

Introduction

Pediatric same day surgery patients were not given any preoperative/pre-emptive pain medications, while PACU nurses observed their children experienced severe pain after their eye surgery. The Perianesthesia nurses conducted Evidence-Based project for administering preoperative/pre-emptive medications that alleviated postoperative distress and pain. In addition, many children undergoing outpatient ophthalmologic surgery received intravenous opioids for pain that required a longer recovery length of stay (LOS) which also caused parents to be frustrated and unhappy. Aim of this EBP project was to identify/evaluate the best evidence for administering preoperative/pre-emptive analgesia for improved postanesthesia care unit (PACU) pain management. Other aims of this EBP project was to: 1) decrease the use of opioids; 2) encourage better recovery by decreased length of stay (LOS); and 3) improve parent satisfaction through evidence-based pain management strategies.

Practice Question

PICO Question: What is the best evidence for administering acetaminophen as a preoperative/pre-emptive medication for outpatient pediatric ophthalmologic surgery to improve children’s postanesthesia pain management?
P = Pediatric patients having ophthalmological same day surgery
I = Pre-emptive acetaminophen medication
C = No preoperative medication versus preoperative oral acetaminophen
O = Improved pain management during emergence from anesthesia

Search Strategy

Six different databases yielded 1,111 articles and 673 duplicate articles removed. Peer reviewers systematically reviewed titles and abstracts for 411 articles that did not support the PICO question. Peer reviewers reviewed full text of the last 27 articles and only 10 articles that supported the PICO were accepted for final appraisal and leveling the evidence. Johns Hopkins Evidence-Based Practice Model for Nursing and Healthcare Professionals was used as a guide to appraise and level the evidence that supported the PICO question. PACU nurses from this academic freestanding surgery center appraised and leveled 10 articles that resulted in the following: four level I-A, two level III-A and four level V- A for quality. The total evidence recommended that acetaminophen was a superior pre-emptive mediation by improving the children’s pain and comfort in the PACU on emergence from anesthesia.

