Opioid prescribing practices for at-risk pediatric populations undergoing ambulatory surgery

Sterling Lee, MS2; Ashley Reid, PharmD; James Thomas, MD; Melissa Masaracchia, MD

University of Colorado School of Medicine, Children's Hospital Colorado

INTRODUCTION

- At risk populations for post-surgical opioid-induced respiratory depression include pediatric patients with a history of sleep disordered breathing (SDB) and obstructive sleep apnea (OSA)
- Although monitoring in the inpatient setting allows for increased vigilance for opioid-related adverse events, children with the aforementioned comorbidities are presumably at even greater risk when undergoing outpatient surgical procedures since there is far less monitoring in place for recognition of events
- We aim to describe our current opioid prescribing practices for outpatient surgical procedures in order to determine whether providers modify prescriptions for certain patient comorbidities, weight or BMI-for-age percentile.
- By shedding light on our current practices, we intend to create an evidence-based framework to institute standardized dosing for this group.

METHODS

- Baseline opioid prescribing data for all outpatient pediatric surgery patients (ages 0-18) were collected and retrospectively from January 1, 2019 to May 31, 2020 and reviewed. Those with an ICD-10 code for sleep disordered breathing or OSA (J35.3, J35.2, G47.3, G47.33), obesity (E66.9) or those who were considered obese based on BMI-for-age percentile (Z68.54) were identified.
- Patients were included if they were discharged with an opioid prescription or with current procedural terminology (CPT) codes reflective of surgical interventions likely to produce an opioid prescription.
- Data retrieved from the electronic medical record used at Children's Hospital Colorado (EPIC) included:
- Patient demographics (age, race, BMI-for-age percentile at time of surgery, ideal body weight, ASA physical status)
- Opioid prescription descriptors (dose, frequency and duration of prescription)
- Surgical subspecialty service (including specific procedure type based off CPT codes or chart review).
- We also noted if an opioid prescription refill was required, and if patients re-presented to the emergency department or were readmitted for pain.

Statistical Analysis

- Study data were collected and managed in an encrypted file with all patient identifiers removed.
- Patient demographics were summarized using descriptive statistics; counts and percentages were used for class/categorical variables, while medians and ranges were used for continuous variables given their non-normal distributions.
- We compared characteristics for the obese group and SDB/OSA group to the control group, respectively. We then compared characteristics between the low and standard dose cohorts within the obese and SDB/OSA groups, respectively.
- Wilcoxon rank sum tests were applied to compare the distributions of continuous variables, while Pearson's chi-square or Fisher's exact tests were used to evaluate differences in proportions of the class/categorical variables between groups. P-values < 0.05 were considered statistically significant. SAS V9.4 was used to conduct all the data analyses.

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Table 1a: Patient demographics for Obese and Control Groups

	Overall			Low dose			Standard Dose		
	Obese (n= 128)	Control (n= 4373)	P value†	Obese (n= 68)	Control (n= 1805)	P value†	Obese (n = 60)	Control (n = 2568)	P value†
Age in yearsπ	15 (5, 20)	11 (0, 21)	**<.0001**	14 (6, 20)	8 (0, 21)	**<.0001**	16 (5, 20)	13 (0, 21)	**<.0001**
Weight (kg)π	97.5 (42.5, 183)	42.1 (4.7, 159)	**<.0001**	93 (47, 176)	27.9 (4.7, 159)	**<.0001**	115.5 (42.5, 183)	51.2 (5.5, 142)	**<.0001**
Surgical services n, (%)			**<.0001**			**0.0003**			**<.0001**
GYNECOLOGY	14 (10.9%)	52 (1.2%)		2 (2.9%)	6 (0.3%)		12 (20%)	46 (1.8%)	
ORTHOPAEDICS	15 (11.7%)	1970 (45.1%)		2 (2.9%)	259 (14.4%)		13 (21.7%)	1711 (66.6%)	
OTOLARYNGOLOGY	62 (48.5%)	1370 (31.3%)		50 (73.6%)	1135 (62.9%)		12 (20%)	235 (9.1%)	
PEDIATRICS	0 (0%)	341 (7.8%)		0 (0%)	108 (6.0%)		0 (0%)	233 (9.1%)	
OTHERS	37(28.9%)	640 (14.6%)		14 (20.6%)	297 (16.4%)		23 (38.3%)	343 (13.4%)	
Prescription duration$	3.8 (0.6, 8.1)	3.5 (0.5, 6.7)	0.9355	5.1 (0.6, 8.1)	5.1 (0.5, 16.7)	0.4712	3.2 (1.3, 7)	3 (0.5, 13.4)	0.6710

