Mixed Reality in Surgery: Walk the Talk

Realidade Mista na Cirurgia: Da Palavra à Ação

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"When everything is digital, Health cannot be an exception".
André de Aragão Azevedo, 2022
Former Portuguese Secretary of State for Digital Transition

Artificial intelligence tools such as text-mining, voice-to-text, machine learning associated with technologies such as virtual, augmented, or mixed reality play an important role as collaborative tools and improve the experience of professionals and patients. These tools are both the future and the present.

Virtual reality (VR), augmented reality (AR) and mixed reality (MR) all have useful applications in the field of medicine. When it comes to using these spatial computing technologies intraoperatively, mixed reality has the greatest potential because it allows for interaction with both real and digital objects.

The COVID-19 pandemic in the "roaring 2020s" have propelled the world into the future of work, and organizations must innovate or be left behind. Mixed reality has graduated to the here and now and is successfully delivering critical value to organizations across sectors.For example, mixed reality was also a more than fundamental piece in the initial years of the COVID-19 pandemic in the United Kingdom, as it allowed the distance between doctors and people who needed health consultations and treatments. This tool made it possible to analyse exams only by gestures in places where there was no contamination by the coronavirus and without having to have contact and close conversations with other co-workers. As well as helping patients directly, medical educators can take advantage of mixed reality solutions to train up new doctors and some organizations use mixed-reality technology to create holographic simulations of medical scenarios and allow the transfer of the knowledge into actual clinical practice. Students learn how to examine, diagnose, and treat patients in a low-risk environment that is as close to real life as possible, but devoid of real-life consequences. Even patients would be able to scroll through their own preoperative scans to see how the doctor will approach their case to ease their minds about their treatment and thus reducing the normal anxiety that occurs before surgery.

But just a decade ago, the idea of incorporating spatial computing systems created primarily for gaming, like VR, AR and MR, into medicine seemed like a futuristic dream.

Today, these highly advanced tools for visualization are already in clinical use around the globe. They have a variety of uses, helping medical professionals with anything from teaching and training new clinicians to providing patients with a closer look at their diagnosis and treatment. MR was first mentioned in 1994 by Paul Milgram, and is a blend of physical and digital worlds, unlocking the links between human, computer, and environment interaction and allows clinicians to do something that was previously unthinkable: be in two places at once.

Recent research has shown that with the use of advanced technological solutions such as MR, the spaces of the operating rooms tend to decrease and the number of professionals present during a surgery too, improving the efficiency in the use of resources in a hospital, whether they are human, of space, or technicians and materials and offering surgeons new preoperative planning tools, and a means to collaborate and share expertise across the globe.

Some surgeons reported that their first experience with this type of technology came with game consoles and that led them to transport to the surgical scene and compare its use to the use by a pilot in command of an airplane. An airplane taking off is piloted on the visual and landing on the visual, flying in the visual with the flight instrument at your side, checking that you are at the correct speed, in the correct direction. Like we all know how to get home from work., but you can look at the GPS or the traffic app to see if there is a better route, so it is using mixed reality in a surgery in a simple procedure, assisting surgeons, so they do not risk making mistakes.

MR is used to increase precision in some procedures. Before and during surgery, using MR headsets, surgeons can access all patient data, such as pathology results and imaging exams in a 3D rendered environment (including cross images) representing the anatomical structures of a concrete patient, with the possibility of superimposing and allowing the precisely identification of the lungs, bones, soft tissues, heart, and blood vessels or tumours and cancers that must be removed, keeping the view over the patient and keeping the hands free to perform the procedure. Surgeons can also do surgical planning, or implant systems and remotely interact with colleagues. All these functions are achieved without compromising sterility and have been demonstrated successfully.Between January and February 2021, a consecutive case series of 13 orthopaedic surgeries were performed. These were performed by different surgical teams, 15 surgeons, across 13 different countries. The procedure types performed were predominantly joint replacement surgeries. Surgical teams used the HoloLens V2 MR headset system. Each team was able to visualize and perform operation using holograms, share a visual representation of the operation in real time, thanks to which they had the expertise of their colleagues at a distance on various clinical cases; train their colleagues at a distance, thus enriching their surgical practice. Audio-visual MR footage from each surgery was then edited and then shown to expert panels from multiple international centres over a 24-hour period. Detailed feedback was obtained from the surgical teams involved using an electronic questionnaire: The overall surgeon satisfaction with the MR headset technology platform used was 52.9% reporting being very satisfied, and 47.1% satisfied and 94.1% surgeons reported that they would continue to use the MR headset technology in their future clinical practice.[10]Several companies are currently developing applications, for MR assisted surgery, that enable clinicians to view and interact with patient data, even in the operating room. With the mapped out surgical plan overlaid onto the real patient, the surgeon could be precisely guided during surgery and leading thus minimally invasive surgery. When multiple experts join the session, even remotely, the surgeon has the advantage of immediate support for surgical decision-making.

The power of MR is very vast: streamline and accelerate processes (training an education), reduce errors, and rework and mitigate issue, ensure operation continuity, protect worker health and safety, better attract, hire, and retain employees and improve bottom-and top-line business results.

The future of MR in the hospital and specifically in the surgery field is endless with MR quickly gaining momentum. It is time to walk the talk.

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