

VR Eases Patient Anxiety in Diagnostic and Interventional Radiology

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Innovative applications of digital therapeutics are changing healthcare delivery in numerous ways, from streamlining provider diagnoses to improving patient care experiences. In the pediatric setting, virtual reality (VR) is being leveraged to make radiology procedures less daunting for patients, and, in some cases, reduce or altogether eliminate procedural sedation.

“There are use cases where the benefits [of VR] are profound. In IR [interventional radiology], a lot of the cases [create] this... level of stimulation that is sometimes more anxiety provoking than it is painful. ... You can get kids—and adults—through these procedures with just a good distraction technology like virtual reality,” says Samuel Rodriguez, MD, pediatric anesthesiologist at Stanford Children’s Hospital and clinical professor of anesthesia at Stanford School of Medicine in Palo Alto, California.

“The research has been clear that virtual reality technologies belong in the medical setting as a way to improve patient experiences by reducing pain and anxiety associated with procedural services,” says Joseph Miller, MD, MSHA, MS, CIRCC, associate professor of radiology, interventional radiology, at Children’s Hospital Los Angeles (CHLA).

Both California-based institutions are pioneering clinical programs that use VR before and during IR-based procedures to reduce sedation or, when feasible, completely replace it. The category III CPT codes for VR procedural dissociation (0771T-0774T), approved in 2023 by the American Medical Association, enable use of

“computer-generated VR audiovisual environments to modify a patient’s perception of pain.”

Building on VR’s existing applications in medical imaging modalities such as MRI, PET/CT, and radiography, this nonpharmacological intervention in IR offers new opportunities to improve patient care experiences.

Interventional-Specific Applications

At CHLA in the IR suite, VR is being used as an alternative to sedation in patients undergoing procedures such as lumbar puncture, tunneled catheter placement/removal, peripherally inserted central catheter placement, arthrography, thyroid fine needle aspiration, thoracentesis/paracentesis, and soft tissue fluid aspiration/biopsy, according to Dr Miller.

“We recognized that we had a significant population of patients who needed something more than simple anxiolysis, but less than general anesthesia, and [found] that virtual reality dissociation could fill that gap,” Dr Miller says.

For some sick patients who require lumbar punctures at Stanford Children’s, agrees Dr Rodriguez, VR offers a solid replacement for anesthesia.

Typically, “we use VR to avoid side effects from anesthesia,” such as nausea and vomiting, says Rodriguez. “Sometimes there are dangers of giving the anesthetic to very sick kids, so we [try to] spare them some of the risk by doing [the procedure] while awake, playing a video game with VR” as a distraction.

In the pediatric setting, VR is being leveraged to make radiology procedures less daunting for patients possibly reducing or eliminating procedural sedation.



Another example is anterior mediastinal mass biopsy owing to the risk of respiratory or cardiovascular collapse, Dr Rodriguez explains.

“The mass is in such a bad area ... the front part of the mediastinum ... that giving the sedation is dangerous—more dangerous than the procedure itself. In the past, we’d have to do it with the [child] totally awake getting needles stuck into their chest over and over,” he explains. “Now we have a situation where they can be playing a video game or watching a movie with a VR headset to relieve a lot of the anxiety and stress and some of the pain around having a procedure like that.”

Use of nontraditional, technology-based tools such as VR requires less preparation and results in faster recovery compared with pharmacological interventions. In cases where VR replaces sedation or general anesthesia, fasting is not required, and the families can usually leave the hospital soon after the procedure without the typical sedation side effects, such as drowsiness, dizziness, and confusion, that require a postprocedural monitoring unit and qualified personnel.

“The response has been very positive, and [soon], we’ll likely offer VR for higher-volume procedures such as simple sclerotherapies for venolymphatic malformations,” Dr Miller says. “It also frees up our anesthesia resources for other patients.”