Level and Quality of Included Evidence

Pediatric Preoperative Pain Medication Evidence Summary							
Author/s - Year Title - Journal	Level Quality	Design/ Method	Sample/ Setting	Major Variables Studied & definitions	Measurements & Data Analysis	Results/Findings	Limitations/ Discussion
Baygin, O., et al. (2011). Comparison of pre-emptive ibuprofen, paracetamol, and placebo administration in reducing post-operative pain in primary tooth extraction. International Journal of Paediatric Dentistry	Level I-A RCT	Prospective, placebo-controlled, randomized, double-blind trial; Comparing efficacy of preemptive analgesia: ibuprofen, paracetamol, and placebo after dental teeth extraction	N=45 children, ages 6–12 yrs., needing primary mandibular molar extraction in Pediatric Dental Clinic,	Children needing primary mandibular molar tooth extraction were treated with treatment preceded by local anesthesia and analgesic drugs during the preoperative period	FACES Scale (5-criteria) used to evaluate pain: during injection; extraction; post-operative -by self- Kruskal–Wallis and Mann–Whitney U tests; paired t-test as the post hoc test; confidence level 95%	Use of pre-emptive analgesics showed lower FACES Scale compared to the placebo, irrespective of the age, weight, gender, and number of teeth extracted during the study period. Additionally, ibuprofen exhibited lower pain scores (P<0.05) compared to paracetamol at the 15-min (P<0.001) and 4-h (P<0.009) periods.	Preoperative use of ibuprofen and paracetamol may provide a pre-emptive analgesic effect in paediatric patients who receive adequate analgesia during mandibular primary tooth extraction.
Campbell, H. T., et al. (2019). Perioperative analgesia for patients undergoing otologic surgery: An evidence-based review. The Laryngoscope	Level I-A	Systematic Review 23 RCT; Canadian Studies ranged from 1997-2016	N=1,842 otologic surgery: 13 studies myringotomy/ Tympanoscopy; 5 Tympanomastoid surgeries; 5 inner ear & microtia surgery patients	Mean age of 8.1 years; age range 6 months - 56 years Heterogenous variables, including differences in agents, dosing regimens, timing of given dose, as well as variability in observational and self-reported pain	Cochrane Risk Bias Tool for systematic reviews	A variety of nonopioid analgesics including acetaminophen, NSAIDs, and α-agonists have been evaluated and demonstrated for efficacy in achieving adequate perioperative analgesia for a variety of otologic procedures.	Different pain scales in studies; Authors decided not to pursue meta-analysis
Kain Z, Mayes L, Caldwell-Andrews A, Karas D, McClain B (2006). Preoperative anxiety postoperative pain and behavioral recovery in young children undergoing surgery. Pediatrics	Level - III A	Non-experimental Observational study	241 children at Yale New Haven Medical Center aged 5-12 years outpatient elective T&A surgery	Assessors were blind to the study hypotheses. These members were trained to achieve inter-rater/intra-rater reliability of .90 on the mYPAS. Training sessions conducted every 3 months.	The modified Yale Preoperative Anxiety Scale (mYPAS) structured observational measure of preoperative	Preoperative anxiety in young children undergoing surgery is associated with a more painful postoperative recovery and a higher incidence of sleep and other problems	Emergence status of PACU children differed on basis of their anxiety in the preoperative holding area. Significantly higher proportion of children in the high-anxiety group was assessed as agitated, crying, and/or thrashing in PACU. Successfully achieved and sustained the goal of increasing use of perioperative acetaminophen surgical patients.
Mahon, B. M., et al., (2024). Improving perioperative acetaminophen administration for safer and cost-effective multimodal analgesia in pediatric surgery: A QI initiative. Pediatric Anesthesia	Level V-A	Quality Improvement Project	Model for Improvement methodology. ³ Key improvement tools included a key driver diagram (KDD) (Figure 1), process mapping and multiple plan-do-study-act (PDSA) cycle testing.	free standing academic children's hospital.	Used EMR to collect data that interface with EMR Excel Spread sheet for analyzing data	February 2021 and June 2021, we noticed a shift, indicated by a run of >8 data points above the center line, increasing our use of acetaminophen to 57% and 63%, respectively. Even though our project ended in December 2021, we continued to sustain our improvements with the final shift occurring in October 2022, reaching 66.8%	Pain impacts patient comfort and satisfaction following tonsillectomy. Inadequate pain control results in prolonged discomfort and the patient's well-being and quality of life during recovery. Healthcare providers need to prioritize pain management and tailor interventions to meet patient's needs. Implementing pain management strategies, can optimize pain control, The risk of bias in the included studies using the Cochrane Risk of Bias 1.0 tool. The researchers performed a frequent network of meta-analysis using a random-effects model. Primary outcome was postoperative pain assessments using validated pain scales.
Montazemi, M., Davanloo, A., Pahnabi, A., & Daneshian, M. (2023). Exploring effective pain relief strategies throughout tonsillectomy: Before, during, and after the surgery. Journal of Pediatrics Review	Level V-A	comprehensive search of electronic databases, including PubMed, Embase, and Cochrane Library was conducted for data gathering. The search strategy employed a combination of keywords related to the study topic	Inclusion criteria encompassed studies published between January 2000 and September 2022, written in English, and involved pediatric and adult patients undergoing tonsillectomy. Randomized controlled trials, prospective and retrospective cohort studies, as well as systematic reviews and meta-analyses, were included	A comprehensive search of electronic databases, including PubMed, Embase, and Cochrane Library, was conducted for data gathering. The search strategy employed a combination of keywords related to the study topic, including tonsillectomy, preoperative, intraoperative, postoperative, opioid, pharmacology, technology, recovery	The identified studies were screened based on their titles and abstracts, followed by a full-text review to assess their relevance to the topic.	In children there are very uncertain outcomes of postoperative pain control and may differ very little between the completion of surgery and patient awakening. Administering analgesics before pain perception	Pain impacts patient comfort and satisfaction following tonsillectomy. Inadequate pain control results in prolonged discomfort and the patient's well-being and quality of life during recovery. Healthcare providers need to prioritize pain management and tailor interventions to meet patient's needs. Implementing pain management strategies, can optimize pain control, The risk of bias in the included studies using the Cochrane Risk of Bias 1.0 tool. The researchers performed a frequent network of meta-analysis using a random-effects model. Primary outcome was postoperative pain assessments using validated pain scales.
