

Postoperative Sedation on General Care Wards: A Retrospective Cohort Study

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BACKGROUND

- Many complications may occur during the recovery from surgical procedures requiring anesthesia. Patients with residual sedation following discharge from the post anesthesia care unit (PACU) may be at increased risk for postoperative complications. To improve patient outcomes, it is important to understand the prevalence of perioperative patient characteristics and clinical factors that contribute to post-operative deterioration.
- Previous studies identified that sedation in both the PACU and on general care wards has been associated with deteriorating respiratory rate, hypoxia, hypotension, decreased level of consciousness, and Naloxone administration.^{1,3}
- Additionally, patients who have an emergent event after surgery have more complications including higher risk of ICU admission, longer hospital stay, and a higher 30-day mortality rate.^{4,5}
- It is unclear whether unexpected post-operative clinical deterioration can be predicted based on perioperative patient characteristics.



RESEARCH QUESTION

- Is there a relationship between the depth of sedation during anesthesia recovery and the occurrence of sedation on postoperative general care wards?

OBJECTIVE

- Determine the incidence, associated clinical factors and outcomes of residual sedation on general care wards.

METHODS

- Retrospective cohort study conducted at Mayo Clinic Hospital in Rochester, MN (May 5, 2018 - December 31, 2020) with Institutional Review Board (IRB) approval.
- We reviewed medical records of patients for demographics, health history, perioperative variables and post-operative course.
- We abstracted perioperative information regarding age, sex, body mass index (BMI), and comorbidities (cardiovascular disease, pulmonary disease, central nervous system disease, renal and hepatic dysfunction and obstructive sleep apnea).
- Perioperative characteristics included: class of surgery, perioperative medications, anesthetic maintenance, blood transfusions, fluid administration, total opioid dose, and surgical duration.
- Patients were dichotomized into sedated (Richmond Agitation Sedation Scale (RASS)) (≤ -2) vs. not (≥ -1) within the first 24 hours following anesthesia.
- Postoperative sedation was defined as RASS (≤ -2) following PACU discharge to the general care ward.
- Acute decompensation within 72 hours of PACU discharge was defined as: emergency response team activation, transfer to higher level of care, unplanned return to the operating room, or naloxone administration.

INCLUSION CRITERIA

- Adult patients (≥ 18 years) who underwent surgical procedures requiring anesthesia and were admitted to general care wards following PACU discharge.

EXCLUSION CRITERIA

- Patients receiving anesthesia in non-operating room settings.
- Procedures during labor and delivery.
- Patients who were discharged from PACU directly to a higher level of care (e.g., ICU), to self-care or to an outside facility.

STATISTICAL METHODOLOGY

- Analyses were performed to compare outcomes of patients with RASS > -1 vs RASS ≤ -2 .
- Patient and perioperative clinical characteristics were compared using the rank sum test or chi square analysis.
- Multivariable logistic regression analysis was used to assess associations between clinical factors and post-operative sedation, with ward sedation as the dependent variable.

RESULTS

- 23,766 patients met inclusion criteria. 1,131 patients (4.8% [95% confidence interval 4.5, 5.0], incidence 4.8 per 1000 anesthetics) were observed to have residual sedation on the ward (Table 1).
- Perioperative characteristics associated with sedation were general surgical procedures, procedures lasting > 4 hours, increasing intravenous fluid administration, and perioperative use of gabapentinoids (Table 1, Figure 1).
- Patient characteristics associated with sedation were female sex, low BMI, diabetes mellitus, and renal disease (Table 1, Figure 1).
- 50% of sedation cases occurred within 32 minutes of PACU discharge (Figure 2).
- Risk for ward sedation increased with degree of PACU sedation (compared to PACU RASS ≥ 0 , the risk of ward sedation with PACU RASS -2 was: 1.87 [95%CI 1.44, 2.43], PACU RASS -3 : 2.98 [2.26, 3.93], and RASS ≤ -4 : 3.97 [2.91, 5.42]) (Figure 3).