π median (range)
$ days prescribed (range)
† P-value compares obese and average weight groups

Legend for Table 1a: Patient demographics by obesity and control group status, and by low-dose/standard-dose oxycodone prescriptions

Table 1b: Patient demographics for OSA-SDB and Control Groups

	Overall			Low dose			Standard Dose		
	OSA-SDB (n= 173)	Control (n= 4373)	P value†	OSA-SDB (n = 147)	Control (n= 1805)	P value†	OSA-SDB (n= 26)	Control (n=2568)	P value†
Age in yearsπ	8 (1, 21)	11 (0, 21)	**<.0001**	7 (1, 20)	8 (0, 21)	0.1013	9.5 (2, 21)	13 (0, 21)	**0.0009**
Weight (kg)π	36 (8.4, 92.8)	42.1 (4.7, 159)	**0.0035**	34.3 (8.4, 92.8)	27.9 (4.7, 159)	0.0512	45.6 (13.5, 80.7)	51.2 (5.5, 142)	0.1911
Surgical services n, (%)			**<.0001**			**<.0001**			**<.0001**
GYNECOLOGY	0 (0%)	52 (1.2%)		0 (0%)	6 (0.3%)		0 (0%)	46 (1.8%)	
ORTHOPAEDICS	13 (7.5%)	1970 (45.1%)		7 (4.8%)	259 (14.4%)		6 (23.1%)	1711 (66.6%)	
OTOLARYNGOLOGY	137 (79.2%)	1370 (31.3%)		128 (87.1%)	1135 (62.9%)		9 (34.6%)	235 (9.1%)	
PEDIATRICS	0 (0%)	341 (7.8%)		0 (0%)	108 (6.0%)		0 (0%)	233 (9.1%)	
OTHERS	23 (13.3%)	640 (14.6%)		12 (8.1%)	297 (16.4%)		11 (42.3%)	343 (13.4%)	
Prescription duration$	5.1 (1, 15.7)	3.5 (0.5, 6.7)	**0.0002**	6.6 (1, 15.7)	5.1 (0.5, 16.7)	**0.0417**	3.9 (1.2, 11)	3 (0.5, 13.4)	0.2377

π median (range)
$ days prescribed (range)
† P-value compares sleep apnea and no sleep apnea groups overall and by low/high dose oxycodone prescriptions
Abbreviations: OSA-SDB, obstructive sleep apnea-sleep disordered breathing
Legend for Table 1b: Patient demographics by OSA-SDB and Control Groups status, and by low-dose/standard-dose oxycodone prescriptions

Table 2: Patient demographics by low-dose vs. standard-dose oxycodone

	Obese			OSA-SDB		
	Low dose (n = 68)	Standard dose (n= 60)	P value‡	Low dose (n= 147)	Standard dose (n= 26)	P value‡
Age in years *	14 (6, 20)	16 (5, 20)	**0.0388**	7 (1, 20)	9.5 (2, 21)	0.0854
ABW (kg) *	93 (47, 176)	115.5 (42.5, 183)	**0.0004**	34.3 (8.4, 92.8)	45.6 (13.5, 80.7)	0.1896
IBW (kg) *	58 (6, 93.7)	55.8 (21.8, 83)	0.5523	26.9 (9.2, 74.1)	35.1 (14, 69.6)	0.0828
BMI	33.3 (27, 52.4)	41.3 (25.4, 68.5)	**<.0001**	20.5 (12.8, 29.5)	21 (14, 28.5)	0.4870
ASA Status, n (%)			0.1580			0.8155
I	4 (6%)	2 (3.3%)		8 (5.4%)	2 (7.7%)	
II	33 (49.2%)	21 (35%)		86 (58.5%)	13 (50%)	
III	30 (44.8%)	37 (61.7%)		52 (35.4%)	11 (42.3%)	
IV	0 (0%)	0 (0%)		1 (0.7%)	0 (0%)	
Surgical Services n, (%)			**<.0001**			**<.0001**
GYNECOLOGY	2 (2.9%)	12 (20%)		0 (0%)	0 (0%)	
ORTHOPAEDICS	2 (2.9%)	13 (21.7%)		7 (4.8%)	6 (23.1%)	
OTOLARYNGOLOGY	50 (73.6%)	12 (20%)		128 (87.1%)	9 (34.6%)	
OTHERS	14 (20.6%)	23 (38.3%)		12 (8.1%)	11 (42.3%)	
Dose weight type			**<.0001**			0.3568
ACTUAL	36 (53.7%)	10 (16.7%)		119 (80.9%)	19 (73.1%)	
IDEAL	31 (46.3%)	50 (83.3%)		28 (19.1%)	7 (26.9%)	
Prescription duration †	5.1 (0.6, 8.1)	3.2 (1.3, 7)	0.4744	6.6 (1, 15.7)	3.9 (1.2, 11)	**0.0279**

