedures?

To answer the first question, one should know, that surgeon with the great capacity has to know the diseases, be able to treat with already established techniques, develop technical abilities, and be able to take care in the post-operative period. Period and last but not the least important, be able to treat the complications that these new procedures should lead to [3]. So to summarize it is not only important to be able to perform the new technologies but also to master the conventional ones and be able to treat any complications that arise from any of the procedures.

To answer the second question one should know that the program should have qualified tutors, a well-defined curriculum, based on medical evidences such as national guidelines [4], that does not

comprehend only a theoretical part but also a practical one, and an evaluation program for the trainees and also the program.

For the sake of argument, we should know that the paradigm of teaching and learning has shifted, and that not only the trainees are evaluated, but also the tutors and the training program as a unit. One can argue that various levels of training should be arranged, and these is a true argument, but one of the most important points is that all levels should be affective in offering knowledge and that this knowledge could be validated and lead to clinical competence. We will present a raw model to teach cardiovascular surgery; not only on new technologies, but also that can be affective on old ones, both for newcomers' as well as already established surgeons.

For a start, this model should be able to clearly define the objectives and end points, develop a curriculum to produce these end points, create a program capable of offering the curriculum and evaluate and regulate all three points above. All training should base itself on competences, so timing will not be consider as a value in these setting. It does not matter how long the trainee takes to accomplish the end points, but if we can achieve them, with the help of the proper tutors. After established the desired objective, the contents should be worked up in different levels of complexity, but aiming to achieve the desired end point. For these contents a different method of teaching and learning, should be accomplished as well as an evaluating method. At the end any of those completing the course are educated in this new area.

If we take as an example coronary artery bypass grafting (CABG), apart from the theoretical teaching, the practical one should begin with visits to the operating room, to familiarize with the technique, by observing established surgeons performing everyday cases. This part tends to stimulate the apprentice in pursuing his training, every time he feels like giving up. From this set he is taken to a skill lab that can be a virtual model (Figure 1), a wet-lab model or a hands-on one, or even a specific model for a given situation. On the beginning the training is done under direct supervision and then by direct practice. At the end of each practice the trainee is evaluated and if the expertise are acquired he goes into the next level; if not he restarts the same model. Accomplishing this part the trainee goes back into the operating room to perform supervised surgeries and as then last step unsupervised surgeries. Based on competences this training may take some time, which as we said, is not important, but it should be able to transform anyone into an expertise in any technique.

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Figure 1: Virtual model for endovascular teaching.

One will argue that for residents it will not be possible for them to master the complicated cases, even if they had performed the teaching in wet-labs or virtual models. We think that this paradigm should be changed. As an example we all know that military aircraft pilots are trained in virtual models, for all conditions, that they are young, with no previous or minimum experience, and that the best of them will be given a very expensive plane to fly and in some cases to land on aircraft carriers.

Who can, an air force train these youngsters to pilot an expensive aircraft and give them difficult goals to achieve and we cannot train a cardiovascular surgeon? As Mark Twain said long ago “Practice does not make perfect, only perfect practice makes perfect”.

It all depends on the model accepted and on its tutors. The model should be based, as we stated previously, on endless repetitions. If we can make an analogy with golf, no one becomes a winner in an Open, if he doesn't start from the beginning.

And the beginning means tuition and training, and it goes from basic to perfection, with deliberative practice and repetition.

One should practice every day on the practice tee, with mulligans, because in the real game there are no mulligans and every shot counts – no re-dos. Why do we insist on this experimental model and not on the old one based on taking the trainee to the operating room? The main reason is that no one can practice in the operating room, because it puts the patient at risk. But there are a few more, not least important, such as, one cannot make mistakes, there are fewer patients, less time to learn (absolute and relative time), more procedures to learn, and unpredictable exposure to a specific procedure. On the other hand if we take into account the simulators as the example to follow, we will see that they have great advantages such as “high fidelity” anatomy, tissue feel, 3-dimensions models or 2-dimensions in endovascular surgery, tactile feedback, mistakes can be made with no risk, deliberative repetitive practice, time acceleration, focus is narrowed and eliminates the usual learning curves (Figure 2). But all these are not complete without the true tutors. Feins [5], when considering cardi thoracic surgical stimulation, stated that learning on a simulator should be supervised by a skilled and trained mentor, due to the fact that least bad habits will develop. This means that residents cannot teach residents and that the training should be given by the best mentors. But who should be the tutor? The tutor should be a cardiovascular surgeon that understands the objective to be achieved with the training, as well as why it is important and its full meaning. For this purpose one should know who ought to be trained, the end points, what are the best methods to achieve the best training and what challenges will be faced. But the

more important questions to be answered are those that the tutor should make to himself at the very beginning - Am I the right person for this task and do I have the knowledge, skills and correct attitude to be a good tutor? If these questions are answered in a satisfying way the training program will launch and it will be a good one.

