REAL-TIME INTERACTIVE 3D SIMULATION OF TEMPORARY CARDIAC PACING

Vassilios Hurmusiadis, BENG, MA, DPhil

Background: In response to the COVID19 pandemic the UK NHS confirmed that more than 4,000 retired healthcare workers had signed up to help battle the outbreak. At the same time large numbers of doctors and nurses of all specialties were being diverted to Intensive Care Unit (ICU) management. Evidently there was a sharp increase in demand for rapid clinical training. Temporary Cardiac Pacing (TCP) is one of the critical interventions in ICU patients with acute respiratory distress syndrome. It is an intervention that helps the heartbeat get back to normal rhythm. Traditionally training for TCP takes place on the patient.

Objective: In order to address the increased need for rapid training, we set out to adapt our heart simulator for ICU procedure training and provide a simulation-bases eTraining solution for TCP.

Methods: We developed an application for TCP eTraining, accessible on tablets and smart phones. The app is based on our validated electromechanical simulation model of the heart and realtime interactive 3D simulation technology. The app content consists of a virtual heart in various arrhythmic states. A simulated interactive pacemaker is connected to the heart model and is capable of generating realtime changes in pacing location, rate, voltage, sensitivity and mode. Real-time ECG signals are being recorded on the virtual heart and are used to monitor the effect of the pacemaker. Self-study tutorials introduce the procedure and tests allow trainees to assess their learning outcomes.

Results: The app has received CPD accreditation in the UK and has so far been used at the University of Oxford, University of Leeds and Middlesex University. All trainees, medical students and trainee nurses followed the self-study tutorials and took the MCQ and interactive test which are embedded within the TCP app. Development was based on Unity 3D and was made available on iOS, Android, macOS, Windows and WebGL platforms.

Conclusion: This project allowed us to meet an urgent training need and at the same time expand our expertise and market scope into clinical training. The impact on clinical training was high and the societal benefit came from better and quicker trained staff. The project was funded by an Innovate UK grant.

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TRICUSPID VALVE ADVERSE EVENTS DURING LEADLESS PACEMAKER IMPLANTATION

Robert G. Hauser, BS, MD, CCS, FHRAS, CCDS;
Jay D. Sengupta, MD, FHRAS, and Susan Casey RN