TABLE 1: CLINICAL CHARACTERISTICS

Characteristic	Sedation on the ward [†]		Multivariable logistic regression [‡]		
	No (N=22,635)	Yes (N=1,131)	Odds Ratio:	(95%CI)	p-value
Sex					$<.001$
Male	10854 (48%)	399 (35%)	1.00	Ref	
Female	11781 (52%)	732 (65%)	1.69	(1.47, 1.94)	
Body mass index, kg/m²	29.2 (25.4, 33.9)	28.4 (23.9, 33.3)	§	§	$<.001$
Diabetes mellitus	3104 (14%)	186 (16%)	1.27	(1.06, 1.52)	0.009
Renal disease	989 (4%)	79 (7%)	1.57	(1.22, 2.03)	$<.001$
Type of surgery					$<.001$
General	7728 (34%)	501 (44%)	1.00	Ref	
Urological/gynecological	5648 (25%)	312 (28%)	0.96	(0.82, 1.12)	
Orthopedics	5609 (25%)	201 (18%)	0.74	(0.61, 0.88)	
Neurological	1740 (8%)	50 (4%)	0.52	(0.38, 0.70)	
Otorhinolaryngology	1405 (6%)	47 (4%)	0.61	(0.44, 0.84)	
Plastic	505 (2%)	20 (2%)	0.47	(0.29, 0.75)	
Surgery duration, hrs	3.6 (2.6, 4.9)	4.1 (3.0, 5.8)	§	§	0.001
Intravenous fluids, L	1.6 (1.0, 2.5)	2.0 (1.3, 3.0)	§	§	0.015
Perioperative medications					
Acetaminophen	15248 (67%)	758 (67%)	0.83	(0.72, 0.96)	0.01
NSAIDs	7675 (34%)	380 (34%)	0.72	(0.62, 0.84)	$<.001$
Gabapentinoid	2851 (13%)	251 (22%)	1.58	(1.33, 1.87)	$<.001$
Lowest PACU RASS score					$<.001$
≥ 0	2744 (12%)	73 (6%)	1.00	Ref	
-1	10590 (47%)	311 (27%)	0.98	(0.75, 1.27)	
-2	6122 (27%)	377 (33%)	1.87	(1.44, 2.43)	
-3	2305 (10%)	241 (21%)	2.98	(2.26, 3.93)	
≤ -4	874 (4%)	129 (11%)	3.97	(2.91, 5.42)	

TABLE 2: SUMMARY OF ACUTE DECOMPENSATION

	No sedation N = 22,635	Sedation N = 1,131	P-value
Acute decompensation[†]	326 (1.44)	92 (8.13)	$<.001$
Interventions			
Emergency response team activation	310 (1.37)	58 (5.13)	$<.001$
Transfer to higher level of care	123 (0.54)	39 (3.45)	$<.001$
To surgery	13 (0.06)	21 (1.86)	$<.001$
To minimally invasive procedure	9 (0.04)	9 (0.80)	$<.001$
Naloxone administration	14 (0.06)	13 (1.15)	$<.001$

