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Invited Commentary

Invited commentary: Training and generation of solid evidence are the shoulders of giants in robotic surgery

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Robotic surgery is the cornerstone of the digital transformation in surgery and the leading player in the advent of so-called "surgery 4.0."[1] Although its rapid implementation is a fact, it is important that we do not make the same implementation mistakes that delayed the generalization of other minimally invasive approaches, especially laparoscopy. This is precisely where the difference lies—robotic surgery is much more than an approach and has notable conceptual differences with laparoscopic surgery. Beyond all the technical improvements with improved visualization and performance of maneuvers, a surgical robot is a perfect interface for obtaining and using clinical information enabling both the perfect planning and execution of the intervention and the optimization of the surgeon's training.[2]

Until now, there has been considerable difficulty in obtaining solid clinical evidence in some areas of surgery due to the absence of well-executed clinical trials. Thus, their results including cost-benefit assessments are largely generated through suboptimally planned use and also by using different generations of platforms and devices that differ markedly in terms of the advantages they offer the surgeon and thus the outcomes. Also, one of the factors that has rarely been taken into account is the experience of the surgical teams as well as the training they have received. In this regard, large series often include clinical results from a wide variety of settings, which can lead to erroneous conclusions. The same is true when it comes to assessing the cost-benefit balance. Often, top-down analyses are performed that only take into account direct costs and ignore relevant details such as the reduction in the development of complications or the acquisition model (purchase/rental) of the robotic platforms.[3,4]

It is striking that the analysis of the usefulness of robotic surgery systematically ignores the "democratizing" effect of robotic surgery, which has provided the possibility of performing procedures in environments that are not accessible with other types of technology, with a much lower morbidity associated with the process from the very first cases. Similarly, robotics has simplified what laparoscopy had made more complex by significantly increasing the difficulty of some procedures (e.g. pancreatic surgery). However, it is important to note the impact of training in achieving these results. Robotics involves a different training model in which a whole surgical team in addition to the main surgeon must be trained to maximize its versatility. The fundamental basis includes video-based education and simulation as interaction with quality audiovisual material and the completion of a minimum number of hours of simulation exercises is clearly associated with early skill acquisition. Furthermore, it is obvious that there is a clear generational gap in that younger surgeons (some of them already digital natives) are able to acquire mastery of robotic platforms more quickly. When the learning curve in robotic surgery has been objectively evaluated, it is significantly shortened and the differences between experienced and novice surgeons are

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significantly reduced by systematic training. If this training model is accompanied by initial training, the learning curve can become almost imperceptible.[5] It is also important to recognize that robotic platforms also allow the application of technology used in telecommunications, including the possibility of sharing the surgeon's vision and all the details of the operating theater environment, making it possible to perform safe and effective telementoring.[6,7]

Unfortunately, the main problem with the implementation of robotics goes beyond the clinical or scientific context. Given the importance of data capture and use as well as training, it is hardly defensible that so far a policy of open access to the data recorded by the devices is not applied, and the obtaining of certifications for the use of platforms is almost exclusively managed by companies. It is time for the surgical community led especially by the scientific surgical societies to take a step forward in this regard.

Robotic surgery still has to overcome important challenges to be considered as the preferred approach in a more generalized manner. Some of these challenges are purely clinical (e.g. its use in emergency medicine), while others are logistical, commercial, and even related to its sustainability. However, in view of the impact it has had so far, there is every reason to believe that the future is not only very near, but also very bright.

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