[OS2-93] Intraoperative intravenous acetaminophen improves analgesia and reduces cost following tonsillectomy: Decision Analysis

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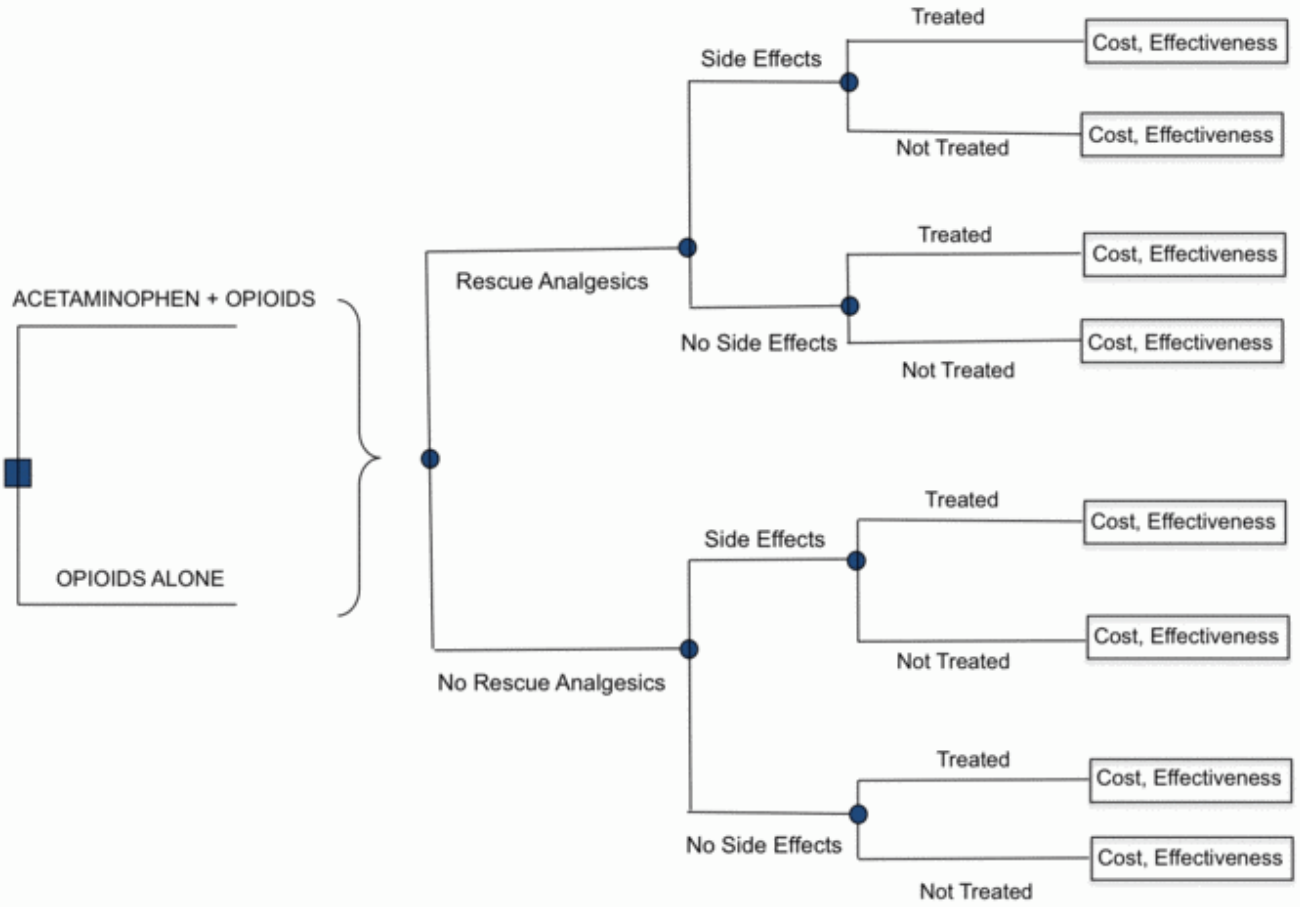
Background & Objective: Tonsillectomy is the second most common surgery in children and is associated with considerable pain. The goal of this study was to examine the cost-effectiveness of the intraoperative combination strategy of intravenous (IV) acetaminophen and opioids versus IV opioids alone strategy for pediatric tonsillectomy.
Methods: IRB approval was obtained. Data on use of rescue analgesics, incidence, and treatment of side effects were obtained from a prospective observational study (n=139). All patients had standardized clinical care. We used Decision Maker® software to construct and analyze a decision analytic model (Figure 1). Primary outcomes were cost and effectiveness. Costs included those of IV opioids, IV acetaminophen, rescue analgesics, and treatment of adverse events (nausea; vomiting; pruritus; respiratory depression). Rare serious adverse medication reactions (< 1%) were not modeled. Effectiveness was defined as frequency with which a clinical provider (MD, CRNA, or RN) did not administer a rescue analgesic. Model sensitivity analysis of marginal cost-effectiveness ratio was performed to study the cost and effectiveness over a probability range of 0 to 1. This was done to check for errors and test the validity of results.
Results: The overall cost of combination strategy was $56.36 and opioids alone strategy was $73.48. The combination saved $17.12 per tonsillectomy (Table 1). Costs came from hospital purchasing contracts and are in U.S. 2013 dollars. On the effectiveness outcome, combination strategy reduced rescue analgesics by 3.3% as compared to opioids alone strategy. Sensitivity analysis of marginal cost-effectiveness ratio showed that the combination strategy was more cost-effective when >35% of patients required rescue analgesic with opioids only strategy (Base-case = 0.35 in Figure 2). Although medication costs of the combination strategy are more, ultimately it is the least expensive strategy due to reduced time spent in PACU.
Conclusions: Even after including the direct cost of IV acetaminophen, the overall cost in the strategy receiving IV acetaminophen and opioids was lower by $17.12 per tonsillectomy when compared to those who received IV opioids alone strategy. Given the 530,000 tonsillectomies performed annually in the U.S., IV acetaminophen results in estimated reduced cost of $9 million per year.