FIGURE 1: VARIABLES AND SEDATION

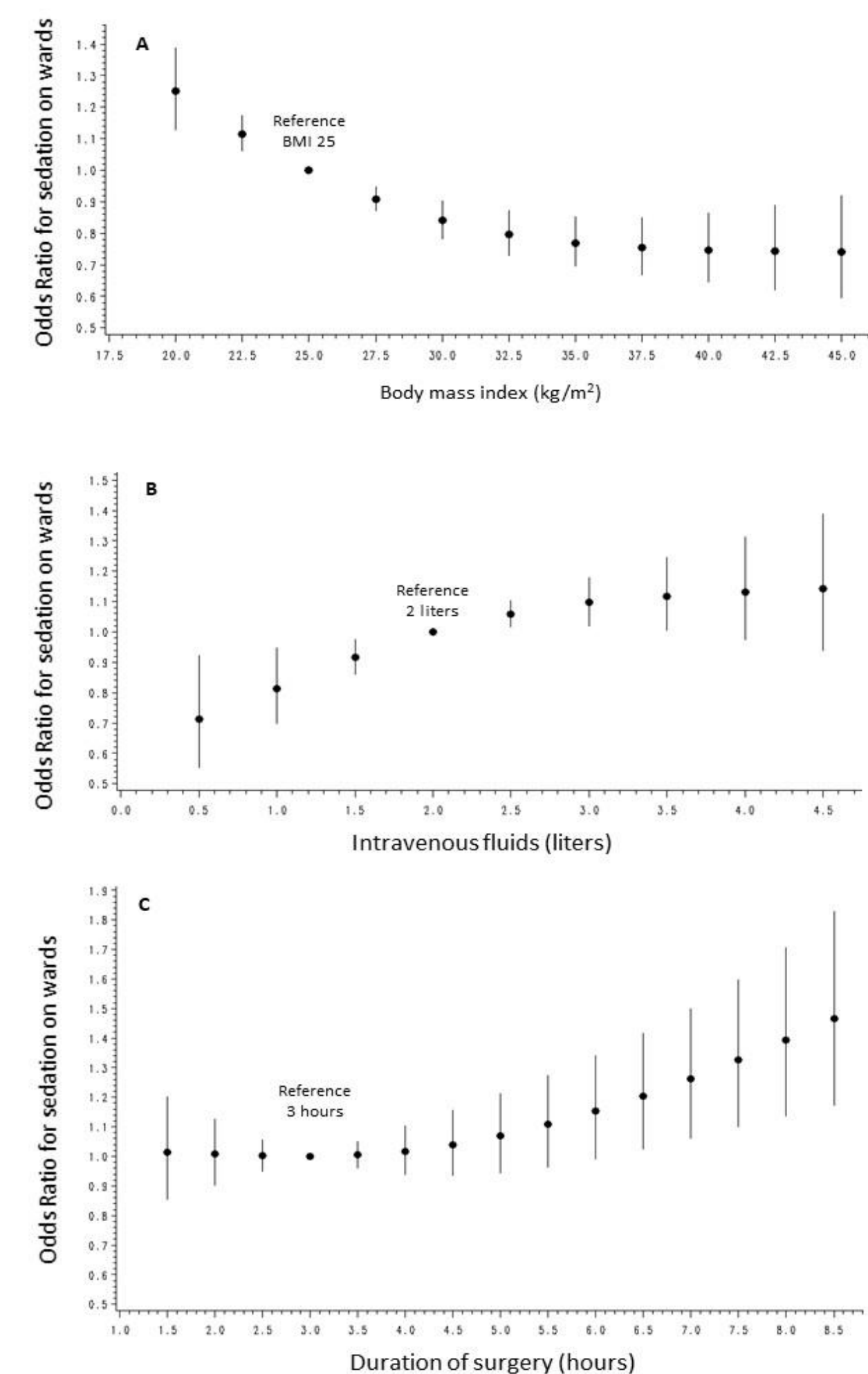


FIGURE 2: TIME FROM PACU DISCHARGE

