The Incidence of Post-Sedation Adverse Events in Pediatric Dentistry

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ABSTRACT

Purpose: The purpose of the study is to determine the incidence of post-sedation discharge events (PDE) in pediatric dental patients following in-office sedation.
Methods: One-hundred-one pediatric patients from University of Texas at Houston Pediatric clinic undergoing sedation where identified. Parents were asked to complete Pediatric Sleep Questionnaire, and a take home 24-hour PDE form. Information was gathered from patient records on Axium.
Results: One-hundred-one patients, including 38 receiving Midazolam +/- Hydroxyzine and 61 patients receiving a Midazolam + Meperidine +/- Hydroxyzine were recruited for this study. Overall, the majority of parents reported PDEs in alertness (96%), activity (90%), and behavior (70%) at one of the timepoints post-discharge, with the majority of PDEs occurring one (52.5%) or four (30.1%) hours post discharge ($p<0.001$). Patients with a history of snore have an increase rate of PDE ($p=0.0255$). Lower patient weight has a trending toward PDE (0.0516). Decreased Brodsky score has a higher occurrence of sleeping in the first hour post discharge ($p=0.027$). There was no difference in PDE comparing route of medication delivery for either regimen. There were significant differences based on regimen for behavioral issues ($p=0.05$), oral trauma ($p=0.005$), and pain ($p=0.05$). OSA screening identified seven patients that meeting requirements to be assessed for OSA. Differences in PDEs based on OSA screening groups showed patients with higher OSA screening values have more parental reports of oral trauma ($p=0.01$) and dizziness ($p=0.02$).
Conclusion: The majority of PDEs occur within 4 hours of patient discharge with patients recovering before 8 hours of discharge and is independent of route of medication administration. Patient with positive OSA screen scores, are more likely to have oral trauma and dizziness, and patient with snoring alone has a correlation with PDE; this information suggesting that formal OSA screenings should be a part of pre-sedation protocol.

BACKGROUND

- Moderate sedation is an advanced behavior guidance technique (BGT) utilized daily in pediatric dentistry when patients require more than basic behavior techniques.[1]
- Contraindications to sedation include cooperative patients with minimal dental needs or patients with predisposing medical and/or physical conditions which would make sedation inadvisable. [1]
- Obstructive sleep apnea (OSA) has a prevalence of 2-5% in the pediatric population; however, it is estimated that the actual occurrence of OSA is much greater in children. This is due to the medical and financial cost of formal diagnosis with polysomnographic evaluation.[2-3]
- Predictors of OSA in children include excessive daytime sleepiness, loud snoring, witnessed apnea, headache, attention issues, adenotonsillar hypertrophy, mouth breathing, and restlessness. [2-3]
- Post-discharge events (PDEs) are irregularly reported in the literature. A scoping review of PDEs following pharmacologic BGT utilization identified four categories (alertness, behavior, activity, and post-sedation symptoms) of PDEs asked of parents following discharge (Box 1).

The goal of this project is to identify the incidence of PDEs following sedation and to determine if children with OSA predictors have an increase in post-sedation discharge events.

METHODS

- This prospective study was approved by the UTHealth Houston Institutional Review Board.
- Patients aged 2.5-11 seen in the UT Grad Pediatric Dentistry Clinic for non-IV conscious sedation guardians were asked to participate in this study.
- Patient records were accessed to gather the following information
  - Age, weight, and height of patient
  - BMI, Brodsky, Mallampati, intra-op behavior
  - Sedation medications, dosages and time given
  - Parents recorded PDEs at 1-, 4-, 8-, and 24-hours post discharge.
- Data was collected in Microsoft Excel and analyzed using R statistical software (R Core Team 2020); p-values <0.05 were considered significant.

Box 1: Parents reported post-discharge events at four timepoints in the 24 hours following sedation discharge.

