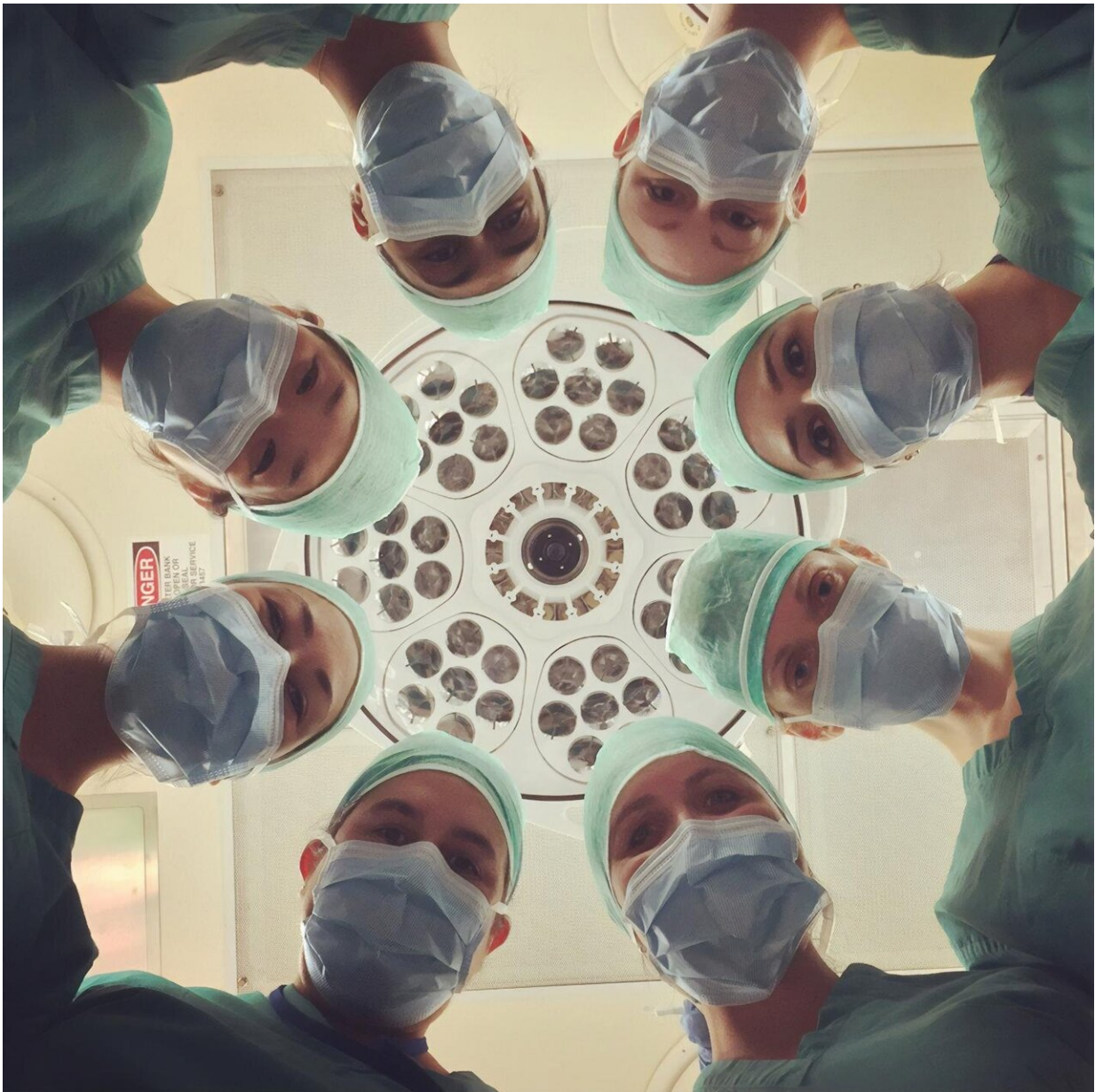


Operations on screen: Creating an accessible surgery simulator

December 2 2020, by Valentina Raffio



UOC and Universidad de Manizales in Colombia are developing a low-cost surgery simulator to train surgeons' psychomotor skills. Credit: National Cancer Institute - Unsplash

Practice makes perfect. This is true in the complex world of medicine too, where just a millimeter can make the difference between success and failure. In partnership with the University of Manizales (Colombia), the Universitat Oberta de Catalunya (UOC) is hosting a project to create a low-cost surgery simulator—a much more accessible tool than those currently available, and which could be used to train both surgeons who are in the early stages of their career and those who are more experienced.

The project creates a 3-D virtual environment in which users can put their psychomotor skills to the test. But unlike real surgery, the operations carried out in the simulator consist of maneuvering within a series of geometric shapes. The program provides real-time feedback on the precision with which users carry out the movements and their overall performance in the exercises. Because "a [virtual environment](#) without metrics, feedback or validation is nothing more than a video game," explained Fernando Álvarez-López, a pediatric surgeon who has created this project as part of his doctoral degree in Education and ITC at the UOC together with the University of Manizales in Colombia and within the framework of the CYTED—RITMOS Network (Ibero-American Network of Mobile Technologies in Health [RITMOS]).

The advantage of this tool, according to its developers, would be its low cost and its accessibility. Many of the virtual reality environments implemented to date are very expensive and require complicated machinery to operate. The simulator developed by the UOC, on the other hand, may cost less than half the price of its competitors, putting

this technology within the reach of professionals from low- or middle-income countries.

Paradigm shift in learning

"This type of tool represents a [paradigm shift](#) in medicine," said Francesc Saigí-Rubió, a professor at the UOC's Faculty of Health Sciences, researcher at the I2TIC lab and co-creator of this project together with Marcelo Maina, professor at the Psychology and Education Sciences Department and researcher at the Edul@b group. "In surgery, you have to learn a series of movements, watch your time and follow protocols; in a way, like when you learn to drive. These simulators will allow surgeons to train from their office, or even from home, until they perfect their technique," added Álvarez.

The ability to perform very precise movements is one of the keys to success in minimally invasive surgery, performed using tiny surgical instruments inserted through small incisions made in the body. Patient recovery can be quicker and easier with this type of surgery, but considerable skill is required to ensure success. Hence the importance of creating environments in which surgeons can practice over and over again all the movements that must be performed for a successful operation.

The project's present and future

The tool has already been tested by 148 users: 100 undergraduates, 20 surgical residents and 28 experts. Among others, professionals from the Vall d'Hebron Hospital in Barcelona have taken part in these tests. The results of the study, published in the specialized open access journal JMIR Publications, endorse the tool's validity for improving surgeons' psychomotor skills at different stages in their career. It is equally useful

for those who are already familiar with virtual reality platforms and for those who have no prior experience.

The researchers are currently working to take this tool to hospital environments. The program's creators hope to develop a version that can be downloaded directly from the internet. Among other things, users will be able to adjust the level of difficulty to their profile and the needs of the time. In the future, it may even be possible to create a more enveloping experience through the use of virtual reality glasses.

"Technology is constantly moving forward, so we want to continue improving this project in line with the needs of the moment," concluded Álvarez.

More information: Fernando Alvarez-Lopez et al, Use of a Low-Cost Portable 3D Virtual Reality Simulator for Psychomotor Skill Training in Minimally Invasive Surgery: Task Metrics and Score Validity, *JMIR Serious Games* (2020). [DOI: 10.2196/19723](https://doi.org/10.2196/19723)

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