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# Resuscitation

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## Letter to the Editor

# Increasing cardiac arrest survivor access to advanced neuromonitoring and neuroprognostication, as recommended in international guidelines — A pilot study



Sir,

One-third of out-of-hospital cardiac arrest (OHCA) patients that remain comatose after return of spontaneous circulation experience seizures, which may not be obvious upon clinical examination. The European Resuscitation Council and American Heart Association recommend using continuous or intermittent electroencephalography (EEG) to detect non-convulsive seizures in OHCA patients.<sup>1,2</sup> This is particularly important when patients are sedated and paralysed, further complicating clinical detection of seizure activity. Guidelines also recommend that electrophysiology studies such as EEG and somatosensory evoke potentials (SSEP) be used for neuroprognostication alongside serial clinical examination, biomarkers and brain imaging in a multimodal manner.<sup>1</sup>

Despite these guidelines, utilization of EEG in Intensive Care Units (ICUs) remains poor; only 1% of OHCA patients in the USA between 2006 and 2012 received an EEG during their inpatient stay.<sup>3</sup> Whilst utilization in Europe is higher, it is still sub-optimal; a 2013 study in Denmark showed 32% of OHCA patients received an EEG and 14% a SSEP.<sup>4</sup> There are clearly barriers to accessing neurophysiology services, especially in cardiac arrest centres lacking specialised departments.

Given the underutilisation of guideline-recommended neuroprognostication tools, we aimed to test the feasibility and safety of setting up a neurophysiology service in a cardiac arrest centre ICU with no on-site neurophysiology department. Two Senior ICU staff members were trained in EEG/SSEP acquisition over a four-month period, by experts from external neurophysiology departments, with a focus on identification and correction of artefact. EEG/SSEP equipment was purchased using a research grant and the ICU was visited by a neurophysiologist to assist with setting up the most appropriate recording method.

25 OHCA patients were enrolled in a single centre study within the THAW trial protocol (NCT03065946), and 6 EEGs and SSEPs per patient were performed over a 72-hour period from admission. Data were then sent securely and electronically to an off-site neurophysiologist for interpretation, along with relevant clinical details. The neurophysiologist was asked to give feedback on the interpretability of

the EEG and SSEP, taking into account electrical artefact, impedance, length, and stimulation procedures.

Of the 104 EEG and 102 SSEP performed, 97% and 90% respectively were deemed good quality. All were recorded without affecting nursing care, and 100% of patients in the study had at least 1 high quality EEG and SSEP during their time on the ICU. The primary reason for reduced quality of EEG and SSEP were artefacts, either external (caused by ventilation, bed vibration or inappropriate placement) or internal (caused by patient movement, most frequently shivering). In practice, even with experienced neurophysiologists, artefacts cannot always be avoided, particularly with complex ICU patients.<sup>5</sup>

These results suggest that with expert training it is feasible for an ICU department within a cardiac arrest centre to set up a neurophysiology service without compromising patient safety, supported by offsite experts for interpretation. This would allow for earlier detection of seizure activity and use of neurophysiology as part of a multimodal approach to neuroprognostication, resulting in better compliance with European and American guidelines for post-cardiac arrest treatment.

## Conflicts of interest

None.

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