

# **Innovative Virtual and Augments Simulations for Medical Education**

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## **Background**

The undergraduate medical curriculum relies on students learning a range of essential clinical skills that they will need to put into practise when they become qualified doctors. Many of the skills can be difficult to master and are currently learnt from either textbooks or from tutoring by doctors. Neither approach is ideal because 1) text-based approaches do not reflect the practical nature of the clinical skills and 2) the time that the clinicians have available to them to instruct the students is limited. Therefore, computer-based simulations are playing an increasingly important role in medical education and training.

This project will build upon the existing work of Dr Wilson (Wilson et al., 2017a; Wilson et al., 2017b; Wilson et al., 2018) looking to further develop important computer simulations to support clinical training. The computer-based simulations will be based around augmented, virtual reality and / or serious games to teach undergraduate medical students a range of essential clinical skills. They will be evaluated in the target population for their efficacy, usability and user experience.

The potential candidate would be expected to be familiar with programming computer games technology, virtual and augmented reality as well as game based learning.

## **Motivation**

This research work is unique in that few institutes are working in developing low cost and easy to use clinical simulations. Many organisations focus on surgery or anatomy training which has market saturation. Dr Wilson and Professor Carruthers are working on clinically important but niche applications that few have considered. The collaboration between our two institutions means that we have access to both the relevant clinical information; advice from world leading clinical experts and a population of medical students to help evaluate the products with.

## **Proposed research**

The projects will be conducted in collaboration with the clinical skills centre at Sandwell and West Birmingham Hospitals NHS Trust (SWBHNHS). It will build upon existing research collaborations with that trust which has already seen the successful development of several computer-based clinical simulations including a virtual reality ophthalmology trainer for trainee doctors, a similar system for training midwifery students, an augmented reality app to help medical students visualise knee pathologies and a virtual reality systems for teaching both doctors and nurses how to diagnose and manage sepsis in a hospital setting.

The research will not only focus on developing computer-based simulations but will use a socio-technical approach to identifying best practices for the development of such software in clinical settings. Both clinical and computer science disciplines have their preferred ways of evaluating their practices. However neither is ideal. Clinical sciences prefer randomised controlled trails (their gold standard) but this is a time consuming process and requires access to many volunteers. Computer science has usability studies, models of acceptance and behavioural intention to use, but these are not always considered viable and credible markers of success by the clinicians therefore compromised approaches that are agile and acceptable need to be defined too.

The research will also involve working with Birmingham City University's Research, Innovation and Enterprise group with a view to looking at how to monetise the outcomes of the research.

### **Potential impact**

The initial research work by Dr Wilson ((Wilson et al., 2017a; Wilson et al., 2017b; Wilson et al., 2018) is already forming the basis of a REF2021 UoA 11 Computer Science and Informatics impact case study. This research will build upon that extending the research base for subsequent REFs. The computer-based systems are in use in the University of Birmingham's medical school and SWBHNHS Trust. We have demonstrate international interest in the apps with a '*lite*' version of our VR ophthalmology app on Google play which has 1300+ downloads with approximately 130 each month.

1. Developing a pipeline for important clinical simulations.
2. Working world leading clinical experts with access to important and not easily available clinical information / data.
3. Looking at the commercial viability of the interventions being created, building on the existing work between Dr Wilson and Mr Assim Ishaque (RIE).
4. Creating cases studies for relevant courses.
5. More undergraduate and postgraduate projects based upon the development of proof of concepts for further candidate computer-based simulations.
6. Generation the potential for future bids, especially providing the collaborations this project can bring.

### **References**

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