

## Robotic thoracic surgery in Brazil

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**DOI: 10.31744/einstein\_journal/2024EDS1**

Robotic surgery allows for better visualization and better handling of tissues during procedures because of the 3D view and articulated instruments which have more degrees of freedom than our own human wrist. Consequently, it is apparently easier to learn than other modalities of minimally invasive surgery (videoassisted thoracic surgery – VATS) and allows more surgeons to perform more complex procedures, particularly those that require bronchovascular sutures or reconstruction. Contributing for this assumption, recent studies have demonstrated that when compared to VATS, robotic surgery was associated with less frequent conversions, and most of the times, the additional VATS conversions were due to challenging anatomies that could have been more easily managed with the robotic platform.<sup>(1)</sup>

The first robotic procedures in Brazil were performed in 2008, but the first robotic thoracic robotic procedures were performed in 2010. Since then, we observed a very slow growth of thoracic robotic surgery numbers until 2015 when more platforms arrived, and more thoracic surgeons were trained.<sup>(2,3)</sup> From, 2015 until 2020 the number of cases performed increased substantially following a greater number of trained surgeons and platforms available. However, from 2021 on, we see a very significant acceleration in the number of thoracic robotic cases performed in Brazil due to several reasons as the increase in the number of platforms, better commercial arrangements, and most importantly the large number of newly trained surgeons since the training process was brought to Brazil and so, the surgeons did not have to go abroad for certification anymore.

In 2024, we are aware that there are more than 100 thoracic surgeons that have the minimal documentation to perform robotic surgery and it is estimated that some 1500 to 2000 thoracic robotic procedures have been performed yearly. However, the challenges to start and keep a successful program are huge. The certification process nowadays regulated by the medical societies is very limited and many surgeons are reluctant to start their programs after finishing these short courses, particularly when they are at institutions where

### How to cite this article:

Terra RM. Robotic thoracic surgery in Brazil [editorial]. *einstein* (São Paulo). 2024;22(Suppl 1):eEDS1.

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there is no active robotic thoracic surgery program. This fact puts a higher pressure in the need for proctors, once these surgeons usually need more supervision and mentorship. Following initial training, proctorship is another big challenge. According to the requisites for definitive certification in robotic surgery by the medical societies, the definitive certificate is only given after a minimum of 10 supervised procedures. Unfortunately, we still do not have enough proctors in Brazil to attend to the high demand of newly trained thoracic robotic surgeons in the need for proctorship. Lack of funding is another issue, and the cost associated with proctorship many times must be paid by the patient or the surgeon. To make things still more complicated, in a recent study we demonstrated the importance of specialized proctors and the fact that after the end of the proctoring period it should be considered that a proctor participated sporadically in more challenging cases,<sup>(4)</sup> this would increase patients' safety. Therefore, the need for proctors goes probably beyond the ten cases. Lastly, the biggest challenge is the cost associated with the platform and supplies. Many institutions are struggling to find new models to make the process to be sustainable since the government and private health plans do not cover robotic surgery yet. Nowadays, patients have to pay out of the pocket for robotic surgery or hospitals somehow subsidize the operations. The definitive solution should include lower prices and that robotic surgery was incorporated to the list of approved procedures by all payers.

Another important topic is social justice. Currently, robotic surgery has been performed in patients who can pay for this expensive procedure. Considering the superior outcomes, it is widening even more the healthcare quality gap between more affluent and more vulnerable people. Therefore, we must find strategies to implement robotic thoracic surgery in more public institutions so that more patients could have access to this type of technology. Some institutions have already started programs dedicated to public patients like *Instituto do Cancer do Estado de São Paulo (ICESP)*, *Hospital Municipal da Vila Santa Catarina Dr. Gilson de Cássia Marques de Carvalho*, and *Hospital de Amor de*

*Barretos* and are doing a great job for their community. In addition to improved care, the platforms in such institutions increase the exposure of residents to robotic surgery and allows that they be trained in the technique.

As for clinical research in robotic surgery in Brazil, there is still much room for improvement. There are only a few publications in literature, most coming from our group and involving case reports and case series.<sup>(5-13)</sup> It is very important that Brazilian surgical scientists become more involved in robotic surgery and embrace research in the field so that we can develop new solutions tailored to the needs of our patients and our country. Funding and expertise are barriers we should overcome though. We must find ways to stimulate the development of innovations, new patents, new procedures, and health outcomes research.

As mentioned previously education is a big issue. Most residency programs do not have robotic platforms and residents have no exposure to the technology. Certification courses are short and give students some exposure to simulators and to the platform but are in essence limited to allow them a smooth adoption of the technique. To fill this gap, the Surgery Program at Albert Einstein created a graduate course in thoracic robotic surgery in which students have exposure to at least 150 hours of lectures, virtual simulation, crises resource management, dry lab, clinical observation of cases and possibility of case supervision. This is a very comprehensive one-year program that has already trained more than one hundred surgeons from Brazil, many countries in Latin America, and even India. Some consider it long and expensive though. Another option is the Einstein Fellowship in Thoracic Robotic Surgery. This is also a one-year program in which students have exposure to more than one hundred robotic procedures and perform at least 10-20 cases.<sup>(14)</sup> The downside of this program is the fact that it demands full dedication and is more adequate for those who finished the thoracic surgery residency recently. Internationally, these fellowship programs are the most popular training opportunities, even though in USA and some European countries, robotic surgery is already integrated in some residency programs, what should be our final goal as

well. Continued education is also very important, as well as refinement of surgical techniques. Currently, we see several opportunities for continued medical education with events and courses promoted by the robotic companies, medical societies and health care institutions.

In conclusion robotic thoracic surgery started in Brazil in 2010, and despite the slow growth initially it is now increasing in numbers exponentially. Nonetheless, at the moment, there are three big challenges we must overcome for a wider and safer adoption of the technique in our country: certification/training, supervision/proctorship, and cost. Addressing these three challenges altogether with equal distribution of robotic procedures, research and innovation tailored to our needs, and continued education should be a priority for all players involved in the care thoracic surgery patients.

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