Technology and Support

Stanford Children’s VR use extends beyond its IR suite, part of broader research under the Chariot Program—founded and co-directed by Dr Rodriguez—which applies technologies, including augmented reality, interactive video games, and VR to treat pediatric pain and stress. The program enables departments to call for VR consults and help successfully complete hospital procedures like blood draws or peripheral intravenous catheter insertions, as well as outpatient services such as physical therapy delivery. Interfacing with headsets, tablets, and projectors, Stanford Medicine’s custom-built VR software creates unique passthrough or completely immersive experiences.

“Our research assistants and coordinators work closely with physicians, child life specialists, radiology technologists, PTs, and volunteers They all give input [so we can] provide custom software to adapt to the needs of [various] clinical situations,” says Dr Rodriguez, who helps distribute the software at no cost to interested institutions through the organization Invincikids.

As with many new applications gaining clinical ground, philanthropy plays a role in VR’s wider adoption. At CHLA, the nonprofit Child’s Play

Global Research Updates on VR in Radiology

Researchers across the globe are studying the impact of VR on adult radiology patients. One study examines the benefits of using VR and 360° environments—utilizing 360° panoramic images and nonimmersive technology to provide patients with virtual access to medical facilities and information before coronary CT angiography (CCTA)—to quell anxiety.¹ It shows that visual familiarity and education enhance patients' preparedness and understanding of CCTA, improving their experience during the procedure.

"[The researchers] designed a novel, 360° virtual counselling environment for CCTA patients, which was well accepted...and reported to improve [the patient's] knowledge about the procedure, increase the patient's senses of security and self-efficacy, and reduce anxiety," the authors report.¹

A *Journal of Vascular and Interventional Radiology* study examined VR's effect on pain reduction during interventional radiology procedures.² Seeking an effective nonpharmacological method of sedation, Philadelphia-based researchers from Temple University Hospital and The Lewis Katz School of Medicine analyzed the analgesic and anxiolytic effects of a VR experience in the setting. They found that "digital sedation" yielded statistically significant reductions in anxiety, heart rate, and systolic blood pressure among participants, with no adverse effects.

Similarly, French researchers evaluated the tolerance and feasibility of using VR headsets with patients during interventional radiology procedures, finding that "the use of VR technology as a complement to traditional therapy for procedures under local anesthesia is feasible and safe in interventional radiology and can be beneficial for pain and anxiety management."³

Charity, which delivers therapeutic games and technology to pediatric hospitals, supported the creation of a dedicated VR technologist position to facilitate effective use of VR in clinical practice.

"Just as a clinician shouldn't have to split their attention between performing a procedure and personally administering medications VR dissociation has worked best for us when someone ... ensures the quality of the patient's VR experience," explains Dr Miller, noting the technologist works collaboratively with child life specialists. "It's not just a tablet playing a video to distract them. Like a sedation nurse, a VR tech monitors the patient and observes their interactions with the virtual world to make sure they are comfortable and dissociated."

At CHLA, VR technologist Phoenix Hunt, who has a BFA in immersive reality, tests the hardware and software and manages the patients' active use of the solutions based on user age, clinical procedure type, and level of anxiety to optimize VR's relaxing effects.

"It's critical to see firsthand what the patient experiences in the headset so I can anticipate [their] reactions and provide better care," says Hunt.

CHLA's IR department is working to establish clinical practice protocols internally before offering VR dissociation services to the wider hospital.

"It is a challenge ... to scale [it] beyond just a division within a hospital. Very few places have programs like ours that span multiple departments and specialties," Dr Rodriguez says.

"It's difficult to just buy a headset off the shelf and implement VR dissociation in your practice—not because of any lack in the technology, but because of a lack of experience in utilizing it in the various circumstances of a modern clinical practice," Dr Miller says.

"VR will not be a part of every medical procedure," he concludes. "But for the kinds of procedures that are most common in both diagnostic and interventional radiology practices, the clear benefits of this technology should ensure a healthy role for VR dissociation in the future."

References

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