



# Mortality among patients with sepsis associated with a bispectral electroencephalography (BSEEG) score



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## INTRODUCTION

- Background:** Many studies have reported largely positive associations between EEG change and sepsis-associated encephalopathy (SAE).
- Goal:** We have previously developed a bispectral electroencephalography (BSEEG) device, which was shown to be effective in detecting delirium and predicting patient outcomes. In this study we aimed to apply the BSEEG approach for sepsis.

## METHODS

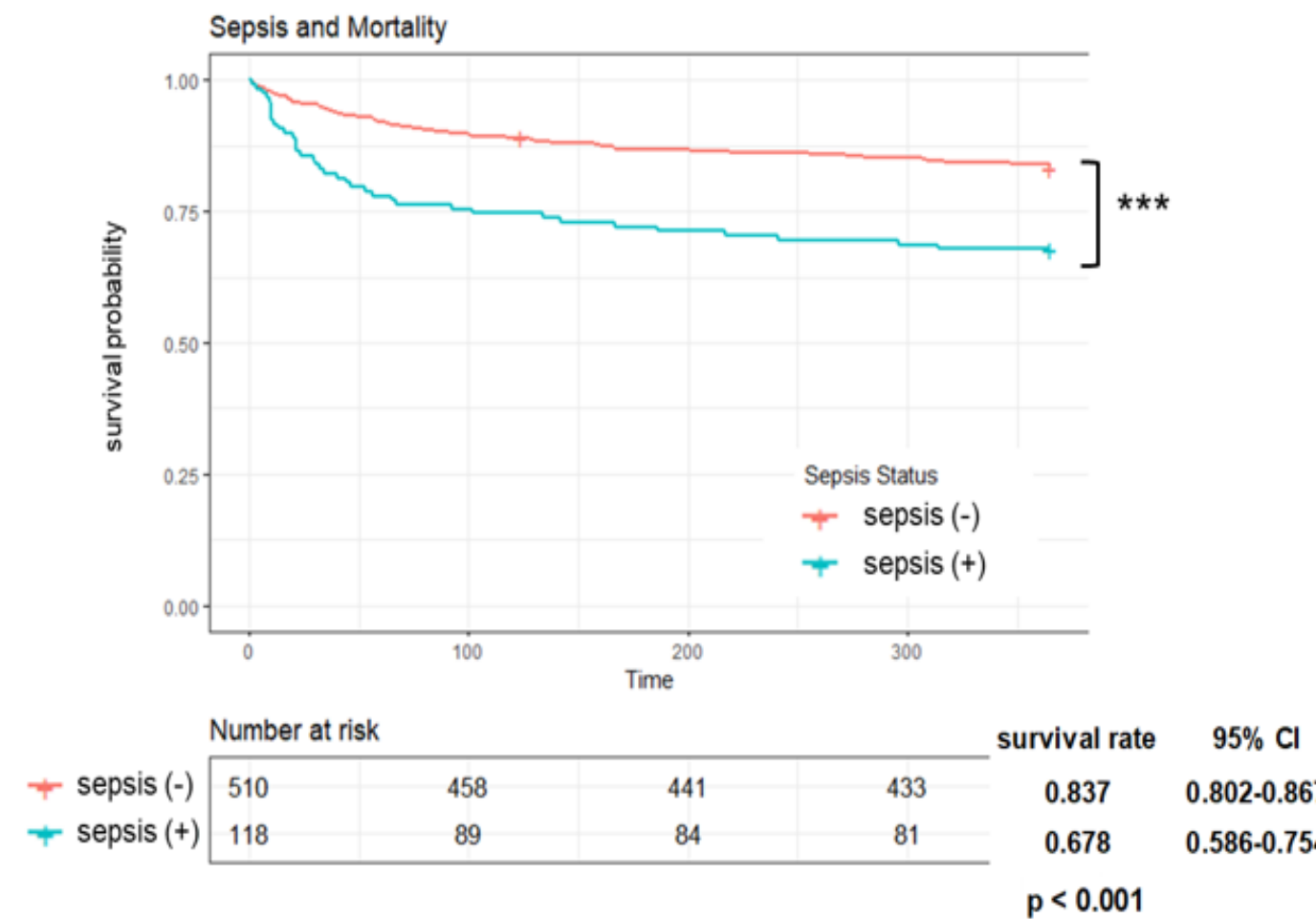
- Design:** Retrospective cohort study with additional chart review using existing data at the University of Iowa Hospitals and Clinics.
- Study participants:** 618 patients were enrolled. 510 (81.2%) were sepsis-negative, 118 (18.8%) were sepsis-positive. Mean age was 66.6 (SD= 15.4).
- Duration:** We analyzed data from subjects enrolled in the study from January 2016 to December 2018.
- Case definition of sepsis:** Sepsis-positive cases were identified based on clinical documentation of sepsis using a word search strategy for the words “sepsis” or “septic” in subjects’ electronic medical records during the study period.
- BSEEG collection:**
  - Portable, handheld EEG device (CONTEC, China).
  - Up to twice daily during daytime.
  - 3~5 min and up to 10 min recordings.
  - Two-channel recording.

