Virtual reality helps reduce patient anxiety and need for sedatives during hand surgery

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As an anesthesiologist, Adeel Faruki, MD, MBA, works with patients to manage not just pain, but also anxiety. It can be a particular concern for patients receiving a nerve block, rather than sedation or general

anesthesia, for upper extremity procedures such as hand surgery.

"If a nerve block is done and blocks the nerves innervating the area a surgeon is working on, what we're generally managing intraoperatively is anxiety and hemodynamic changes," explains Faruki, an assistant professor of anesthesiology in the University of Colorado School of Medicine. "Patients may feel fear, they may feel claustrophobia, so we started asking how we can reduce the amount of sedative medications given intraoperatively for patients who receive nerve block for upper extremity surgery. We thought, 'Why don't we offer them a distraction?'"

This led to recently published research studying virtual reality (VR) immersion compared to monitored anesthesia care for hand surgery.

"As VR has continually grown into the medical sphere, we realized that immersive experiences through VR have the potential to benefit patients as much as the intraoperative treatments we currently use," Faruki says. "We decided to look at patient satisfaction in a pilot study comparing the two groups' experiences."

Virtual reality immersion during surgery

Faruki began this research as a resident at Beth Israel Deaconess Medical Center at Harvard Medical School, working with his faculty mentor Brian O'Gara, MD, who had an interest in reducing the associated effects of sedation with patients who may not need it to manage pain.

"We're realizing that a lot of the medications we're giving patients, the intraoperative sedation, are safe but can carry side-effects—dropping blood pressure, slowed breathing," Faruki says. "If VR can have a similar effect of managing patient anxiety without with the side effects associated with sedation, that's something we should be studying."

Faruki and his research partners randomized 40 participants who were having elective hand surgery into two groups, one receiving intraoperative monitored anesthesia care (MAC) and one using VR in addition to receiving MAC. They worked from a hypothesis that intraoperative VR use would reduce sedative dosing during elective hand surgery without detracting from patient satisfaction as compared to just MAC.

Participants in the VR group viewed immersive programming of their choice via a head-mounted display during surgery. As a primary outcome, Faruki and his co-researchers measured intraoperative dose of propofol, a common anesthetic, per hour. Secondary outcomes included patient-reported pain and anxiety, overall satisfaction, functional outcome, and post-anesthesia care unit (PACU) length of stay.

Possibilities for VR technology

Patients in the VR group received significantly less propofol per hour than the MAC control group. Though there were no significant differences between groups in overall satisfaction, PACU pain scores, or postoperative functional outcome, participants in the VR group had a significantly decreased PACU length of stay.

"A number of participants in the VR group stated that they were very aware but comfortable," Faruki says. "The beauty of this is, if you have an effective way to manage pain for a specific surgery, you can give patients VR headsets, get them in an immersive environment, and as long as the nerve block doesn't wear off, they can very comfortably endure surgery."

An additional benefit of VR applications during surgery is two-way communication with patients, Faruki says. "The VR screen allows you to send patients messages, so you could let them know how much longer

the procedure will take or ask how they're feeling," Faruki says. "The VR group also had a much higher amount of redosing of local anesthetic around the surgery site because they're awake and can communicate whether they're feeling any pain. Whenever your heavily sedate patients, you're often masking what you're managing, but with VR, the patients are fully awake."

Faruki notes that he and his research colleagues weren't studying pain reduction, but "whether you can maintain an adequate experience for patients with less intraoperative sedation." He adds that there is interest in replicating research done by O'Gara at Beth Israel Deaconess Medical Center, looking at the use of VR in joint repair surgery.

"We're looking to expanding the use of VR into more high-risk populations," Faruki says. "Patients receiving surgery for a broken hip, for example, may be older or have more health conditions and giving them sedation is much higher risk. If we can give them an adequate spinal dose of medication, yet keep them awake and comfortable and hanging out in an immersive environment, it creates an opportunity to reduce the risks associated with anesthesia."

There also is potential to study the use of VR in reducing patients' negative experiences in the surgical recovery unit, managing pain with non-pharmacological applications. "I really do foresee a lot of uses for VR technology in the future," Faruki says, "not to take away from the use of anesthesia, but to be a complementary treatment that benefits patients."

More information: Adeel A. Faruki et al, Virtual reality immersion compared to monitored anesthesia care for hand surgery: A randomized controlled trial, *PLOS ONE* (2022). DOI: 10.1371/journal.pone.0272030

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