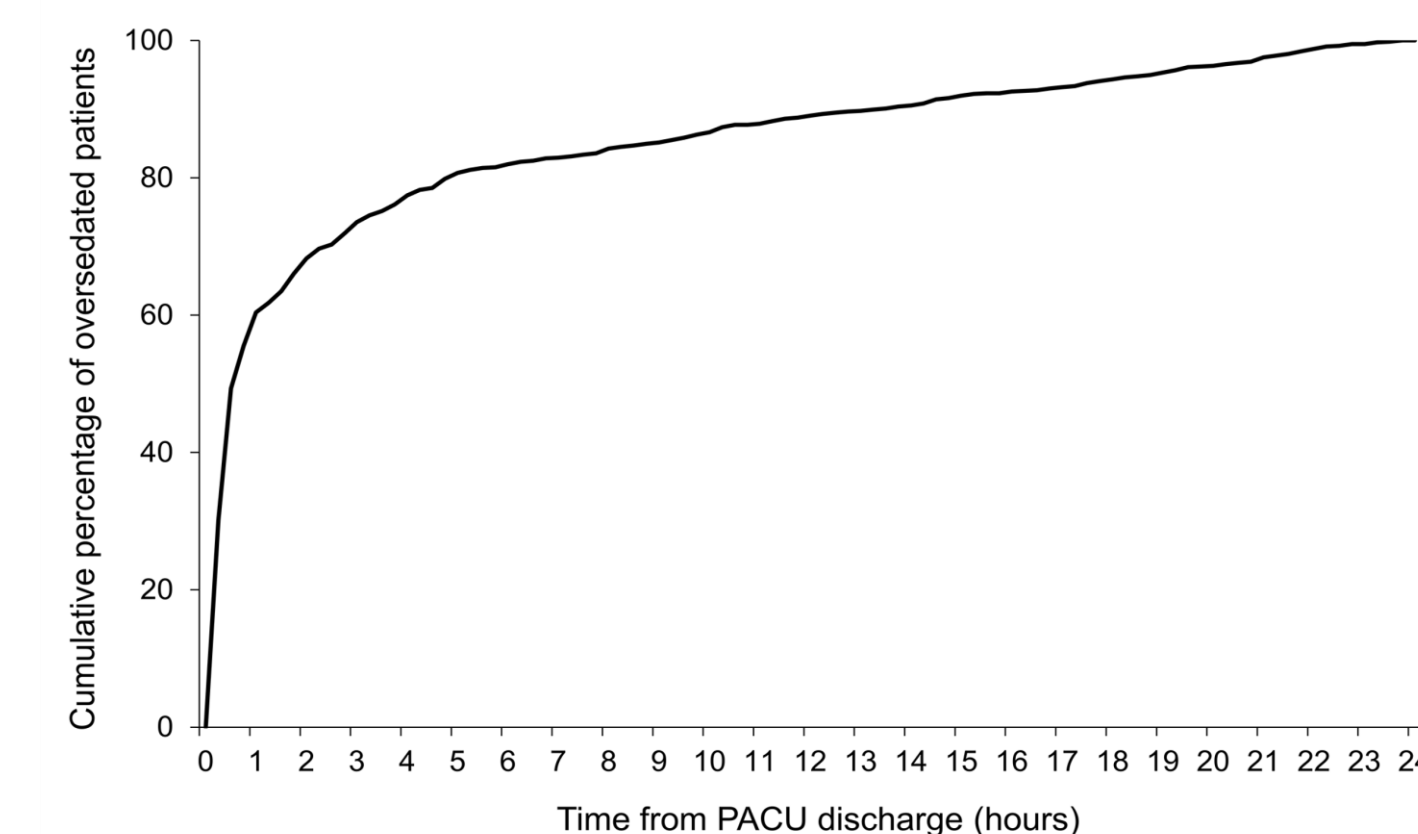
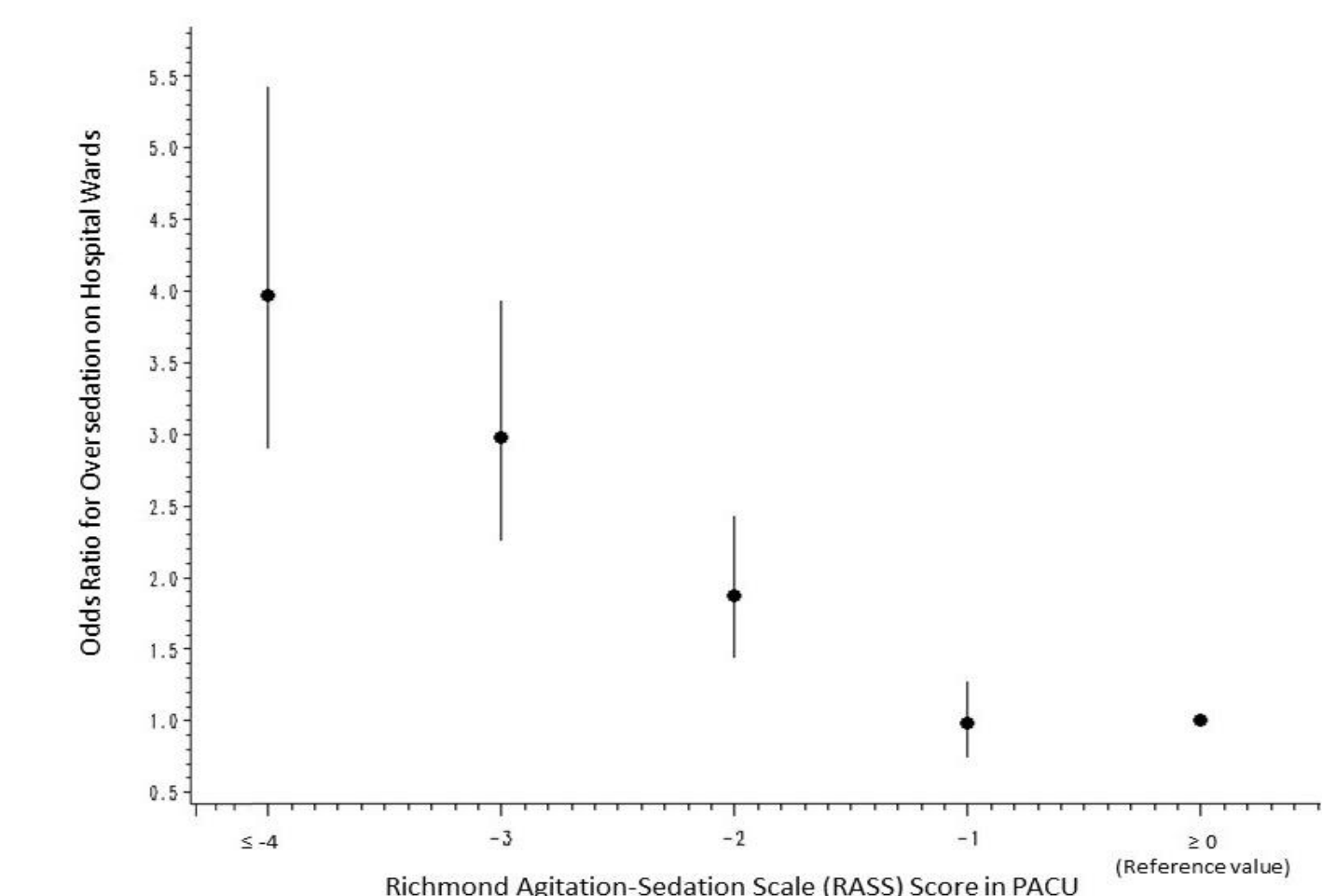


