Racial differences in the pain management of children recovering from anesthesia
Nafiu O, Chimira W, et al.
Pediatric Anesthesia. 2017; 27: 760–767

This is a prospective, observational study of 771 children aged 4-17 years, evaluating racial differences in probability of receiving analgesia for pain in PACU, the background being that racial disparities have been identified with pain management in e.g. paediatric emergency departments.

The conclusions were that receipt of analgesia for acute pain in PACU was not significantly associated with a child's race. For severe pain race was not a factor in the administration of any analgesia although minority children were more likely to receive IV opioid for mild pain.

The relevance to us in Australia is unclear as it is hard to compare the social fabric of American society with ours with respect to race, multiculturalism and its effects on something like post-operative pain relief! Additionally, because of the small numbers of minority groups compared to the white population, all the different minority groups were grouped together rather than evaluated separately. It might have been interesting to examine the particular ethnic groups that are particular to one's own institution.

Reviewed by: Dr Vanessa Rich

Benefits of an individualized perioperative plan for children with autism spectrum disorder
Swartz J, Amos K, et al.
Pediatric Anesthesia. 2017; 27: 856–862.

This paper was a retrospective chart review of 224 patients with autistic spectrum disorder (ASD) for whom an individualised perioperative plan was developed. The authors reviewed the need for pre-operative sedation, sedation stratified by ASD severity level, behaviour at induction and caregiver satisfaction.

The plan was developed by a multidisciplinary team, involving the patient as well as the caregiver. Decisions were made regarding optimal time of day for the procedure, modification of hospital arrival time, minimisation of admission procedures and place transitions, premedication, use of distractions and the PACU environment. Caregiver satisfaction was assessed with a routine postoperative phone call.

Requirement for premedication increased with increasing severity of ASD, but the overall premed rate was 38% of the cohort. 90% of the cohort was cooperative at separation and induction of anaesthesia and was inversely correlated with the severity of ASD regardless of sedation. Only 51% of the caregivers were successfully contacted but 98% of them were satisfied with the perioperative experience.

The results suggest that perioperative programs for the management of children with ASD are beneficial and there certainly was a fairly low rate of premedication and high rate of cooperation at induction; however, this was not able to be compared with rates of sedation at the same institution prior to implementation and was only compared with published rates of premedication at other institutions.

Take Home Message
It does make common sense that children with ASD do not necessarily manage well within the One-Size-Fits-All approach to the perioperative process and that modifications depending on the needs of each child would make for a smoother path for the child. Despite the shortcomings of this paper in terms of scientific endeavour, it no doubt required a significant outlay in terms of time and personnel to develop the plans for the children, as well as buy-in and commitment from the perioperative staff to facilitate the individual plans. For this the team involved should be applauded.

Reviewed by: Dr Vanessa Rich

Premedication with salbutamol prior to surgery does not decrease the risk of perioperative respiratory adverse events in school-aged children

Ramogolam et al

British Journal of Anaesthesia, 119 (1):150-7 (2017)

Background

Respiratory events remain the leading cause of perioperative mortality and morbidity in the paediatric population. We know that when a child has a cold they are at an increased risk of bronchial hyper-reactivity and airway events, but there is still a question as to whether bronchodilation by way of salbutamol pre-medication may mitigate this risk.

This double-blind study randomised 470 children ages 6-16 years to receive placebo or salbutamol via a spacer within 20 minutes of commencing anaesthesia, and then compared the incidence of respiratory events between groups. In order to be eligible, the child's parent needed to report at least two risk factors from an extensive and varied list of perioperative respiratory events (cold <2 weeks, wheezing <12 months, exercise-induced wheeze, nocturnal cough, eczema, passive smoking, family history of atopy). Any respiratory events encountered were recorded by the anaesthetist or the PACU nurse. They included laryngospasm, bronchospasm, desaturation <95%, airway obstruction, severe coughing and postoperative stridor. Of note, all children had a general anaesthetic and an LMA was used. Cases where a child was intubated were not included. The incidence of respiratory events was 14% in the placebo group and 12% in the salbutamol group – this difference was not statistically significant. Further, when only severe respiratory events (bronchospasm and laryngospasm) were compared between the groups there was also no difference, with 5 patients in each group exhibiting these symptoms.

