

Efficacy of Eyesi surgical simulator training in improving high-tension capsules capsulorhexis performance

Eficácia do treinamento com simulador cirúrgico Eyesi em melhorar a capsulorrexe em cápsulas de alta tensão

The article evaluating the training conducted with the Eyesi surgical cataract simulator has shown improvement in the performance of surgeons in training of capsulorhexis in capsules of high tension after repeated training, which increased the ability of the surgeon and their self-confidence.⁽¹⁾

Models are used for over two millennia, according to historical records of the Roman era, when wooden swords covered with leather allowed military battle simulation. Currently, one of the best-known examples of the use of models is the flight simulator for teaching and training pilots.

Studies using simulation in the teaching of medicine show that students improve their performance and knowledge in the area studied. In addition, the teaching model has been modified in order not only to improve the use of the students, but also to ensure greater safety of patients.⁽²⁾ The use of simulation techniques offers the opportunity to acquire various skills and the ability to repeat the procedure as many times as necessary until the subject is learnt.⁽³⁾ High-cost models are typically more realistic to allow better training of students, but have more limited access, especially when it comes to medical residency services in developing countries. Such a problem can be partially overcome by developing simpler training models by the students themselves, which, although not capable of simulating it so accurately, increase their participation in the learning process, becoming another stage before training with real patients and reducing anxiety.

Low-cost models developed by the students themselves with the assistance of professors allow each student to have their own model to repeat the training as much as necessary, as well as

offering the chance of eye anatomical learning during the building process.⁽⁴⁾ Simulation-based education is an important investment that can assist in the education of safer physicians, which will be able to offer better assistance to the population, reducing the risks of the learning curve.

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Response to the Letter to the Editor

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We appreciate and agree with the comments regarding the article on the Eyesi surgery simulator, but we would like to add a few comments. For a surgeon to develop and be safe and confident, it is necessary to have theoretical knowledge, manual skills, and repetitive training, in order to improve their abilities and critical judgment for making decisions. Any teaching technique that can improve the surgeon's skills and training and that reduces their learning curve will certainly help reduce the risk of complications.

Student participation in the development of simulation models adds many positive factors to the teaching-learning process, and the cost has always been and will probably continue to be a problem to be faced in teaching services. However, it is unquestionable that modern technological advances now offer us tools such as the Surgical Simulator that add highly effective features

to the surgical training process, and this is already documented in the scientific literature. Could one imagine that a decade or two ago the resident could train capsulorhexis in a white cataract or a crystalline with zonular dehiscence in a simulation model? And have the opportunity to practice the emulsification of the nucleus at different levels of density? And practice the cortex aspiration in many situations of adherence to capsule? Today's technology offers us this opportunity. But, like everything else, it has a cost.

What we should probably discuss today would be the estimation of the cost-effectiveness of investing in a high-cost equipment such as the surgical simulator. Would it generate loss or savings?

We would need to estimate how many surgical complications and their consequences would be avoided (capsule rupture, need for anterior and posterior vitrectomy, intraocular lens fixation, secondary glaucoma, endothelial decompensation, corneal transplantation, long term eyedrops use, patient withdrawal from their professional activities, repercussions of visual impairment on the patient's activities, multiple ophthalmological appointments, etc.) to each surgeon who performed the training.

How many training surgeons can a Simulator equipment train?

In our 4-year simulator experience, each student spends an average of 14 hours of hands-on training to meet the standard curriculum of Eyesi Simulator for cataract. If we achieve an optimization of the daily occupation of the device from Monday to Friday, from 8:00am to 06:00pm, we will have 50 hours available weekly and 200 hours monthly, enough to train 14 students per month and 168 per year. In a study published in 2013 (McCannel CA, Reed DC, Goldman DR. Ophthalmic surgery simulator training improves resident performance of capsulorhexis in the operating room. *Ophthalmology*. 2013, Vols. 120(12):2456-61.) the reduction of complications related to problems in the manufacture of capsulorhexis was 15 to 5% among the residents who took the training with the simulator. If a resident performs 100 surgeries in a year, there will be 10 complications less per resident per year. If we train 168 residents in the simulator per year, there will be 1680 complications avoided per year. If each complication has a

direct and indirect aggregate cost of R\$ 1,000.00, it will save R\$ 1,680,000.00 per year. Wouldn't this savings alone financially justify the investment in the equipment?

In medical education, as well as in public health, if we do not prioritize investment in quality education and prevention with cost planning, society will continue to spend more on solving the problems caused rather than spend less investing in prevention.

It is up to us, physicians, professors, trainers of new surgeons, to disseminate new ideas and technologies that are here to improve the teaching-learning process, with the resources we have available, whether with low-cost simulation models or, hopefully, it will be a reality within to everyone with the use of all the benefits that a high-tech resource can offer.

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