## METHODS

- BSEEG score calculation:**
  - Signal-processing algorithm was used to produce a BSEEG score based on a ratio between low-frequency (3 Hz) power to high-frequency (10 Hz) power.
  - The very first BSEEG score obtained during the subject’s study duration was termed “1<sup>st</sup> BSEEG score”.

## RESULTS

- Mortality based on sepsis status**

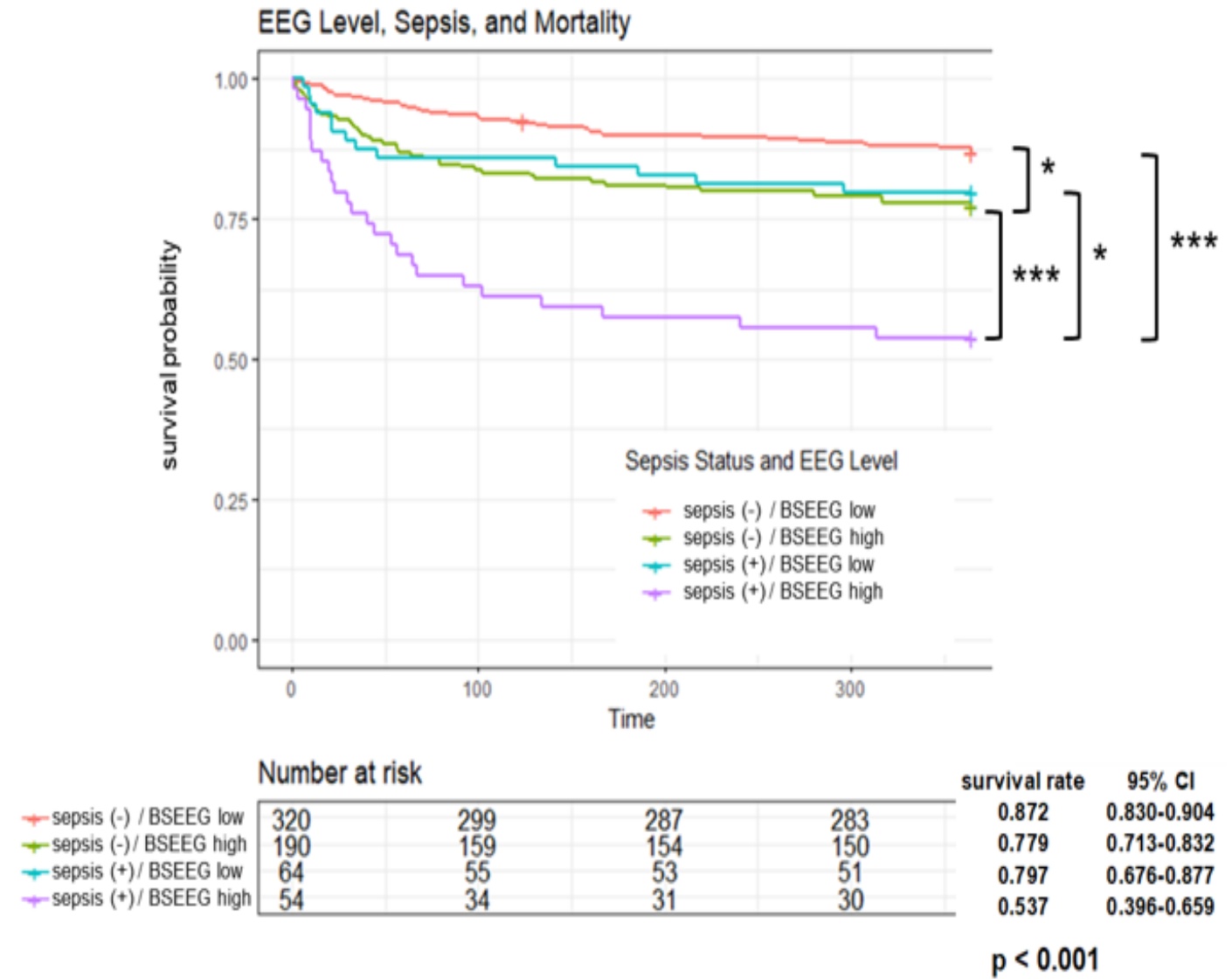


\* p < 0.05, \*\*\* p < 0.001 sepsis (-): sepsis-negative, sepsis (+): sepsis-positive

- 365-day mortality was compared between the two groups to confirm that sepsis categorization based on our definition is reasonably accurate by showing that sepsis is associated with high mortality.

