Respiratory Volume Monitoring: Early Warning of Respiratory Depression & Identifying Oximetry False Alarms

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Introduction: Timely identification of respiratory depression is critical for safe patient care, but increased patient monitoring can lead to false alarms, alarm fatigue and straining of staff & resources. Pulse oximetry yields false alarms far exceeding actionable events, yet SpO₂ monitoring remains an integral component of patient care. Non-invasive respiratory volume monitoring (RVM) provides accurate, real-time minute ventilation (MV) measurements to provide continuous, point-of-care respiratory assessment & enable timely interventions.

Methods: RVM & oximetry data were collected from 220 patients (67.1±9.9 yrs, BMI:29.6±5.7 kg/m²) after surgery. “Predicted” MV (MV_PRED) & “Percent Predicted” (MV_MEASURED/MV_PRED x100%) were calculated for each patient. SpO₂ alarm condition was set at <90%. SpO₂<90% for ≥2 min was defined as a “desaturation event” and MV<40% as “Un-Safe MV.” MFANOVA & un-paired, one-sided t-tests were used.

Results: In 39/220 patients (18%) a SpO₂ alarm condition was observed. In 25/39 pts (64%) the low SpO₂ values were considered spurious (single point measurement) & treated as “false alarms.” 14 pts had a “desaturation event”. In 8/14 pts (57%) the desaturation event coincided with normal or elevated MV (182±110% MV_PRED, p>0.5) rather than true respiratory depression. Desaturation events coincided with low MV in only 6/220 pts (2.7%). “Unsafe MV” occurred prior to all 6 “true” desaturation events (avg:15.8 min, range 4-34 min, p<0.5). MV prior to desaturation was far below MV_PRED (21±8% MV_PRED, p<0.01). No difference in population demographics (true vs false desaturation) was found (p>0.2 for ht, wt, age, BMI, sex).

Conclusions: In this cohort, 85% of all SpO₂ readings meeting alarm conditions & 43% of desaturation events occurred in patients with adequate MV & were most likely false. Monitoring MV as well as SpO₂ can improve the identification of true respiratory depression & focus resource deployment. Advanced warning by RVM may help detect & prevent true desaturation events, with potential to minimize complications, reduce alarm fatigue, improve patient safety & reduce healthcare costs.