Discussion

The results and conclusion of this study are interesting in that it deviates from the hypothesis that salbutamol is protective in at-risk children presenting for surgery. However, it does not enlighten us as to when salbutamol may actually help. The total study group were not at particularly high risk of having airway events - the authors acknowledge only 25% had had a cold within the last two weeks, so 75% had only minor risk factors. They were all over age six and we know that smaller children are at a greater risk of respiratory events. The study did not include any patients who were intubated, which is well known to increase airway resistance, and excluded ENT procedures which may also increase risk. Further, the LMA's were mostly removed awake and it is not uncommon for this to be associated with coughing and occasionally hypoxia which is unlikely to be affected at all by salbutamol pre-medication. Use of opiate analgesia was not compared between groups. These factors make the results more difficult to interpret.

It may be that salbutamol is effective in children with wheeze or an active cold who require intubation, however this study did not help to answer this question. While the subgroup analysis looking at only severe events (laryngospasm, bronchospasm) showed no difference, the numbers were very small and therefore the results are difficult to interpret with confidence. It is likely that larger numbers and a more focused, at-risk population would be required to truly determine whether salbutamol is useful.

Take-home message

This study confirms the suspicion that the routine use of salbutamol in relatively low-risk children having low-risk procedures is not likely to be a worthwhile intervention. It does not dispel the possibility that salbutamol may be helpful when children are at high risk of laryngospasm and/or bronchospasm, for example when the child is small, has an active cold or wheeze, will require intubation and is having an airway procedure.

Reviewed by: Dr Amanda Dalton

Association Between Exposure of Young Children to Procedures Requiring General Anesthesia and Learning and Behavioural Outcomes in a Population-based Birth Cohort

Hu et Al.
Anesthesiology. Vol 127 (2): 227 – 240

This retrospective cohort study looks at children from Olmsted County Minnesota from 1996 to 2000. After propensity matching, children in this cohort were grouped for anaesthesia exposure before the age of 3. 70 patients exposed to GA were excluded because a matched control could not be found. The groups were analysed for potential bias. The age of three was chosen for practical reasons. Firstly, this age is comparable to that in previous studies. Secondly it allowed for there to be sufficient numbers of subjects within a presumed window of vulnerability. 116 children had multiple exposures, 457 had a single exposure and 463 children were unexposed. 21 children were excluded because of severe intellectual disability. Characteristics of the children across the three groups were similar. Characteristics of the children who were exposed to GA but not enrolled in the trial were similar to those enrolled. The children within the district did not differ to children outside the district.

Medical and school records were used to assess outcomes. The age at first exposure was significantly higher in children who had a single exposure to anaesthesia. The mean duration of exposure was 3 times higher in multiply exposed children and was greater than 2 hours in 52 % of these children (vs 12 % of singly exposed children). The findings of this study are similar to the earlier cohort. The study found that multiple exposures was associated with increased frequency of learning disabilities and attention-deficit/hyperactivity disorders. In addition, multiple exposures were associated with a decreasing in reading and language development but not cognitive ability. The association between single exposure and ADHD did not reach statistical significance. The authors conclude that this may be due to insufficient power in the study to detect a difference or due to a lack of association between single exposure and ADHD. The authors note that the overall frequency of learning disability increased when compared to the earlier cohort whilst that for ADHD decreased. This is in keeping with the overall population trends for the two conditions over the same time period.

Take Home Message
This study is of interest because it looks at children anaesthetised with modern techniques. The earlier cohort of children from Olmsted County was taken between 1976 and 1982. Since then anaesthesia has seen a shift from the use of halothane to the use of sevoflurane and isoflurane, the introduction of pulse oximetry and capnography as standard monitoring and in the case of the study location, an increase in sub-speciality trained paediatric anesthesiologists. Children receiving multiple exposure to anaesthetics before the age of 3 are at risk of adverse outcomes in the domains of learning and attention. Causality cannot be inferred. For a further expert discussion of the implications of this study, please read the Editorial in the same issue[1]. Importantly, the Editorial looks at the likelihood of a causal relationship between anaesthesia and ADHD with respect to three factors: Reproducibility of results, the issue of confounding variables and biological plausibility. In particular they outline the pathogenic mechanisms causing ADHD and how these might interact with anaesthesia.