## RESULTS

- Mortality based on sepsis status and BSEEG score**



\* p < 0.05, \*\*\* p < 0.001 sepsis (-): sepsis-negative, sepsis (+): sepsis-positive

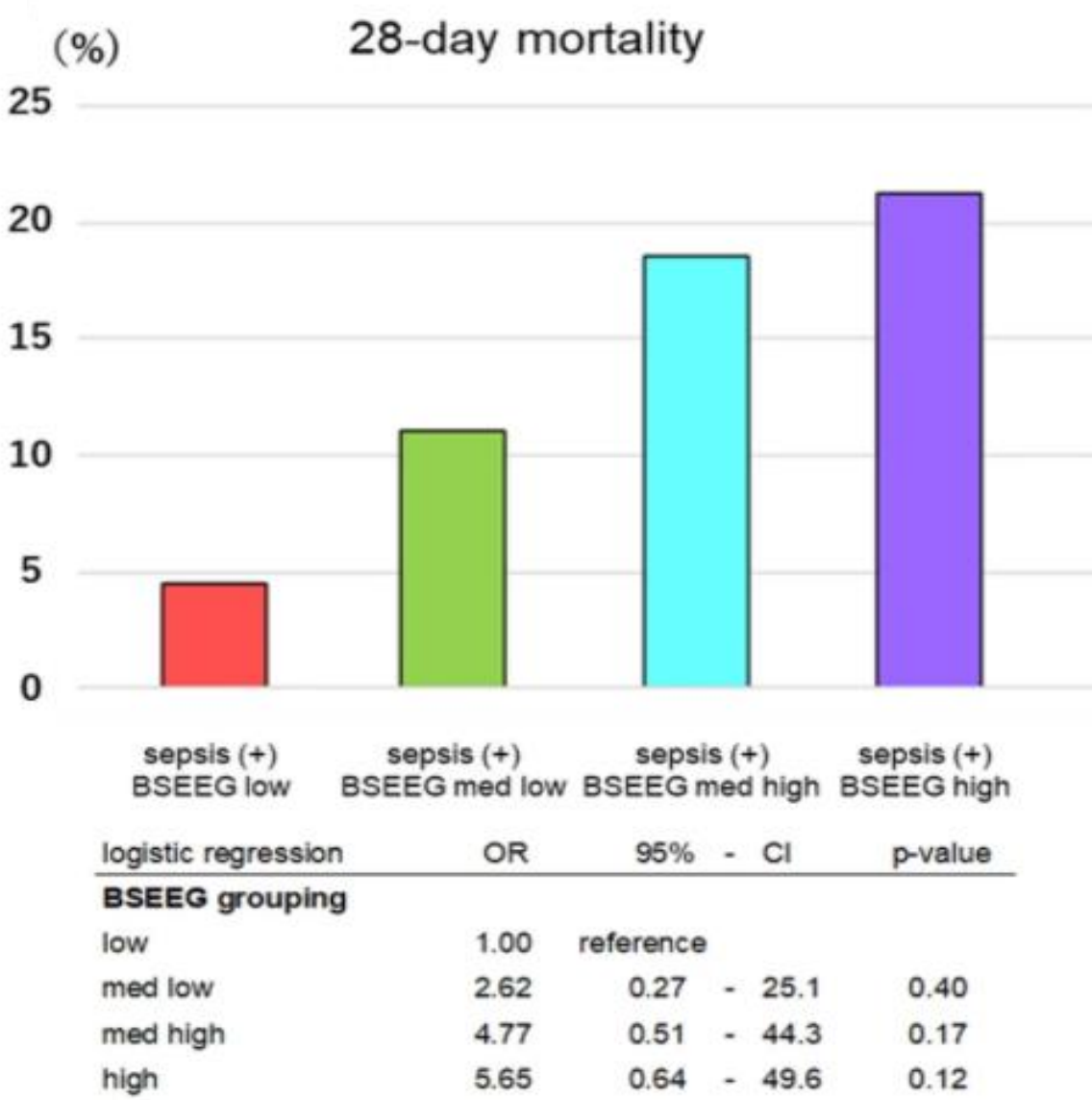
- Sepsis-positive patients with a high 1<sup>st</sup> BSEEG score had the highest mortality. At the same time, sepsis-positive patients with a low 1<sup>st</sup> BSEEG had similar mortality to sepsis-negative patients with a high BSEEG score.

Table 2: Result of the Cox proportional hazard model

|                 | HR   | 95% CI    | P-value    |
|-----------------|------|-----------|------------|
| Age             | 1.03 | 1.02–1.05 | *** <0.001 |
| sex, female     | 0.97 | 0.68–1.39 | 0.885      |
| CCI             | 1.17 | 1.12–1.23 | *** <0.001 |
| current sepsis  | 1.61 | 1.08–2.41 | * 0.021    |
| 1st BSEEG score | 1.25 | 1.06–1.48 | ** 0.008   |

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001  
Abbreviation: CCI = Charlson Comorbidity Index

- Mortality based on dose-dependent manner among sepsis-positive patients**



## CONCLUSIONS

- Mortality increased among septic-positive patients based on 1<sup>st</sup> BSEEG scores in a dose-dependent manner.
- Sepsis-positive patients with a low 1<sup>st</sup> BSEEG score had mortality comparable to sepsis-negative patients with a high 1<sup>st</sup> BSEEG score.
- Our present results suggest the usefulness of the BSEEG approach as a potential tool for identification of patients at high risk and management of sepsis.

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