**METHODS**

**Setting and participants**

All subjects were enrolled after admission to the UIHC or an emergency room visit. Because the study included patients with delirium, not all subjects had the capacity to consent. We determined whether patients were able to consent to participate at the time of enrollment. Subjects with the capacity to consent did so themselves; however, when subjects were not able to consent, their legally authorized representative provided signed approval on their behalf.

**Clinical data collection and case definition**

Chart reviews and interviews were conducted to procure medical history and demographic characteristics. Clinical assessment for delirium was conducted up to twice a day during the follow-up period and was determined by scores obtained with the Confusion Assessment Method for Intensive Care Unit (CAM-ICU), the Delirium Rating Scale-Revised-98 (DRS-R-98), and the Delirium Observation Screening Score (DOSS). We defined a delirium status by a CAM-ICU positive, DRS-R-98 score ≥18, or DOSS score ≥3. Clinical scores were measured up to twice a day during each subject’s hospital stay. Clinical documentation of delirium was also grounds for defining a positive case of delirium. We considered subjects as delirious if they had met our delirium criteria during their follow-up period.

**BSEEG data collection and score calculation**

Raw EEG data were exported in European Data Format for further analysis. We extracted EEG data and subsequently filtered for excessive noise. Several filtering strategies were applied as EEG are prone to artifact signals, such as those caused by facial muscle activities, eye blinks, simple body movements, and surrounding electronics. First, signal windowing was then performed, whereby each channel of data was extracted and each channel was subsequently divided into 4-second windows. Then, Low-pass and high-pass band filtering were applied for raw EEG signals to obtain signals between 0.5 and 20 Hz. Additional artifact removal was done to avoid noise, such as signals from the echocardiogram. We limited downstream analysis only for EEG signals with data over 60 seconds suitable for our algorithm. We applied our previoiusly developed algorithm of BSEEG to EEG signals obtained from the forehead of the study participants. The power spectral density of the remaining partitioned signals were obtained via fast Fourier transformation. The BSEEG score was calculated as a power ratio between low frequency (3 Hz) to high frequency (10 Hz) as described previously (BSEEG score = 3 Hz frequency/10 Hz frequency). These power ratios were calculated for every 4-second window segment, and BSEEG values from each window over the total recording time were averaged to provide the final BSEEG score. In addition, the standard deviations (SDs) of variability of each BSEEG score from those multiple window segments were calculated to show the level of fluctuation in those scores.