

Advanced external pacing workshop

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Patient simulation currently requires expensive equipment and software. This puts simulation beyond those hospitals without the necessary resources, especially outside the first world. Additionally a need to book simulation time and be in proximity to equipment means that organising simulation teaching at short notice is difficult. Simulation as a tool for temporary external pacing is currently not available.

A new method of generating ECG complexes at runtime using a multiple sine wave composition algorithm was devised in an attempt to improve waveform and rhythm transition fidelity. This method was placed within an interactive electrical model of the heart with support for atrial and ventricular pacing. A lumped-compartment physiological model was attached to the heart model to allow display of arterial, central venous, and pulmonary artery pressures in real time. Baroreceptor functions allow autonomic feedback to both models. A mechanical model of the heart was devised in order to quantify the effects of atrial or ventricular dyssynchrony. Experimental data [1,2] was used to calibrate the behaviour of the model to increase accuracy in response to stress, (e.g. haemorrhage or anaesthesia).

The simulation exists in three software formats, Flash, iOS and Java. The simulation can run in a client-control ad hoc networked simulation, or as a stand-alone single user learning package. We are currently evaluating the

embedding this model into manikins to enhance traditional immersive simulation training, especially within the context of cardiothoracic training.

We have successfully conducted multi-user simulations over short distances (same room) and long distances (transcontinental with the Australian Association of Anaesthetists). We have used the single user programme to train nurses and junior anaesthetists in a cardiac intensive care unit.

We present this mechanism for model driven pacing teaching simulation at EACTA and invite candidates to join the workshop. We will try to cover the majority of pacing problems the clinician is likely to encounter in the perioperative phase and encourage candidates to solve these using the interactive model.

References

1. Pestel GJ, Fukui K, Kmberger O et al. J Surg Res 2008 (10.1016/j.jss.2008.11.002)
2. Clancy M, Alderman J, Cavallero N, Taylor K. J Accid Emerg Med 1996; 13: 316-320

Declarations

The program has commercial value and is currently being developed for the downloadable app market.

The Medtronic 5388 temporary pacing box available within the program is used with permission by Medtronic.