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**Title:** Bispectral index (BIS®) in hypercapnic encephalopathy caused by COPD exacerbation

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**Body:** Introduction: hypercapnic encephalopathy (HE) is frequently observed in COPD exacerbations and no scale is validated to measure its intensity. Bispectral Index (BIS), is an electronic tool that uses algorithmic analyses of electroencephalogram and is used to measure the depth of anesthesia Objective: to evaluate the relationship between the values of the BIS and the sedation/awareness scales most frequently used (Glasgow Coma Scale, GCS; Ramsay Sedation Scale; and Richmond Scale) in patients with COPD exacerbation and HE Methods: we selected 10 patients with COPD exacerbation, respiratory acidosis, neurological alterations (as expression of HE) and candidates for non-invasive mechanical ventilation (NMV). BIS Monitor and NMV were started at the same time. Gas exchange and neurological alertness scales were measured, as well as brain activity using the continuous BIS system (scale 0-100). 35 measurements were performed Results: there is a significant correlation between the clinical scales and BIS values (Ramsay-BIS,  $r^2=0.812$ ; GCS-BIS,  $r^2=0.707$ , and Richmond-BIS,  $r^2=0.594$ ,  $p < 0.001$  all 3). Analysed per categories, we found that lesser degrees of HE (Ramsay 2) had an average BIS of 92 (95% CI 90-94), whereas in Ramsay 3 was 66 (95% CI 55-78) and Ramsay 4 was 59 (95% CI 49-69). In stable phases it was  $95 \pm 3$ . Conclusions: the clinical scales are subjective and not necessarily applicable to discriminate levels of HE. The BIS monitor displays quantitative, continuous information and it is equipped with alarms that could be used to warn about severe HE; it provides more detailed information than the offered by other scales and could be useful to monitor the progress of patients with NMV.