Alertness
Asleep
Asleep but easy to awaken
Awake but drowsy
Awake and alert
Behavior
Normal
Agitate
Restless
Withdrawn
Activity
Less active than usual
Same as usual
Hyperactive
Post-Sedation Symptoms
Unsteadiness on feet
Inability to support head
Nausea
Vomitting
Biting of cheeks, lips, or tongue
Trouble concentrating
Headache
Dizziness
Agitation
Excessive sleepiness
Behavioral changes
Anaphalyaxis/Allergic reaction
Changes in breathing
Unable to eat/drink
Seizure
Excessive sweating
Mouth and/or facial swelling
Pain
Bleeding
Snoring
Other (Self Report)

RESULTS

- 120 patients consented to participate in the research with 101 (84%) completing the PSQ and 24-hour post sedation survey.
- 59% of patient have returned to pre-sedation behavior, activity and alertness by 8 hours post discharge. (Figure 1)
- Post-operative complications were reported in 71.6% of patients (Figure 2).
  - Unsteadiness (44% of respondents) and pain (36% of respondents) were the most common post-operative complications and excessive sleepiness.
  - Parents of 44 patients (44%) reported more than one post-operative complication.
  - Adverse events with less than 10% occurrence were mouth or facial swelling (9.9%), inability to eat (7.92%), snoring (7.9%), trouble concentrating (6.9%), headaches, dizziness, nausea and vomiting (3.9%).
- Midazolam and meperidine regimen, 81% of patient reported baseline activity levels 8-hours post discharge, compared to midazolam only, had 57% of patient recovered in that same time frame (P=0.0077, Figure 3)
- Table 1 provides patient-specific information based on sedation agent used and OSA-predictive factors.
  - Patient with a lower weight, show a trend towards in an increase in post-discharge events. (p=0.0516)
  - Patient with a history of snoring have an increase rate of post-discharge events. (p=0.0255)
  - Patient with a lower Brodsky score have higher occurrence of sleeping in the first hour of discharge. (p=0.027)
  - Midazolam has correlation with post operative pain and oral trauma
  - Midazolam and meperidine correlation with altered behavior changes

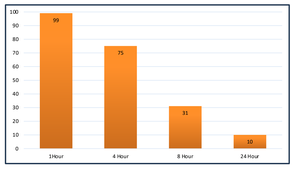

Figure 1. Reported changes in behavior, alertness and activity levels post discharge for all dataset.

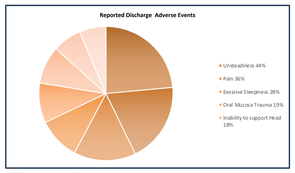

Figure 2. Adverse events reports in more than 10% of patients for overall dataset.

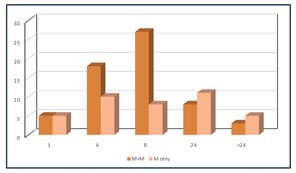

Figure 3. Comparing reported changes in behavior, alertness and activity levels post discharge of midazolam to midazolam + meperidine.

Table 1: Patient-specific variables related to post-discharge adverse events.

		Post-Discharge Events		
All Subjects	Overall	Yes	NO	p-value
Age (mean, SD)	72.6 (24.0)	71 (24.0)	77 (24.1)	0.2884
Gender				0.419
Male	51	27	14	
Female	50	40	10	
Weight (mean, SD)	23.4 (8.6)	22.6 (7.6)	26.4 (10.7)	0.0516
BMI % (mean, SD)	42.3 (35.0)	42.3 (35.4)	40.6 (34.6)	0.7927
Brodsky (mean, SD)	34.7 (17.8)	35.9 (18.4)	30.8 (15.3)	0.208
PSQ Positive Score		6	1	1
History of Snoring		27	3	**0.0255**
Slept in First Hour Post- Discharge				
Brodsky (mean, SD)		30.7 (17.6)	38.7 (17.2)	**0.027**
History of Snoring		14	16	0.513
Midazolam				
Pain		18	20	**0.05**
Oral Trauma		12	26	**0.005**
Midazolam and Meperidine				
Behavior Changes		22	11	**0.012**
High OSA score on PSQ				
Oral Trauma		4	13	**0.01**
Dizziness		2	2	**0.02**

CONCLUSIONS

- ***In this study, the incidence of a post-operative events increased as (1) positive screening value for OSA using PSQ or (2) history of snoring.***
- **Limitations include that** some post sedation survey results we obtain greater than 48 hours after the time of discharge and parents may not have able to full recall the time periods in the change in PDE for their children. The PSQ survey took parents up 15 minutes to complete, using the shorter 21 question PSQ could limited the amount of parental fatigue while completing the questionnaire, and may obtain more accuracy in its results.
- **Further research** would benefit with continued prospective study, with increased number of patient that participate in the research