



# Transforming the Healthcare Simulation Spectrum: Now, Next and Beyond

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## The use of virtual reality software Holoeyes in the teaching of vertebroplasty: A post user experience survey



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### Objective

Virtual reality (VR) is an innovative educational resource to help learners gain practical understanding of anatomy and procedures.

In recent years, the use of VR technology in spine medicine has become increasingly popular with technological advancements and an increased volume of minimally-invasive procedures. Studies have shown that the use of 3D holograms outperforms traditional training methods. It promotes faster understanding of relevant anatomy and surgical skills, accelerates learning, and contributes to accurate, safe procedures with better patient satisfaction.

In this study, vertebroplasty teaching was performed through a holographic spine model displayed in a virtual environment. The objective of this study is to evaluate the perception, acceptance and feasibility of VR simulation in teaching spine anatomy and its application to vertebroplasty in our local context.

### Materials and Methods

Images of a plastic spine model were reconstructed from human digital imaging and communications in medicine (DICOM) computed tomography imaging into 3D VR formats using the Holoeyes software, compatible with the Oculus Meta Quest VR system, a head mounted display with tracking capabilities for an immersive VR experience.

The participants were taught the use of the virtual reality software application, anatomy and the clinically relevant anatomy as applied to vertebroplasty.

Participants would then respond through a structured assessment form.



### Results

Five consultants, two junior doctors and four medical students participated in this study with feedback received from all. 63.3% of participants have heard of VR use in medical training but only 36% have experienced VR as part of their training.

Eighty-two percent of participants strongly agree this was an enjoyable training method. 90.9% and 100% of participants agree on the feasibility of the device use in a clinical and education setting respectively. A 71% majority felt their skills or workflow could be improved using this training system, and the remaining 29% neither agreed nor disagreed. Qualitative feedback included the novelty of the training system, potential to ignite interest in learning but also weakness such as having to adapt to the software.

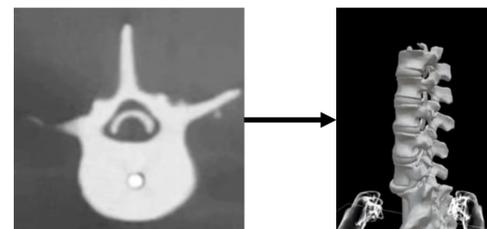
### Discussion

The survey results were overwhelmingly positive, showing a high degree of acceptance and feasibility of integrating this technology in our local context.

Through this short evaluation, there is a proof-of-concept that benefits both the trainer and trainee and could expect to see continued uptake and assessment of VR training systems in the near future. More experienced operators may also find benefits in pre-procedural simulation using this system, especially in cases with more complex anatomy.

Important to note that this study has two key limitations, namely the lack of outcome measures to demonstrate the actual effectiveness of the training system, and a small sample size. There were also some suggestions for improvement made by participants, including the removal of glitches, better resolution, multiplayer functions and making the headset lighter to allow extended usage.

Going beyond the VR system used in this study, the Holoeyes software is also compatible with an Augmented reality (AR) device called the HoloLens, which allows for a mixed reality application of the same software. The potential utility of this concept would be to pave the way towards AR-guided vertebroplasty enabling operators to gain access more efficiently and safely. Fusion trials to prove this concept are underway, and it is exciting to anticipate further findings in this area.



### Conclusion

The study demonstrated the acceptability and feasibility of virtual reality training amongst medical students and doctors in understanding vertebroplasty and its relevant clinical anatomy.

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