

## **Depth of Sedation Does Not Predict Episodes of Apnea**

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### **Introduction**

Patients requiring sedation for less invasive procedures are commonly provided monitored anesthesia care (MAC). MAC is comprised of a combination of sedation and/or analgesic drugs with the goal of providing patient comfort with fewer side effects such as respiratory depression and apnea. In this study, we examined if apnea was associated with the level of sedation as determined by brain function monitoring during MAC.

### **Methods**

After IRB approval and patient consent, patients who were scheduled to undergo total knee arthroplasty with regional anesthesia and sedation were enrolled. Patients received routine ASA monitoring plus measurement of respiration rate by rainbow acoustic monitoring (RRa, Rad-87 with RA sensor, rev C, Masimo, Irvine, CA) and depth of sedation measured by patient state index (PSI) (SEDLite brain function monitor, Masimo). Waveform data from the SEDLite and Rad-87 were continuously recorded using data collection software. The primary clinician who provided sedation by propofol infusion was based on clinical need, performed all anesthesia care blinded to the RRa and PSI values. A second unblinded clinician monitored RRa and PSI to assess sedation and episodes of apnea. Additionally, the clinician verified all presumed respiratory pauses by simultaneously viewing the acoustic waveforms while listening to the breathing sounds from the acoustic signal using specialized software (Tag Editor, Masimo). Distribution of PSI values versus the frequency of respiratory pauses and relationship between RRa values and PSI were plotted.

### **Results**

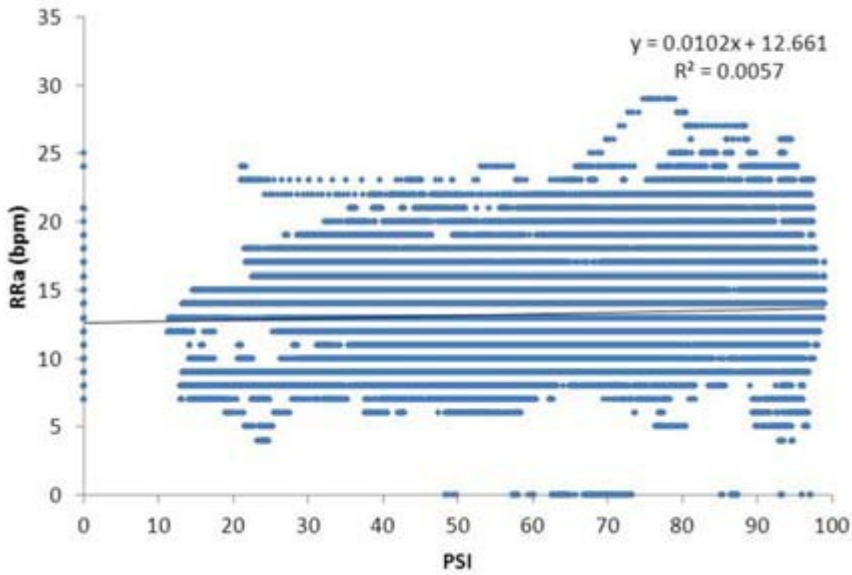
Retrospective analysis identified 28 respiratory pauses from the 20 enrolled patients. 13 patients experienced apneas producing an average  $2.8 \pm 1.9$  apnea episodes per patient. In these patients there was no correlation between the depth of sedation as measured by the PSI and the incidence of apnea (Fig. 1) All episodes of apnea occurred when PSI was greater than 40 ( $71.5 \pm 11.4$ ) (Fig 2). Nine patients showed burst suppression on the SEDLite monitor, indicating periods of very deep sedation but none of these periods were associated with the presence of apnea.

### **Discussion**

Both apnea and excessive sedation occur in patients undergoing MAC but do not occur at the same time. This is consistent with our knowledge of the anatomy of the upper airway and risks of airway obstruction.(1) This suggests that both respiration rate monitoring for the detection of hypoventilation and brain function monitoring for depth of sedation are indicated for patients being provided sedation.

References: 1) British Journal of Anaesthesia, 2003, 91(1): 31-9

### Relationship Between RRA and PSI



### Distribution of PSI values During Respiratory Pauses