1. Can We Really Suggest that Anesthesia Might Cause Attention-deficit/Hyperactivity Disorder? D Efron, L Vutskits and A Davidson. Anesthesiology 2017. Vol 127(2): 209-211.

Reviewed by: Dr Catherine Olweny

Current use of factor concentrates in pediatric cardiac anesthesia

NA Guzzetta et al
Pediatric Anaesthesia 2017; 27: 678-687

This systematic review assesses the current use of factor concentrates focusing on recombinant activated factor VII, fibrinogen concentrate and prothrombin complex concentrates and highlight areas that require further research in paediatric cardiac surgery. This article reviewed the currently available evidence both in adults and paediatrics and discusses the maturation process of haemostasis, including the differences between neonates and adults such as age-related variation in fibrinogen structure and function.

For recombinant activated factor VII, there is substantial literature in the off-label use in pediatric cardiac surgery but the authors could only find a single prospective study which showed no difference with placebo group for prophylaxis, however the study has been criticized for using an ineffective dose, a dosing regimen that was not frequent enough for children and that the factor concentrate was not designed to be used as an 'universal haemostatic agent'. The increase in risk of thrombosis was discussed. The article mentioned the conclusion from the Congenital Cardiac Anesthesia Society in 2012 that there were insufficient data to make evidence based recommendation but there is observational evidence of benefit as rescue therapy.
The article discussed the manufacturing process of fibrinogen concentrate and the pharmacokinetic in adult and older children. They also mentioned the relationship between pre- or postoperative plasma fibrinogen concentration and postoperative bleeding. One of the study quoted showed that there is no significant difference in median blood loss in the first 48 hours and amount of allogenic blood product used between giving fibrinogen concentrate and cryoprecipitate.
Finally, the article discussed the use of prothrombin complex concentrates (PCC). PCC has been shown to reduce transfusion requirement and re-exploration for bleeding in adult cardiac patients. There is a lack of paediatric data, there is one prospective study on a 4 factor PCC (Confidex) in infants which showed reduction in red blood cell transfusion and chest drain output but no difference in need for Fresh Frozen Plasma. The study author hypothesized that it may be a good adjunct to platelets and cryoprecipitate to augment coagulation. The article also discussed the potential risks for unwanted thrombosis from PCC.
The authors produced a table which highlighted the research needs which included data for efficacy, safety and cost effectiveness. They concluded that these studies are required before evidence based recommendations can be on the use of factor concentrates in paediatric cardiac surgery.

Reviewed by: Dr Abigail Wong

Effects of intraoperative liberal fluid therapy on postoperative nausea and vomiting in children - A randomised controlled trial.

Ashok V et al.
Pediatric Anesthesia. 2017; 27: 810-815.

Perioperative liberal fluid therapy might be an inexpensive and safer alternative to pharmacological prophylaxis of PONV.

This was a randomised, double-blind study in India of 145 ASA I and II children aged 3-7 years undergoing lower abdominal and penile surgery (<60mins) under GA. The exclusion criteria included children with high risk of PONV (previous PONV or motion sickness). The children were randomly assigned to receive an infusion of Ringer's lactate intraoperatively. The restricted group received 10ml/kg/hr and the liberal group received 30ml/kg/hr. All received sevoflurane with a caudal

block and IV paracetamol. No intraoperative opioids, antiemetics or muscle relaxants were given. All episodes of nausea, vomiting and rescue antiemetics were assessed for 24 hours.

The incidence of PONV was significantly less in the liberal group with 20 (27%) children vomiting versus 33 (46%) children in restricted group (p=0.021). The time to first rescue antiemetic was longer in the liberal group but not statistically significant (p=0.337). Also 60 (83%) children in the restricted group complained of thirst in the first 6 hours postoperatively compared to 12 (17%) in the liberal group.

Take home message
This study supports the more liberal use of fluids intraoperatively to prevent PONV and thirst. Obviously, these results may not apply to different clinical settings such as longer surgeries or when opioids or antiemetics are given. Whilst 30ml/kg is unlikely to cause problems for children is this setting having short procedures, potential complications of liberal fluid therapy would have to be considered for longer surgeries and in children with co-morbidities.

