



A Survey of Augmented Reality/Virtual Reality Interest in Medical Settings

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Abstract

AR and VR technologies are becoming widely used in several fields, including medicine. As this technology has become more accessible, powerful, and cheap, the potential exists for AR/VR to play a larger role in the future of medicine. While some studies have been conducted to assess how using these technologies in a surgical setting can prove beneficial to patients, physicians, and healthcare centers, there is little data concerning the level of interest, and the factors that modulate that interest in using AR/VR in medicine.

Previously, AR/VR has been used in 3 major areas in medicine: training, surgical planning, and surgical navigation. In training, users can simulate procedures repeatedly in a virtual environment with little cost or risk [1,2]. In preoperative planning, surgeons can use 3D renderings of patient anatomy to familiarize themselves with the unique challenges of their patients, potentially more so than with traditional imaging [3]. Finally, in surgical navigation, augmented reality (primarily) is used to overlay pertinent information in a surgeon's field of view that could contain imaging, comments from colleagues watching a live-stream, or any number of tailored items to improve the surgical experience [3,4].

Among studies that have a component analyzing general interest in AR/VR, we have seen promising results. In one such study over 90% of participants surveyed in an education setting reported that the integration of this technology into medical practice and curricula was valuable [1]. Another noted a consensus among its subjects praising AR/VR for its realism, haptics (physical feedback from the virtual system intended to reflect actual stimuli), and potential use as a training tool [2,6].

However, few studies have been published that provide deeper insight into clinical interest in using these technologies, particularly how various dimensions of the experience can influence perceptions. If there is a benefit to be gained from using AR/VR in medical practice, it is in the best interest of the field to understand how to further increase awareness, and approachability of these technologies so that benefit can be shared with patients. This study will assess the validity of certain survey topics and questions in evaluating user experience [7]. As with some of these other studies, the survey will evaluate this technology comparatively with more traditional methods (i.e., 2D and 3D imaging presented on a computer screen) [8] Questions in this study will be informed by the Technology Acceptance model (TAM), which argues that intention to use a new tool or device is correlated to perceived usefulness and ease of use [9].

Other novel areas of this study include gathering professional factors related to the use of AR/VR by care providers. Factors such as age, profession, and expected uses in practice will help bridge a gap in literature and point towards information or messaging differences regarding this technology across populations.



Image Source: <https://visualise.com/virtual-reality/virtual-reality-healthcare>

Background – What is AR, What is VR?

AR, or Augmented Reality involves the use of a headset that overlays information on top of the real world. User interaction with this can be largely passive, where they only read information, but the use of controllers or verbal commands can allow for the changing of information seen by the user.

VR or Virtual reality uses a headset to show an image of a virtual or recreated world to the user. This means that any view of the real world comes indirectly through camera feed that may be mounted on the headset itself or elsewhere. Interaction with VR is usually required, and generally involves the use of controllers to manipulate 3D objects



Image Source: <https://utswmed.org/medblog/shoulder-replacement-virtual-reality-texas/>

Aims and Hypothesis

1) To examine the level, specialties, and interest in AR/VR imaging modalities for clinical use in physicians and allied health professional practice.

2) To investigate other specific ideas subjects hold regarding AR/VR technology and collect a comprehensive sample of clinical practitioner input to integrating this technology in future practice.

Hypothesis: Augmented Reality/Virtual Reality (AR/VR) interest will be inversely related to the number of years that a health professional has been practicing.

Outcome measures

Outcome measures will be based on comparison of the survey data from medical professional participants at UCHHealth. Primary outcome measures in this study will be survey responses, with emphasis on whether the subject is interested in integrating AR/VR technology in their future practice. Other survey results will assess general demographic information, as well as other responses that characterize opinions on multiple facets of AR/VR use in medical practice.

Study Design

Study participants will be identified and consented during their working hours at a UCHHealth, or affiliate, facility. Once consented, participants will be invited to complete the online survey via REDCap. REDCap is a 21 CFR Part-11 ready platform. Participants will be able to access the survey on an electronic device, watch the accompanying demo videos for AR/VR technology, and then complete the provided questions. No further participation is required after submission of the survey, but participants will have the option to provide information that can be used to identify them for a future study examining AR/VR use.

Population

Populations to be enrolled in this study focus on medical professionals or allied health providers who perform professional services within a UCHHealth, or affiliate, facility. UCHHealth boasts nearly 6,000 specialists from which the sample will be derived [10]. A sample size of 600 participants is set to provide a 10% sample of the total target population and allow for the exploratory nature of this study.

Inclusion Criteria:

- 18 years or older
- UCHHealth, or affiliate, employee
- Provider of services within a UCHHealth, or affiliate, facility.

Exclusion Criteria:

People under the age of 18, as well as people who do not fit the above inclusion criteria will be excluded from the study.

Survey

Demographic/professional Data collected:

- Profession (MD, DO, NP, PA, other)
- Service line/specialty
- Years practicing
- Years in current role
- Demographics: Age, sex, race/ethnicity,

VR/AR Experience, Likert Scale Evaluations:

- Level of experience with technology
- Level of distraction from the display
- Ability to manipulate scans
- Comparison of detail to traditional 2D imaging
- Hardware ease of use
- Software ease of use
- Confidence in ability to learn the system
- Practicality of the system
- Interest in using AR/VR in practice
- Benefits in practice compared to traditional imaging
- Area of interest for integrating AR/VR into practice



Open response questions:

- How you would expect AR/VR to change clinical practice
- Resources or assistance needed to integrate this technology in practice
- Greatest deterrent in using this technology in practice

Next Steps

At this time, data collection is still in progress. When complete, data collection will involve:

Quantitative analyses:

- Demographic data will be reported as the mean, standard deviation, and 95% confidence interval for continuous variables (e.g. age, years of medical experience, etc.)
- Likert scale questions will be reported as a percent total response for each scale value with the median and interquartile range used to indicate distribution of the response.

Qualitative analyses:

- Word categories will be generated from the free response questions to identify common themes in survey response; percent respondent agreement will be reported to quantify word category occurrence.

Following completion of the study, a secondary study will be launched seeking to analyze patient outcomes in the setting of AR/VR use in surgery

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