Motion analysis during the use of a public access defibrillator: Can motion from an untrained user cause inappropriate shocks?

Hannah Torney, Peter O’Hare, Rebecca Funston, Dewar Finlay, Justin Magee, Raymond Bond

1 Ulster University, Co. Antrim, UK
2 HeartSine Technologies Ltd., Co. Antrim, UK

Introduction: Many modern public access defibrillators (PADs) are fully-automated, removing the need to press a button to deliver a shock. This reduces the number of tasks to be performed, and therefore the potential for error. However, these devices have the additional risk that the user may touch the patient during shock delivery.

This study was divided into two parts. Part 1: A retrospective analysis of motion in post-market events. Part 2: A usability study of a fully-automated PAD.

Methods:
Part 1: Data, consisting of ECG and ICG traces and demographic information, was returned by customers when the defibrillator was used. Traces were analysed for motion during the analysis phase of the algorithm.
Part 2: Randomly selected lay-users (n = 109) were instructed to enter a room, where they found a simulated cardiac arrest patient (manikin) and a fully-automated PAD. The participant was expected to power on the device, place electrodes, deliver a shock, and perform CPR.

Results:
Part 1: Of the 1532 events reviewed, 371 (24.2%) had motion in the ECG/ICG traces. Motion in the form of chest compressions caused an inappropriate shock in one case (0.06%).
Part 2: Participant ages ranged from 15 to 83 years. A total of 48 (44.0%) participants had CPR training, and 7 (6.4%) had defibrillation training.

All participants successfully powered on the defibrillator and delivered a shock. Electrode placement was acceptable for 98 participants (89.9%). Median time to deliver a shock was 70 s, 95% CI 69.0 s, 74.0 s. One participant (0.9%) touched the manikin during shock delivery.

Conclusion: Although motion was visible in approximately a
quarter of the post-market traces, the likelihood of inappropriate shock is low (0.06%). The findings of the usability study indicate that the fully-automated defibrillator can be used safely and effectively by a large sample of the intended users.