

XR TECHNOLOGY AND HEALTHCARE

WHAT IS THE XR ASSOCIATION?

The XR Association promotes the dynamic growth of the XR industry. We convene and educate policymakers, thought leaders, researchers, developers, civil society, and the public on XR's infinite potential and serve as the premiere resource for anyone interested in learning about the applications of immersive technologies. Our members—Oculus from Facebook, Google, HTC VIVE, Microsoft, and Sony Interactive Entertainment—are united in our mission to champion the responsible development and thoughtful advancement of XR solutions that foster positive societal outcomes. Let us help you explore the endless potential of XR.

WHAT IS XR TECHNOLOGY?

XR is an umbrella term encompassing virtual, augmented, and mixed reality technology as well as other forms of alternate, expanded, or immersive reality applications, including those not yet invented.



Virtual Reality (VR)

VR replaces or occludes a user's reality with a new virtual reality. This new reality can be fantastical, like a faraway galaxy, or practical, like a training warehouse.



Augmented Reality (AR)

AR layers virtual content, such as digital objects or information, onto real-world images captured from a device's camera.



Mixed Reality (MR)

MR blends the digital and physical worlds, empowering users to interact with both in real time.

XR is changing the way we learn, do business, and provide essential human services. By delivering efficiencies in manufacturing, enhancing workplace safety, accelerating learning and job training, providing risk-free first responder training, improving healthcare and medical services, and providing rich experiences to individuals living with disabilities, XR is poised to become a part of daily life for users across the globe. XR is the technology of the future—today.

XR IS IMPROVING MEDICAL TRAINING AND PATIENT CARE

XR's use in healthcare is on the rise, from the operating room to medical classrooms, from pain management to mental health. Experts estimate the market for XR in healthcare could reach \$7B by 2026. The next page provides just a few examples of how XR is revolutionizing the medical field and improving people's lives. Learn even more about XR's impact on healthcare in [XRA's recent letter to the Department of Health and Human Services](#).

MEDICAL EDUCATION AND TRAINING



Medical Education

XR allows medical students to repeatedly practice techniques in life-like virtual environments. Students at UC San Francisco are using XR to practice [dynamically removing layers of tissue and organ systems](#) at no risk to patients. Relative to traditional cadaver-based training models, virtual environments simulate the movements and reactions of living patients, ultimately mitigating error and promoting superior health outcomes.



Surgical Training

VR offers [experiential surgical education](#), helping surgeons increase their skill level. A study from UCLA's David Geffen School of Medicine saw a 230% boost in overall performance in tibial intramedullary nailing, a procedure to repair a fractured tibia, among VR-trained surgeons relative to their traditionally trained counterparts.



Surgical Support

XR helps surgeons visualize organs, tumors, X-rays, and ultrasounds in real time and from multiple angles without diverting attention away from patients. [Surgeons at the Cleveland Clinic are using Microsoft's HoloLens](#) to layer virtual, three-dimensional projections of their patients' anatomies atop their bodies, improving efficiency and reducing procedure time.



COVID-19 Emergency Response

As the COVID-19 pandemic strains global healthcare resources and personnel, emerging [technologies like VR are helping fill training and experience gaps](#). More than 300 doctors at Los Angeles' Cedars-Sinai hospital have learned new skills, such as how to assess a patient's symptoms or perform CPR while wearing protective gear, through VR. Early clinical research suggests that VR training reduces performance errors and increases accuracy relative to conventional training approaches.

PATIENT CARE



Stroke Rehabilitation

VR systems have been designed to incorporate critical aspects of neuroscience and motor learning to [assist stroke survivors with motor recovery](#). Research indicates that VR systems trigger cortical activation, which promotes neuroplastic changes and thus functional improvement following a stroke.



Pain Management

Physicians and researchers are exploring the use of [virtual reality as a safe and sustainable alternative to opioids for pain management](#). VR influences patients' emotional states and attention paid to pain, and also helps to block pain signals from reaching the brain. One study of patients with neuropathic pain found a 69% reduction in pain during VR sessions and a 53% reduction immediately following.



Mental Health

VR is [helping military veterans suffering from post-traumatic stress disorder \(PTSD\)](#), particularly those who have not responded well to conventional treatment. In a recent therapist-guided study, veterans walked on a treadmill while interacting with images chosen to represent their traumatic experiences. Those who received VR treatment reported a 19% greater reduction in PTSD symptoms after 12 weeks relative to their counterparts.