

Bispectral EEG to Predict Delirium After Spine Fracture In Older Adults

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INTRODUCTION: Delirium is a frequent and serious complication among older patients with spine fracture. Negative consequences of delirium such as medical complications, prolonged skilled nursing facility admission, and mortality can be mitigated with early detection. Screening questionnaires to detect delirium are available; however, their effectiveness declines when implemented in busy hospital workflows. Bispectral electroencephalography (BSEEG) is an objective point-of-care test previously validated to detect onset of delirium in older hospitalized adults. Its simplified 2-measurement-lead placement and rapid, hands-off measurement make it an attractive alternative to traditional questionnaire-based methods. The aim of this study is to evaluate the effectiveness of BSEEG as a delirium screening tool for older adults with spine fracture. We hypothesize that the BSEEG can effectively predict delirium in this population.

METHODS: Patients over 50 years with spine fracture were prospectively enrolled from University of Iowa Hospitals & Clinics. Patients were excluded if they were non-English speaking, had an active psychotic disorder, or were on a ventilator. Baseline demographics were recorded including age, sex, and Charlson Comorbidity Index. Baseline cognitive function was measured using the Mini-Mental State Examinations (MMSE). Delirium was assessed clinically using the 3-Minute Diagnostic Interview for Confusion Assessment Method (3D-CAM) twice daily. BSEEG measurements were collected twice daily for up to 6 days of hospital admission and compared to a previously established power spectral density ratio threshold to determine a binary delirium prediction. Statistics were executed with GraphPad. This study was approved by IRB.

RESULTS SECTION: 18 subjects were enrolled in the study. The subject demographics are as follows: 44% female, age 73.4 ± 11.6 , and 100% white/non-Hispanic. 5/18 subjects (33%) experienced delirium. Nutritional status and baseline cognition are not significantly different for patients who did and did not experience delirium. The following preliminary performance metrics were determined for the device: sensitivity = 0.21, specificity = 0.5, positive predictive value = 0.60, and negative predictive value = 0.15.

DISCUSSION: Results are limited by sample size and pending enrollment of 49 subjects for sufficient power. Preliminary results do not support the conclusion that BSEEG is an effective method of predicting delirium in older adults with spine fracture. Ongoing enrollment is needed to determine if BSEEG can effectively detect delirium for this population.

SIGNIFICANCE/CLINICAL RELEVANCE: If effective, bispectral encephalography would provide a simple, novel, and objective screening tool for delirium in patients with spinal fracture. Effectively identifying patients at risk for delirium would allow the healthcare team to prevent negative effects such as medical complications, extended admission, and skilled care after discharge for older adults with spinal fracture.

IMAGES AND TABLES:

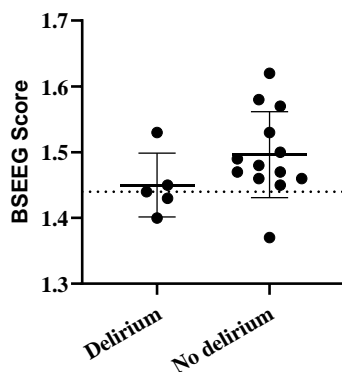


Figure 1: **Bispectral EEG delirium prediction.** Subjects had delirium if they scored positive on the 3D-CAM screening questionnaire during the study. BSEEG score is the maximum BSEEG score recorded during study. A BSEEG score greater than or equal to 1.44 is considered at risk for delirium.

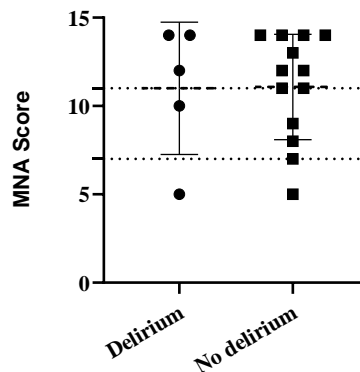


Figure 2: **Nutritional Assessment.** Nutritional status is assessed with the Mini Nutritional Assessment: normal nutritional status (12-14); at risk of malnutrition (8-11); malnourished (0-7). Subjects who experienced delirium during the study did not have significantly different nutritional statuses than those who did not.

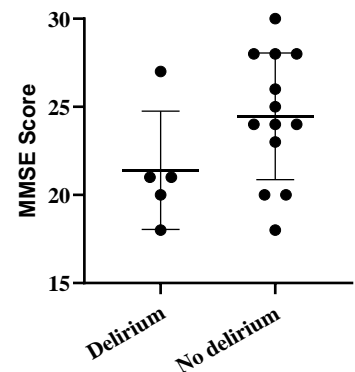


Figure 3: **Baseline cognition.** Baseline cognition was assessed with the Mini Mental Status exam with the highest possible score of 30. Subjects who experienced delirium during the study did not have significantly different baseline cognition than those who did not.