Prediction of Early Severe Postoperative Pain in Pediatric Ambulatory Surgical Patients

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BACKGROUND

Despite ongoing advances in perioperative care, significant postoperative pain remains a common problem. Many children recover from severe postoperative pain (SPOP) within an hour of admission to the post-anesthesia care unit (PACU)[1], but SPOP has multiple negative effects. These include increased overall complication rates, prolonged PACU and hospital stay, increased hospital costs, and may be the first step to chronic pain and opioid addiction[2]. The prevailing opioid epidemic highlights the importance of preventing SPOP and identifying its risk factors.

SPOP is influenced by largely unknown factors in pediatric ambulatory surgery. Early identification of SPOP risk factors could result in preemptive intervention or earlier intervention in the recovery phase, thus reducing the care burden of these patients. Our objectives in this prospective, observational study were to describe the incidence of SPOP in pediatric ambulatory surgery, and examine the factors associated with SPOP.

METHODS

After IRB approval, 813 children aged 4-17 years undergoing painful, elective, ambulatory surgery were prospectively recruited into a cross-sectional observational study.
- Painful surgery = use of intraoperative analgesic or nerve block.
- **Primary outcome:** pain score ≥ 7 during PACU stay.
- Secondary outcome: IV opioid or non-opioid administration in PACU.
- Factors compared using Chi-square and T-test analysis.
- Two multivariable logistic regression models were used to determine predictors of SPOP.
    - Model 1: Preoperative history alone
    - Model 2: Preoperative history + Intraoperative variables
    - Model predictive performance assessed using Receiver Operator Characteristic curve (ROC) and area under ROC curve corresponding to 95% confidence interval.

RESULTS

- 175 patients (21.2%) experienced at least one episode of SPOP in PACU.
- Minimal differences between patients with and without SPOP except:
    - Univariate analysis identified the following predictors:
        - Younger age (8.9 vs 9.7y, p=0.01)
        - Habitual snorers (p=0.001)
        - Less likely to have past surgical history (p=0.02)
        - Pharyngeal surgery (p<0.001)
    - Multivariate analysis identified the following predictors:
        - **Model 1:**
            - Age (p=0.004)
            - Habitual snorers (p<0.001)
            - Non-White ethnicity (p=0.049)
        - **Model 2:**
            - Age (p=0.014)
            - Pharyngeal surgery. (p=<0.001)

Table 1. Odds ratio and coefficients of multivariable logistic regression models for severe PACU pain after ambulatory surgery

Variables	Model 1: History			Model 2: History + Intraoperative		
	Odds Ratio	95%CI	p-value	Odds ratio	95% CI	p-value
Age (years)	0.92	0.87- 0.97	0.004	0.99	0.69 – 0.98	0.014
Female	1.06	0.67 – 1.48	0.702	0.99	0.69 – 1.41	0.974
Snoring	2.16	1.51 – 3.08	<0.001	1.32	0.85 – 2.05	0.202
BMI	0.98	0.95 – 1.02	0.794	0.99	0.96 – 1.03	0.723
ASA Status	0.94	0.70 – 1.27	0.714	0.87	0.63 – 1.21	0.416
Non-White ethnicity	1.46	1.01 – 2.14	0.049	1.35	0.89 – 2.03	0.148
Previous surgery	1.17	0.83 – 1.66	0.363	0.99	0.68 – 1.45	0.967
Pharyngeal surgery				3.89	2.23 – 6.77	<0.001
Duration of Surgery				1.00	1.00 – 1.01	0.054
Intraop. MS. Eqn/kg				1.38	0.50 – 26.4	0.844

Abbreviations: Intraop. = Intraoperative; MS = morphine sulfate; OR = odds ratio; CI = confidence interval; PACU = post anesthesia care unit

- Children with SPOP usually received intraoperative morphine (p=0.001), acetaminophen (p=0.001), and dexamethasone (p=0.003).
- On multivariate analysis only snoring was retained as a significant predictor in model 1, and model 2 only slightly improved the discriminate ability of the model.
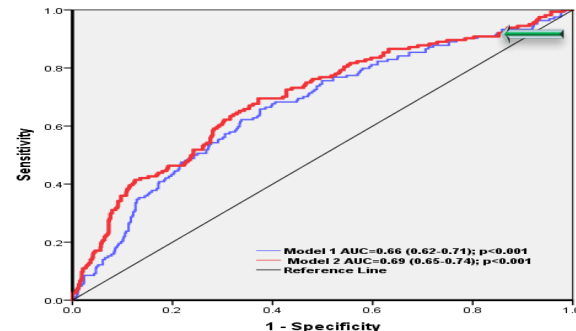

CONCLUSION

- SPOP is common in children undergoing ambulatory surgery, but hard to predict.
- Prediction models using history and intraoperative variables showed **fair** ability to identify children who would have SPOP.
- Predictors included younger age, habitual snorers, Non-White ethnicity, no previous surgical history, and pharyngeal surgery.
- Pharyngeal surgery is very high risk and warrants preventative therapies.
- Further model refinement with additional variables, additional institutions, and larger sample size should improve model calibration.

REFERENCES

1. Chung F, Ritchie E, Su J. Anesth Analg 1997;85:808-816
2. Svensson I et.al Eur J Pain 2001;5:125-133