Reviewed by: Naomi Pearson

Differences in intraoperative hemodynamics between spinal and general anesthesia in infants undergoing pyloromyotomy

Ing. C et al.
Pediatric Anesthesia. 27 (2017) 733-741.

This was an observational study looking at infants who underwent pyloromyotomy at 2 sites from 2008-2013:
1. 51 infants received spinal anaesthesia (SA) at the University of Vermont Medical Centre (UVM)
2. 52 infants received general anaesthesia (GA) at Columbia University Medical Centre (CUMC).
All infants included had available electronic anaesthetic records and baseline haemodynamic data and were ASA 1 or 2. If placement of spinal block was unsuccessful or an inadequate sensory level obtained, infants in the SA group were excluded.

Intraoperative BP was assessed approximately every 5 min at UVM and 3 min at CUMC. All the infants who had SA had an open pyloromyotomy whilst of those receiving a GA, 36% had an open procedure and the remainder had a laparoscopic procedure. In the GA group 48% of infants had an awake intubation with the remaining receiving a RSI. All were given Sevoflurane for their GA, 1 was also given Desflurane and 2 also had nitrous oxide. Most infants also received propofol and some received fentanyl and paracetamol. No vasoactive medications were administered to any infants in this study. The mean volume of IV crystalloid given in the GA group was 21ml/kg and 13ml/kg in the SA group. The mean duration of anaesthesia was longer in the GA group (90.3min) versus 72.6min in the SA group.

The decrease from baseline for mean intraoperative SBP was 8.2% for SA and 24.2% for GA. The decrease from baseline for mean intraoperative MAP was -16.3% for SA versus -24.6% for GA infants. SA infants also had smaller drops in minimum intraoperative MAP and SBP. There were no significant differences in heart rate between SA and GA infants. A further analysis looked only at infants who underwent an open procedure and the haemodynamic differences remained the same.

Take home message:
This study found that SA performed in a group of healthy infants undergoing pyloromyotomy resulted in reduced changes in BP from baseline and significantly higher BP readings in SA compared to GA infants. It is still difficult to say if these haemodynamic differences between the 2 techniques are likely to have

clinically significant outcomes and other factors also need to be considered when choosing the technique of anaesthesia for these infants.

Reviewed by: Naomi Pearson

An Analysis of Substandard Propofol Detected in Use in Zambian Anesthesia
Mumphansha H et al. Anesthesia and Analgesia. 2017 vol.125 (2): 616-619

This paper describes the investigation of Unimed Propofol Injection following reports of adverse events associated with its use in hospitals across Zambia. The adverse events noted included urticaria, bronchospasm, and profound hypotension. In addition, the propofol appeared to not produce the desired effect after a seemingly appropriate dose. Samples of the drug from two different batches were analysed in Ottawa Canada and were compared to a Canadian manufactured equivalent. The samples analysed were stored according to the manufactures instructions from the time they were obtained until analysis. However, the supply chain and storage prior to collection could not be commented upon. Although the samples were found to contain propofol, they did not contained the stated amount of propofol with one sample containing as little as 44% propofol. None of the samples were out of date and no known degradation by-products were found on analysis. According to the article, the British Pharmacopoeia states that the propofol content should be within 95.0 % and 105.0 % of the amount stated. The authors conclude that removal of propofol from use in Zambia was neither practical (Thiopentone was in short supply and ketamine is not an ideal agent for all cases) nor in the best interest of patients. Whilst the Unimed brand was removed from use in Zambia, there remained the potential for other substandard products. The authors conclude courageously that the only solution is working towards understanding the anaesthetic medication market and supply chain in order to regulate it effectively.

Take Home Message

1. The importance of documenting and reporting any unexpected effects of commonly used drugs.
2. The problem of substandard (and potentially counterfeit) medications can affect anaesthetic medicines.
3. To ensure patient safety, close monitoring and regulation of the anaesthesia medicines market and supply chain needs to extend to all drugs.

Reviewed by: Dr Catherine Olweny