* median (range)
† days prescribed (range)
‡ P-value compares low dose and high dose oxycodone prescribing by comorbidity
Abbreviations: ABW, actual body weight; IBW, ideal body weight; BMI, body-mass-index, ASA status, ASA Physical Status
Legend for Table 2: Patient demographics for obese and OSA-SDB groups by low-dose and standard dose oxycodone status.

Table 3: Oxycodone prescriptions compared by comorbidity status

Groups	Low Dose	Standard Dose	Overall p-value	P Value* (Control vs. Obese)	P Value* (Control vs. SDB)
Control	1805 (41.3%)	2568 (58.7%)	**<.0001**	**0.0073**	**<.0001**
Obese	68 (53.1%)	60 (46.9%)			
SDB	147 (85%)	26 (15%)			

* P-value compares low dose and standard dose oxycodone prescriptions by comorbidity status

Legend for Table 3: Oxycodone prescription dose compared by comorbidity status

For our purposes, the following were considered standard oral oxycodone doses:
Infants >6 months, children, and Adolescents:
Patient weight <50 kg: Initial dose: 0.1-0.2 mg/kg/dose every 4 to 6 hours as needed.
Patient weight ≥50 kg: Initial dose: 5-10 mg every 4 to 6 hours as needed.

Low dose oxycodone doses were considered <0.05mg/kg/dose.

CONCLUSIONS

- More than half of clinicians (61%) prescribed opioids based on actual body weight independent of dose for obese and SDB patients
- However, most were prescribed at a reduced dose indicating they were aware of the increased risk for opioid complications, (≤0.05mg/kg, n=155, 84.2%)
- When actual body weight was used, most providers did reduce the dose of oxycodone (≤0.05mg/kg, n=155, 84.2%).
- When ideal body weight was used, we observed a trend in which most prescriptions were written using the standard dose of oxycodone (>0.05mg/kg).
- While the risk of overdosing obese and SDB patients is less likely when using IBW over ABW, the reduction in dose infers that providers were at least aware of the potential for these issues.
- This also suggests that practitioners were more inclined to estimate proper doses rather than undertake lean body mass calculations.
- Inconsistency surrounding proper dosing in these populations are further highlighted with thirty SDB patients who underwent surgical procedures typically warranting an opioid analgesic but did not receive an opioid prescription at discharge.
- Furthermore, while our institution does not commonly prescribe opioids to children under the age of 5 undergoing tonsillectomy/adenoidectomy, seven children in that age range received an opioid for these procedures.
- These prescribing practices confirm that there is high variability in dosing between providers for similar procedures.
- Why isn't ideal body weight being used?
  - More complex calculations are involved to compute ideal body weight
  - Some providers are unaware of dose change suggestions
- Future work: identify knowledge gaps in appropriate opioid prescribing and factors for lack of adherence to proper dosing in these at-risk populations

RESULTS

- Data was collected on 4674 patients
- 173 patients were identified with OSA/SDB, or tonsillar and/or adenoid hypertrophy
- 128 patients were defined as obese (BMI > 95th%)
- Table 2:
  - Most patients were identified as ASA physical status 2
  - Surgical services that rendered most opioid prescriptions for SDB and obese patients included otolaryngology and orthopedics
  - Patients having otolaryngology procedures were more likely to be prescribed reduced doses of oxycodone.
  - For obese patients, 64% of prescriptions were based on ideal body weight
  - When IBW was used, providers were more likely to prescribe standard doses of oxycodone (>0.05mg/kg, 83.3%, p<.0001)
  - When ABW was applied, low-dose oxycodone was more likely to be prescribed (53.7%, p<.0001)
  - For SDB patients, 78.9% prescriptions were based on actual weight; and of those, the majority were written for low dose oxycodone (86.2%)
  - Low-dose oxycodone prescriptions were often written for a longer duration than those prescribed using standard doses (6.6 days vs. 3.9 days, p<0.05)
- Table 3:
  - Patients with no comorbidities were more often prescribed standard doses of oxycodone (greater than 0.05mg/kg n=2568, 58.7%)
  - Obese and SDB patients were more likely to be prescribed lower doses (less than or equal to 0.05mg/kg, 71.4%) regardless of the size descriptor used for calculations