Osorio, D., et al., (2024). Efficacy of different routes of acetaminophen administration for postoperative pain in children: A systematic review and network meta-analysis. Canadian Journal of Anesthesia	Level I - A	Conducted a systematic review of randomized controlled trials (RCTs)	children aged between 30 days and 17 yrs. who underwent any type of surgical procedure	Studied the comparisons of directly & indirectly, of intervention effect as a common comparator. Importantly, indirect comparisons and network meta-analysis facilitate the estimation of the relative effects of intervention.	There was no evidence of differences between intravenous vs rectal routes of administration of acetaminophen (difference in means, -0.28; 95% confidence interval [CI], -0.62 to 0.06; very low certainty of evidence) and intravenous vs oral acetaminophen	Outcomes of postoperative pain control and postoperative vomiting may differ very little between the oral and rectal route. Better designed and executed RCTs are required to address this important clinical question.	The risk of bias in the included studies using the Cochrane Risk of Bias 1.0 tool. The researchers performed a frequent network of meta-analysis using a random-effects model. Primary outcome was postoperative pain assessments using validated pain scales.
Thompson, A. R., Vernamonti, J. P., Rollins, P., & Speck, K. (2024). Implementing change: Sustaining enhanced recovery after surgery protocols in pediatric surgery using iterative assessments. Journal of Surgical Research	Level III A	Prospective Cohort Pectus Surgery observational - nonexperimental	16 children aged at large academic children's hospital using the ERAS protocol.	ERAS protocol criteria: Pectus repair surgeries are very painful. 16 pectus repairs performed using the ERAS protocol. 94% (n % 15) included the administration of preoperative acetaminophen, compared to 9% (n % 4) in the historical control group (P < 0.001).	Analysis Stata Statistical Software: Release 17 (Stata Corp. College Station, TX). The continuous variables were treated as nonparametric and were compared using the Mann Whitney U-test/Wilcoxon rank sum test. Differences in categorical variables were analyzed using Fisher's Exact tests. Significance was defined as P < 0.05.	16 pectus repairs included in the ERAS protocol group, 94% (n = 15) and 94% (n = 15) received: Preoperative acetaminophen and gabapentin, respectively, which was significantly greater than the historical control group (P < 0.001).	ERAS protocol compliance varies based on phase of care. Solutions to sustain protocols depend on the institution and the patient population. However, the utilization of implementation science fundamentals was invaluable in this study to identify and address areas for improvement in protocol compliance. Median/Maximum FLACC pain scores along with clinical safety profiles were statistically equivalent between the groups. The intervention was associated with a 2-day reduction in post-operative length of stay (P < 0.0001)
Vavolizza, R. D., et al., (2022). Standing intravenous acetaminophen is associated with a reduction of post-operative opioid use in infants aged less than 1 year treated on the acute care floor. Journal of Surgical Research	Level III-A	Retrospective cohort	Review N= 131 infants' charts meeting inclusion criteria: Performed between pre- and post-intervention on a surgery floor who received IV-acetaminophen every 6 hours	Retrospective chart review: acute care floor undergoing emergent and nonemergent abdominal or anorectal surgery from January 2012 through December 2020	Statistical significance was determined using Student's t-test, Wilcoxon Rank Sum Test, Fisher's Exact Test using SAS Version 9.4. All statistical analyses, a P value of 0.05 or less was considered significant.	Standing IV acetaminophen is associated with a reduction of post-operative opioid use in infants being treated on the acute care floor while maintaining equivalent FLACC pain scores. Similar opiate reduction strategies may be of value at other institutions.	Median/Maximum FLACC pain scores along with clinical safety profiles were statistically equivalent between the groups. The intervention was associated with a 2-day reduction in post-operative length of stay (P < 0.0001)
Zieliński, J., et al., (2022). The effect of pre-emptive analgesia on the postoperative pain in pediatric otolaryngology: A randomized, controlled trial. Journal of Clinical Medicine	Level I - A	RCT Study conducted in Poland Medical University	N=51 children ages 3-15 yrs. randomized to 2 groups (randomized and control: where patients, parents, anesthesia providers, and surgeons blinded	Prospective study investigated preoperative analgesia and postoperative pain assessment using Wong-Baker Faces Scale and the FLACC Scale	Control group given weight-based midazolam in flavored liquid; Experimental group – weight-based acetaminophen and midazolam preoperatively; PostOp pain assessed	Statistically significant correlation between administering pre-emptive analgesia (acetaminophen) and reducing pain in children after otolaryngological procedures compared to placebo.	Zielinski 2022re-emptive analgesia should be routinely used in children undergoing otolaryngological procedures.

Recommendations for Translation into Practice

Evidence overwhelmingly recommended that acetaminophen be administered to pediatric ophthalmology surgery patients before their surgery as its analgesic effects reduces pain and improves comfort for children emerging from anesthesia in PACU.

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Synthesis

Surgery can be a source of anxiety and pain for many patients, especially children and parents. While opioids and benzodiazepines are common to manage these issues, they come with risks. Evidence Review and Appraisal:
➤ **Total number** = 1,111; Duplicates removed = 673; Remaining = 438; After reviewed titles/abstracts =15; Full text= 9
➤ **Appraised and Leveled** = 4 Level I-A (2 systematic reviews RCTs); 3 Level III-A; 2 Level V-A
➤ **Evidence suggests** that giving acetaminophen before surgery is a safe and effective for children

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