PATIENT SPECIFIC TRAINING: DEVELOPMENT OF A CT-BASED MIXED REALITY FIBREOPTIC INTUBATION SIMULATOR

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Background: Fibreoptic intubation training has traditionally been performed using real fibreoptic scopes and manikins or improvised airway 'boxes', recently progressing to virtual reality training devices [1]. The latter are populated with computer generated images, represented 2 dimensionally on screens without depth perception and fail to reproduce the natural variation. We aimed to address these issues by producing a simulator that utilises a real patient's anatomy, in a mixed reality platform, without the need for additional hardware.

Methods: Health Research Authority Ethics approval was obtained. A digital imaging and communications in medicine (DICOM) file from an anonymised CT scan of a patient's head and neck, was processed in Avizo data visualisation software. It was segmented into anatomical structures and 2 tissue densities (bone/cartilage and soft tissue). This was imported into the Unity game engine as a 3D model. A fibreoptic scope with functional eye piece, monitor (to display the virtual fibreoptic scope image) and reference plane were also modelled. These objects were placed into a scene using the Windows Mixed Reality Toolkit to allow component interaction and support the application to a Hololens 2 mixed reality headset. Azure anchors were used to site the simulation in a real-world location and allow consistent position between use sessions (Figure 1). The gesture recognition function of Hololens was used to enable grasping and manipulation of the fibreoptic scope controller and voice commands were also enable for key actions. Its use was piloted by the developing team.

Figure 1: Mixed reality fibreoptic intubation simulator, Hololens views

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Results: Using a DICOM file creates a detailed an anatomically accurate image, though it lacks surface characteristics (texture/colour variation) that make features appear natural. The virtual monitor is an interesting psychological construct, being a virtual view from within a virtual world. However, this performed well, with sufficient frame rate and resolution to feel natural. The physics of a flexible scope proved challenging, so we modelled this as a rigid structure for proof of concept. We also noted that the inclusion of collision avoidance would increase usability and realism.

Conclusion: There is a deliverable workflow from CT scan to mixed reality training. If refined this could be used to prepare for airway management in specific patients e.g. airway cancer [2]. Automating the DICOM import process would give access to the wealth of clinical variation available through existing CT databases and support a broader/higher level training experience.

REFERENCES

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PAEDIATRIC IN-SYNC – INTERPROFESSIONAL SIMULATION NURTURING COLLABORATION

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Background: There is international agreement that undergraduate healthcare students should be prepared for practice by experiencing Interprofessional Education (IPE) [1]. As a result, in the last decade IPE has become established in the curriculum of undergraduate health and social care education. Simulation-Based Education (SBE) provides an immersive, authentic experience to explore teamwork for undergraduate healthcare students.

Methods: A paediatric SBE course was developed for undergraduate physiotherapy (PT), medical (M), and children specialty nursing students (CN) with intended learning outcomes focussed on teamwork. During the course, three participants (one from each discipline) worked collaboratively to address the needs of a simulated patient. One scenario focussed on recognition and management of an unwell child and the other scenario was discharge planning. Following the scenario, interprofessional faculty co-facilitated a structured debriefing using the Plus/Delta model. The course was evaluated using the 'Readiness for Interprofessional Learning Scale' (RIPLS) [2]. The RIPLS scale measures attitudes to learning with other professionals on a five-point Likert scale. In order to gather additional qualitative data, the RIPLS was adapted to include free text questions. Statistical analysis of the pre- and post-course RIPLS was conducted using SSPS and thematic analysis was used to analyse the free text comments. The qualitative analysis is reported here.

Findings: Thirty-three students have participated to date (12 PT, 13 M, 8 CN). The four subscales of RIPLS were used as a framework for the thematic analysis. Most of the students described valuing the collaboration and teamwork during