With all said, and all the questions answered, a true program can be started, having the ideal conception that all technical steps should be learned, one at a time, and that the requirement for expertise, in a given field, is the mastery in each step. To create a training program, one of the first points is the level of knowledge and practice, already acquired by the trainees. After the first exposure to a real situation, in the operating room, they should be introduced, in the lab, to different skill levels, in different hand-made simulators, and after these modules to the wet-lab, to work on biological simulators, for hands-on sessions [6]. If the goal is to give training in minimally invasive surgery, after being trained in a simulator, and mastering everystep, a second phase should be accomplished in a “black box”, with appropriate instruments and a heart sealed on a box, under direct vision, and the last part of the training in an experimental or animal models. If instead of minimally invasive surgery the aim is endovascular surgery the virtual simulators can be used, for different steps, and ending up with experimental or animal models.

In Brazil, through the national society of cardiovascular surgery, a program was started, to train new cardiovascular surgeons, after a four

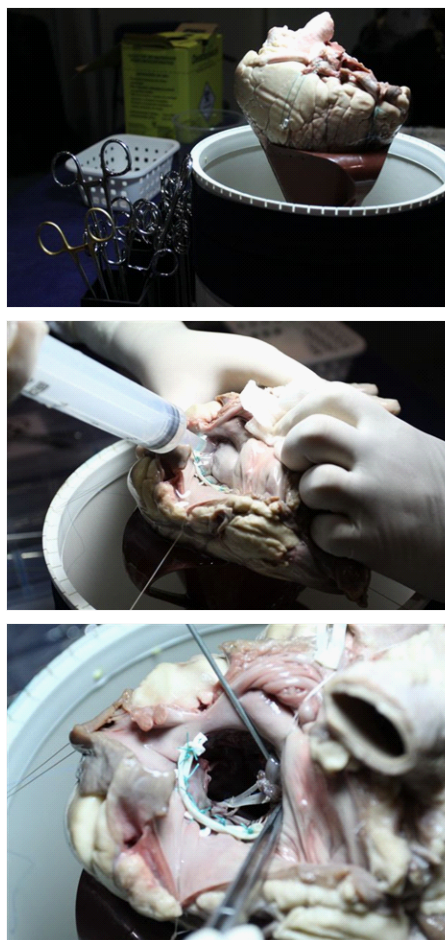


Figure 2: Three images of a Wet-lab on mitral valve plasty. (Imagem 1, 2 &3).

year residency in general cardiac surgery, or retrain established cardiac surgeons, into becoming experts in endovascular surgery. The program has a theoretical approach, given by experienced tutors, all with academic background, followed by a part where the trainee is located to a virtual simulator and a "Hands On" lab, under the supervision of specialists Figure 2. Three images of a Wet-lab on mitral valve plasty (Figure 3). The first course was able to engage 20 surgeons in the theoretical part, which had a conventional lecture of the important topics, followed by an extended discussion between the mentors and trainees. When evaluating this course, we found out that the more important part was the discussion and not the lecture itself, due to the important practical side of it.

Following the theoretical part the trainees were exposed to a virtual simulator, where they got in contact with the decision of choosing the right wire, catheter or endoprosthesis, for a given case.

These simulators are extremely friendly and ease to use. Its software gives the possibility of having a great variety of situations, with different levels of complexity. New softwares are coming up to the market, which gives us the capacity to practice in real cases. This means that if you have digital images from a patient CT scan, you can feed the software and then train on the virtual model, with the normal clinical pitfalls, for a next day clinical case. So it will be real the statement that, tomorrows case is done today, and more than this the benefits to the patient if you already know the problems to be countered and how to avoid them by means of practical solutions, in real life, obtained in virtual training.

After these courses, the trainee follows a strict program in a specialized center, where he has the opportunity not only to participate in all cases, but also being able to take part in the clinical discussion as well as in the surgical procedures. They have different lengths of time,

depending on the goals, but they are first done by the expert tutors and then under direct supervision. After completion of the all these steps a supervised procedure will be performed at his own surgical facility and thereafter the trainee will perform by him. In the need of future training anyone could be enrolled in a new course.

To accomplish all these it is necessary to have support from an associative body, a governmental department or private one, and a close link with academic organizations, such as Universities or Post-Graduation Courses, in close cooperation with the industry. This cooperation with the industry carries no conflict of interest, as long as it is open to all that are interested and the academic and administrative decisions are carried by those with an academic sense and not a commercial one.

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Figure 3: Tutors operating on an animal model and trainees operating under direct supervision.