Table 1: Direct perioperative cost analysis with and without IV acetaminophen

Variables	Cost	
Acetaminophen IV 10mg/mL 100 mL vial	$15.38	
Morphine IV 1mg/mL 10 mL vial	$10.59	
Fentanyl IV 50 mcg/mL 2 mL vial	$6.20	
Hydromorphone IV 2mg/mL 1 mL vial	$6.17	
Ondansetron IV 4mg/2mL 2mL vial	$3.94	
Nursing and ancillary cost of one episode of PONV	$13.25	
Cost in PACU (Facilities, Supplies, Labor per 10 min)	$63.70	
Probabilities of variables	**IV Acetaminophen + IV Opioids**	**IV Opioids alone**
Probability of rescue analgesic requirement	62 %	65 %
Probability of developing side effects among those who had rescue analgesics	36%	40%
Overall cost in 2013 U.S. Dollars	$ 56.36	$ 73.48
Savings per tonsillectomy ($73.48 - $56.36)	$17.12	

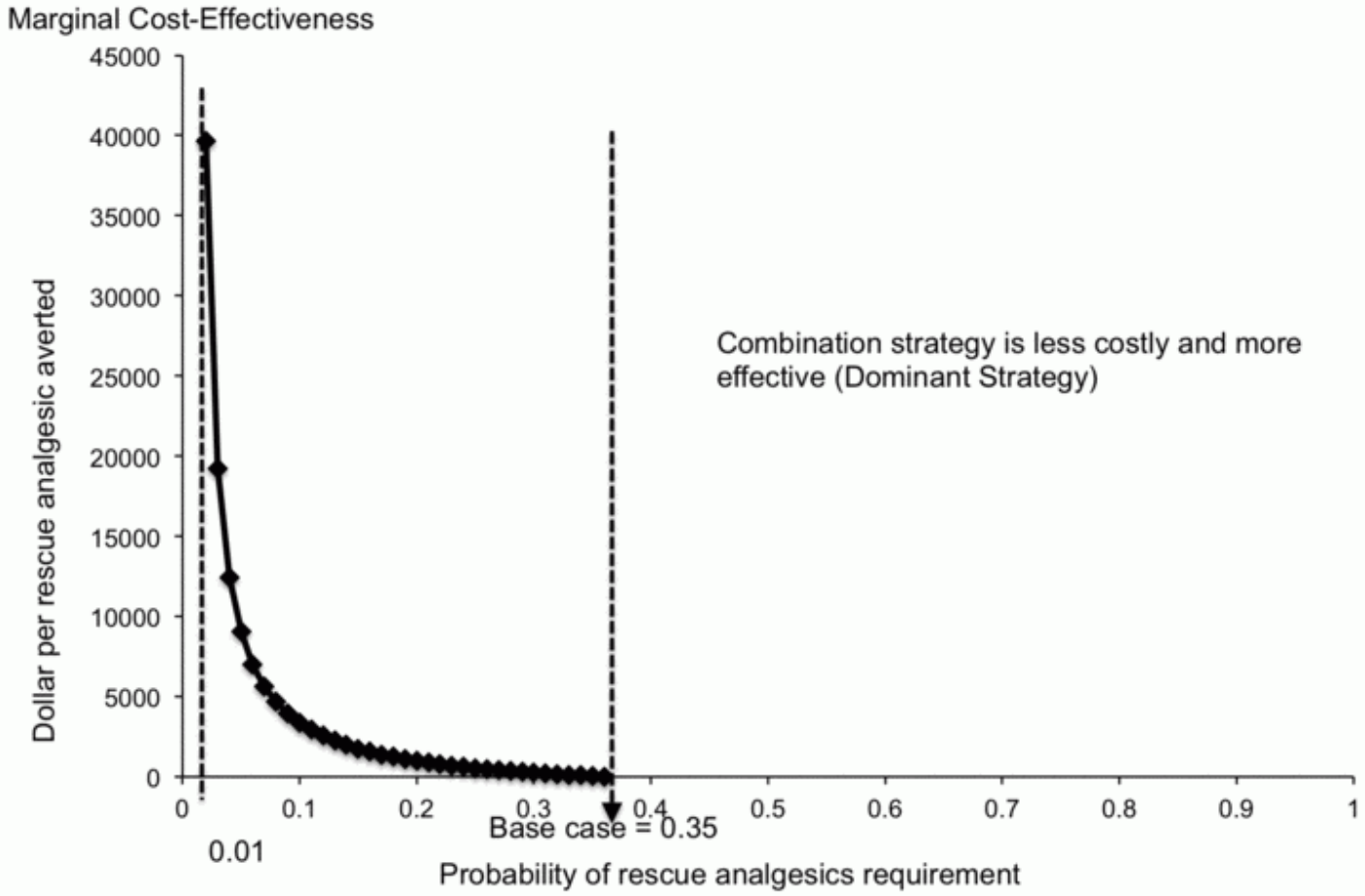
*Drug cost includes syringe costs, pharmacy preparation time, and extra documentation time for narcotics. Costs are in 2013 U.S. $. Medication costs are for single dose vials. The side effects modeled were nausea and/or vomiting, pruritus, and respiratory depression.

Figure 1: Decision Analytic Model



Decision Model of the use of IV acetaminophen in combination with opioids vs. IV opioids alone in pediatric tonsillectomies. The chance events following both the strategies are similar and are indicated by round circles following the bracket. Patients next face the need for rescue analgesics, subsequent development of side effects, and additional treatment or not for these side effects.

Figure 2: One-way sensitivity analysis of probability of recue analgesic use



One-way sensitivity analysis examining the marginal cost-effectiveness ratio of the combination of IV acetaminophen and IV opioids strategy compared with IV opioids alone as a function of the probability of requirement of rescue analgesics in opioids alone strategy. As the probability of rescue analgesic increases, the marginal cost-effectiveness ratio of combination strategy decreases. Above a probability of 35% (Base case = 0.35), combination IV acetaminophen and IV opioids dominates by being both less expensive and more effective. At a probability of rescue analgesics of < 1% (0.01) the marginal cost-effectiveness ratio of the combination strategy becomes infinitely large.