The Hospital for Sick Children
Technology Assessment at Sick Kids (TASK)

EXECUTIVE SUMMARY

THE COST-EFFECTIVENESS OF CLINIC-BASED CHLORAL HYDRATE SEDATION VERSUS GENERAL ANAESTHESIA FOR PAEDIATRIC OPHTHALMOLOGICAL PROCEDURES

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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Introduction

The inability of young children to tolerate detailed eye examinations while awake often necessitates the need for sedation or general anaesthesia (GA). Examinations under anesthesia (EUA) are carried out in the operating room (OR) and require many staff and resources. Chloral hydrate sedation allows examinations to be carried out in a nurse-led unit conveniently based in an outpatient clinic and may be a cost-effective alternative to GA.

Objectives

The primary objective was to determine the incremental cost of paediatric eye examinations carried out in the clinic under sedation using oral chloral hydrate compared to examinations carried out in the OR using GA per additional successful procedure gained from a societal perspective. The secondary objective was to conduct a cost-minimization analysis (CMA) under assumptions of equivalent effectiveness between clinic-based sedation and GA.

Methods

A cost-effectiveness analysis (CEA) was carried out from a societal perspective to compare eye examinations carried out under sedation (EUS) to eye exams carried out under anaesthesia (EUA). The analysis was performed using stochastic patient-level data from a retrospective cross-over cohort of 80 pediatric ophthalmology patients that had an EUS within seven months (prior to or following) an EUA at the Hospital for Sick Children (SickKids), Toronto, Canada. An episode of care time horizon that represented the patients' total length of stay at Sick Kids was used. Costs included direct health care costs including all medical personnel and services, supplies and equipment used for sedation and GA, as well as parent or caregiver productivity losses. Effectiveness and safety were assessed from the number of successful ophthalmological procedures and the number of adverse events in each group. Adverse events of interest included paradoxical reactions, desaturation, nausea and vomiting, prolonged sedation, and reduced heart rate. To address uncertainty, univariate sensitivity analyses were conducted for select cost variables and a probabilistic sensitivity analysis (PSA) was conducted using 1,000 Monte Carlo simulations. Mean costs with 95% confidence intervals (CIs) were estimated for all cost-effectiveness findings.

Results

In the base case, the expected cost of EUS was $404 (95% CI $385, $424) per patient and the expected number of successful procedures was 1.36 (95% CI 1.20, 1.52) per patient. The expected cost of EUA was $1,134 (95% CI $1,094, $1,174) per patient and the number of successful procedures was 2.03 (95% CI 1.86, 2.19) per patient. EUA was an average of $730 more costly per patient than EUS and resulted in an additional 0.66 successful procedures per exam. EUS was less costly but also less effective. Three adverse events were observed in two EUS patients compared to 1 adverse event in the EUA group. Results from the one-way sensitivity analysis showed OR cost to be the most sensitive model input, followed by anesthesiologist fees. Varying the cost assumptions did not change the finding that EUS was less costly compared to EUA. The mean cost per patient from the PSA was $406 (95% CI $401, $411) for EUS and $1,135 (95% CI $1,125, $1,145) for EUA. The mean number of successful procedures per patient was 1.39 (95% CI 1.34, 1.42) for EUS and 2.06 (95% CI 2.02, 2.11) for EUA. EUA was $729 more costly on average than EUS but resulted in an additional 0.68 successful procedures per child. In the PSA, the number of planned procedures and the probability of a successful sedation were the most sensitive model inputs. In the CMA, when failed sedations in the clinic were assumed to be completed in the OR, the expected cost of EUS increased to $586.31 (95% CI $438.08, $734.54), but remained significantly less than EUA. The strategy that required patients to attempt an exam in the clinic first, and if needed (due to failed sedation), undergo a second visit in the OR, resulted in mean cost savings of $555.37 (95% CI $282.74, $818.13) per patient, approximately $187 less than the incremental savings per patient in the base case.

Conclusions

Hospital budgets are under increasing pressure to rationalize care. Interventions that reduce costs despite being slightly less effective can result in more efficient allocation of healthcare resources when the trade-off between costs and outcomes does not pose morbidity or mortality risks. EUS represents an easily adopted hospital-based intervention with negligible set-up costs, with savings that can accrue even when patient throughput is low. Results from this study demonstrated significant savings when ophthalmologic exams were carried out in an outpatient clinic using chloral hydrate sedation, albeit with fewer procedures completed per exam. When taking into account the proportion of failed sedations that have to be repeated in the OR, the clinic approach remained cost-saving. Exams carried out in the OR under GA may be more appropriate when a large number of procedures per patient are required.