Comparison of Depth of Sedation Measured by PSA 4000 and Richmond Agitation-Sedation Scale (RASS)

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Purpose

To investigate the relationship between electroencephalogram (EEG)-based Patient State Index (PSI) (a computed EEG variable using the PSA 4000 device (Physiometrix)) with the sedation or agitation level subjectively measured by Richmond Agitation-Sedation Scale (RASS) score in intubated and mechanically ventilated medical ICU patients.

Methods

After obtaining informed consent, PSI was measured continuously for up to 8hrs. RASS testing was performed at 2 hr intervals. PSI readings, obtained 5 minutes before, and immediately prior to RASS testing were documented for correlation with RASS (Pearson Correlation Coefficient). The distribution of PSI values for three clinically relevant RASS categories: A. 0 to +2 (alert, restless, or agitated); B. -1 to -3 (drowsy, light sedation, moderate sedation); C. -4 and -5 (deep sedation, unarousable) was also determined (ANOVA).

Results

Patients (n=20; 40% male; age 52 +17 years; APACHE II 27.5 + 6.5) underwent RASS testing on 78 occasions. Mean (+SD) RASS was -2.86 + 2.08, range = -5 to +2. PSI 5 minutes before RASS (66.1+19.8, range 13 to 99) and PSI immediately prior to RASS (66.7+20.1, range 12 to 99) were similar, and both correlated highly with RASS ($r = 0.539$, $p < .0001$, and $r = 0.562$, $p < .0001$, respectively). ANOVA revealed significant differences in PSI scores among clinical RASS categories at both time periods (both: n=78; $p<0.0001$). PSI values (mean, 95% confidence interval) are displayed for RASS categories in the Table.

Conclusion

The significant associations between PSI and RASS support the validity of the PSA 4000 as a tool to monitor the level of sedation in the ICU. *Clinical Implications:* Additional research in larger populations and relevant subgroups, including further investigation of PSA 4000 as a clinical tool for sedation management, will further define its role in intensive care.

PSI immediately prior to RASS

RASS Category	n	Mean PSI	95% Confidence Intervals
A (alert/agitated)	13	82.3	73.1 / 91.6
B (mild-moderate sedation)	26	73.9	68.9 / 78.8
C (deep sedation)	39	56.8	50.1 / 63.5