Virtual Reality in Health Care

Educational Briefing for Non-IT Executives

Executive Summary

Although virtual reality (VR) is considered an emerging technology, it has been researched for decades for its ability to improve clinical training and education, interactive diagnostic imaging, pain management, psychiatric and behavioral treatment, and general patient health and wellness. Despite the evidence that demonstrates the potential medical efficacy of VR, most of this past research has been academic, and so this technology is not yet widely used in clinical settings. Historically, the high cost of VR systems has been a primary barrier for adoption. However, increasing computing power and the ubiquity of personal computers (PCs) and smartphones has brought a rapid decline in cost, which has made this technology accessible to a greater number of health care organizations.

What is VR?

Along the spectrum of mediated reality, there are two main categories: VR and augmented reality (AR). VR technology uses software to generate a three-dimensional (3D), computer-generated environment that is completely immersive to the user. VR allows users to experience a complete simulation of the real world, using a head-mounted display (HMD) and an input device, such as a controller or data glove, to interact with objects in the virtual world. VR aims to remove external stimuli, and so requires technology that can provide high-resolution images with seamless, natural interaction to replicate reality through our sense of sight, touch, and sound. The Oculus Rift and HTC Vive are examples of VR products.

The primary difference between AR and VR is the level of immersion. VR applications combine hardware, software, and sensory synchronicity in a way that achieves a sense of "presence" for the user, so that the subject feels like he or she is fully immersed in that digital environment. This is in contrast to AR, in which the user also interacts with computer-generated images, but as a supplement to his or her real environment (e.g., the Microsoft HoloLens).

Examples of VR Applications for Patient Care

Medical Education and Training	Medical Interventions	Behavioral and Mental Health	Health and Wellness
• Surgery planning (image-guided surgery) • Surgical simulation • Clinical skills training • Equipment training • Imaging visualization • Emergency planning • Telementoring • Social skills training • Virtual hospital tours	• Rehabilitation (stroke, brain injury, physical therapy) • Vision therapy (amblyopia, strabismus) • Pain management (acute, chronic) • Telemedicine (virtual doctors) • Phantom limb pain • Assessments (neuropsychological, diagnostics, activities of daily living)	• Addictions (alcohol, drugs) • Developmental and learning disabilities (autism, Asperger's syndrome) • Mental disorders (schizophrenia, attention deficit hyperactivity disorder, Alzheimer's disease) • Mood disorders (depression) • Eating disorders • Exposure therapy (post-traumatic stress disorder [PTSD], anxiety, phobias)	• Meditation • Fitness (diet, exercise) • Treating isolation • Stress management • Recreation • Virtual travel for the disabled • Counseling

Source: Health Care IT Advisor research and analysis.

What is the state of VR adoption in health care?

The bulk of existing VR research and development is academic, and focuses on controlled clinical applications with some private industry collaboration. VR has experienced a resurgence of interest in line with a new wave of low-cost, broadly available hardware options. Until recently, health care providers struggled to justify VR investment, particularly for solutions aimed at patients, primarily due to the expense and lack of demonstrated scalability.

The most traction VR historically has gained was as a training and education tool for clinicians and surgeons. Despite this strong health care foothold, providers and vendors now seek ways to optimize patient care with VR. These initiatives aim to build off existing research that addresses health outcomes related to rehabilitation, PTSD, pain management, and other medical conditions.

Why is it important?

Many VR solutions are still in pilot stages or serve distinct niches, but the medical field is ripe for innovation, and VR holds great potential to disrupt not only inpatient care, but also outpatient therapy and retail health. The ongoing developments in HMD products, and billions of dollars invested in the market by vendors such as Google and Facebook, have served as a catalyst for greater adoption in the future. As VR transitions from the academic research setting to the enterprise market, it can bring new revenues and cost savings. VR can significantly change treatment paradigms to benefit health systems, consumers, and a range of other health care stakeholders.

One of the primary determinants of VR's future success will be whether or not the technology can meet the "hype" or expectations of the users. Despite VR's potential, it is too early for it to become the standard for patient care. It will likely require another five to ten years for VR to reach peak adoption and become fully integrated with existing care models.

How does VR affect health care providers and IT leaders?

Operational benefits

- VR can reduce costs related to direct patient care, including decreased reliance on medications, particularly for pain management. VR also has the potential to reduce readmissions and shorten postoperative stays. The cost of VR hardware and software is often comparatively cheaper than an unreimbursed hospital stay.

Patient experience benefits

- VR can enhance the patient experience in terms of clinical outcomes, convenience, and in some cases, entertainment value. VR may also create improved access to care for geographically dispersed or underserved populations (e.g., virtual doctor consultations).

Questions That Hospital Executives Should Ask Themselves

1. Does our organization have the risk tolerance to act as an early adopter of this technology?
2. Do we have a VR champion to help build a business case for large-scale VR initiatives?
3. If we invest in VR, what are some potential high-priority use cases?

Additional Advisory Board research and support available

Report: Virtual Reality in Patient Care

Webconference: The Hospital of the Future

Source: Health Care IT Advisor research and analysis.