Introduction: While opioids are a vital component of postoperative pain management, they can cause Opioid-Induced Respiratory Depression (OIRD). Thus, additional monitoring for patients receiving opioids has been advocated. Identifying patients in the post anesthesia care unit (PACU) who are at greater risk for OIRD could improve patient safety by indicating which patients would benefit from additional monitoring on the general hospital floor (GHF) and modification of opioid dosing. Here, we evaluated the ability of a non-invasive respiratory volume monitor (RVM) to identify patients at-risk for OIRD on the GHF based on their respiratory status at PACU discharge.

Methods: Following IRB approval, in an observational study, we used an RVM (ExSpiron, Respiratory Motion, Inc., Waltham, MA) to quantitatively measure tidal volume, respiratory rate and minute ventilation (MV) for up to 48 h in 215 patients following abdominal surgery. MV was expressed as percent of MV predicted (MVpred) based on body surface area and gender. A Low MV event (LMVe) was defined as MV<40%MVpred sustained for ≥ 2 min, and LMVe Rate was calculated as the number of LMVe per hour. Patients were categorized by the number of LMVe in the last 60 min prior to PACU discharge: Group A (Not-At-Risk): < 1 LMVe and Group B (At-Risk): ≥ 1 LMVe in the last 60 min prior to PACU discharge. T-tests were used to compare differences between groups, with p < 0.05 used as significance threshold.

Results: 215 patients (110 males, BMI 26.7 (range 15.1-41.2) kg/m2) were enrolled and monitored for 3.1 ± 0.1 h in the PACU and 38.5 ± 0.9 h on the GHF. 136 (63%) patients experienced no LMVe during the monitoring period and 98.8% monitored hours were LMVe-free. The majority of patients (N = 200, 93%) did not experience an LMVe in the last 60 min of their PACU stay (Group A). The remaining patients (N = 15, 7%) had at least one LMVe at the end of their PACU stay (Group B). The two groups had similar ASA scores and PACU and GHF length of stay while Group B patients had slightly higher BMI than Group A patients (Table). Group B patients experienced a significantly higher rate of LMVe than Group A on the GHF (Figure, 0.68 vs. 0.10 LMVe/h, p < 0.0001). Furthermore, 68% (N = 136) of patients in Group A had no LMVe on the GHF while 13% (N = 2) of Group B patients had no LMVe on the GHF. The majority of Group B patients (N = 11, 73%) had several (i.e., ≥ 6) LMVe throughout their GHF stay while only 14% of Group A patients had ≥ 6 LMVe on the GHF.

Conclusions: In this observational study, the majority of patients maintained adequate MV with few LMVe in the PACU and GHF, suggesting that the RVM can provide useful data without unnecessary alarms. A small fraction of patients (7%, Group B) experienced an LMVe near the end of their PACU stay and these patients continued to experience frequent LMVe indicative of OIRD on the GHF. By
using the RVM in a clinical protocol, these patients could have been identified as high risk in the PACU and recurring LMVe could have been addressed with changes in therapy or additional monitoring. Identification of patients at higher risk for OIRD using RVMâ€™s quantitative physiologic measurements may help improve safety while best allocating resources to contain costs.