

Patient State Index (PSI): Optimization of Delivery and Recovery from Propofol, Alfentanil and Nitrous Oxide Anesthesia.

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Background

The Patient State Index (PSI; Physiometrix, Inc., PSA4000, N. Billerica, MA) is a mathematical multivariate classifier function derived from quantitative EEG (QEEG) features recorded from anterior and posterior scalp locations. PSI has been demonstrated to have a significant relationship to level of sedation during intravenous propofol, inhalation and nitrous/narcotic anesthesia. This multisite study evaluated utility of PSI monitoring as an adjunct to standard anesthetic practice for optimization of delivery and recovery from anesthesia.

Methods

306 patients were enrolled in this multi-center prospective randomized clinical study. Using continuous monitoring throughout the period of propofol-alfentanil-nitrous oxide anesthesia delivery, PSI guidance was compared with use of standard practice guidelines [both before (historic controls, HC) and after exposure to the PSA4000 monitor, (standard practice controls, SPC)]. Anesthesia was always administered with the aim of providing stability, with rapid recovery.

Results

No significant differences were found for demographic variables or for site. The PSI group received significantly less propofol (mcg/kg/min) than the SPC group ($p < 0.01$) and HC group ($p < 0.001$). Alfentanil usage (mcg/kg/min) was similar in all three groups. Verbal response time, emergence time, extubation time and eligibility for OR discharge time (all times in minutes), were all significantly shorter for the PSI group, compared with HC ($p < 0.001$) and SPC groups ($p < 0.05$ or $P < 0.01$). No significant differences in the number of unwanted somatic or hemodynamic events and no incidences of reported awareness were found. Conclusions: Use of the PSI for guiding titration of anesthetic delivery significantly decreased propofol usage and improved recovery time. No differences in unwanted somatic or hemodynamic events were found between groups. These findings demonstrate the potential clinical utility of PSI monitoring to optimize propofol delivery.

	Historic (HC)	Standard (SPC)	PSI
Emergence	9.9 ± 5.2	7.9 ± 5.1	6.5 ± 4.3
Extubation	11.2 ± 6.2	8.9 ± 5.2	7.4 ± 4.5
OR D/C	13.9 ± 8.0	11.0 ± 6.3	9.0 ± 5.3
Alfentanil	6.5 ± 2.6	6.9 ± 2.5	6.9 ± 2.4
Propofol	140.7 ± 37.8	134.4 ± 32.7	122.5 ± 33.5