FIGURE 3: PACU SEDATION



DISCUSSION

- In this study, sedated patients compared to non-sedated patients had several fold higher rates of clinical decompensation requiring emergent interventions.
- Patients who were sedated on the ward had a 16-fold increase in the rate of naloxone administration, had more episodes of non-cardiac hypotension and more surgical emergencies. Furthermore, sedation on the general care ward was linked to longer hospital stays and greater mortality than non-sedated patients.
- The majority of ward sedation cases appear to occur within the first hour of discharge from PACU.
- Our findings suggests that the stimulating PACU environment may arouse patients only to revert to a sedated state upon admission to the less stimulating general care ward.

LIMITATIONS

- This study reflected a clinical practice where management decisions are made based on presenting patient and surgical variables. This lack of protocolization likely introduced treatment bias due to perceived risk of individual patients.
- Only patients who were discharged to the general care wards were considered for this study.
- This analysis reflects the practice of a major academic center and may not be generalizable to all practices.

CONCLUSIONS

- Postoperative sedation on general care wards occurs in approximately 1 in 20 patients.
- Deep levels of sedation on the general care ward are highly correlated with deep sedation in the PACU suggesting that patients may be discharged to the ward prematurely.
- There are clinical implications that sedated patients on the ward have a more complicated postoperative course. *Specifically*, patients who were deeply sedated during PACU recovery should warrant careful evaluation prior to PACU discharge with special regard to if the duration of PACU stay should be extended.
- Finally, the accepting unit should be alerted that such patients may be at higher risk of post-operative complications.

REFERENCES & ADDITIONAL INFO

