



Interactive video games to reduce paediatric procedural pain and anxiety: a systematic review and meta-analysis.

Sajeev M et al. *BJA*, 2021, 127(4): 608-619

Summary

This review is based on 34 studies suitable for meta-analysis out of 36 eligible studies, which were in turn selected from 2185 abstracts found through a literature search using Medline, Embase & PsycINFO along with 5 articles from a Google Scholar manual search. The combined selected studies have 3406 patients between the ages of 1 to 18 years, presenting for a variety of procedures with the commonest being venous access (33%) and day surgery (31%). The definition of video games is based on the Oxford English dictionary definition, and this encompasses a variety of devices with an interactive audiovisual component including VR games, conventional video games and non-VR customised games.

The selected studies were analysed using the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' guidelines. Primary outcomes were paediatric anxiety and paediatric pain which found children that played video games reported less anxiety and pain. Interestingly, in the subgroup analysis, there were no significant differences between types of video games used. Secondary outcomes looking at caregivers' anxiety and the need for patient physical restraints were also favourable in the video games groups. Secondary outcomes which were either equivocal or showed no difference include improvement in burns wound healing, perioperative procedural compliance and emergence delirium. Adverse events from the studies were found to be minimal, with the commonest adverse events being nausea, vomiting, and motion sickness; with less common ones being dizziness, headaches, seizures and claustrophobia.

Take Home Message / Commentary

There is increasing evidence that peri-procedural anxiety in the paediatric population is a common occurrence and has an impact on patient morbidity. This meta-analysis suggests that the use of video games appears to have a small to modest effect in improving procedural anxiety and pain, with very little unwanted side effects and a high level of patient acceptability. Encouragingly, the type of video games used did not appear to make a difference, which may make this option economically more viable. The authors have stated that more research is needed to confirm this conclusion, as well as to look at optimal timing of this intervention and staff involvement in its implementation.

Personally, given most parents and carers have access to video games on their smartphone or tablet devices, I would be happy for their child to continue to play during anaesthetic interventions as one method of potentially reducing periprocedural anxiety.

Reviewed by Dr. K.C. Law

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



Incidence, characteristics and risk factors for perioperative cardiac arrest and 30-day-mortality in preterm infants requiring non-cardiac surgery

Jansen, G et al., *Journal of Clinical Anesthesia*, 2021 Oct;73:110366.

Summary

This is a retrospective observational study that includes 229 preterm infants (age < 37wk) having surgery from the records of 22650 paediatric anaesthetics in one large German tertiary hospital over 10 years (2008-2018).

30-day-mortality was 10.9% (25/229) and **perioperative mortality** 0.9% (2/229).

Risk factors for mortality were perioperative cardiac arrest (OR 12.5), low body weight (wt<1kg OR 26.0; 1-1.5kg OR 10.3); comorbidities involving the lungs (OR 3.7) and gastrointestinal tract (OR 3.5); sepsis (OR 3.6); afterhours surgery (OR 7.3); emergency surgery (OR 4.5); and pre-existing catecholamine therapy (OR 5.0).

Incidence of **perioperative cardiac arrests (POCA)** was 3.9% (9 of 229).

Risk factors were congenital anomalies of the airways (OR 4.7), lungs (OR 4.7) heart (OR 8.0), and pre-existing catecholamine therapy (OR 59). Of these 9 POCA cases, 5 had circulatory causes (haemorrhagic or septic shock), 2 dying in theatre and 3 who died in NICU within 30 days. All those who survived had POCA attributed to respiratory causes (blocked ETT, difficult intubation, dislodged ETT and pneumothorax).

Comments

Anaesthetising sick and small preterm neonates causes even the most experienced anaesthetists concern. Risk factors for POCA in children as described in the literature include age <1yr, prematurity, ASA \geq 3, and emergency surgery. For neonates, risk factors are prematurity, congenital heart diseases (CHD) and other congenital defects. The common theme is preterm neonates. Though there are a few single-centre studies referenced, the multicentre NECTARINE study published recently is the largest to date, including 690 cases of preterm infants. Here 30-day mortality was 2.4% for non-cardiac surgery, there were 8 cases of POCA (1.15%) and no intraoperative deaths.

In this summarised paper, the incidence of POCA and mortality is markedly higher than other literature, possibly because this was done at a tertiary centre that takes care of sicker and smaller children. With the small sample size of POCA cases (9) and perioperative deaths (2), care needs to be taken in interpretation but none of the factors are surprising. Some of these risk factors can also be interpreted as an expression of the severity of the underlying disease (like catecholamine therapy) rather than causative. After-hours risk can be explained by either surgical urgency or resource availability. It was relevant that intraoperative shock (haemorrhagic or septic) as a cause of POCA was associated with a 100% mortality rate as compared to respiratory causes.

Understanding perioperative incidence, characteristics and risk factors of premature neonates undergoing surgery is significant for all paediatric anaesthetists. Despite the limitations of this study, it confirms the importance of perioperative assessment, preparation, scheduling of optimal surgical timing, resource management, protocols (like shock, haemorrhage and coagulation) and optimal preoperative stabilization in this high-risk population.

Reviewed by Dr. Graham Knottenbelt

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



Behavioural changes after hospital discharge in preschool children experiencing emergence delirium after general anaesthesia: A prospective observational study Kim et al., Paediatric Anaesthesia, 2021;31(10):1056–1064

This study looks specifically at whether the experience of emergence agitation after anaesthesia in small children will lead to deteriorating behaviour a week post-operatively. This is a fraught area: we know post-operative behavioural regression is a real phenomenon, but ascertaining which factors in the peri-operative journey contribute can be complex. Pre-existing anxiety, pain, prolonged admission and a departure from usual routines will all factor into a child experiencing behavioural regression after surgery.

The numbers in the study are small – 100 children aged 2 to 7 were recruited, with only 73 being included in the final analysis. Inclusion involved a parent completing a child behaviour checklist (CBCL) pre-operatively, and then repeating this same checklist a week post-surgery. Children also had a pre-op anxiety score collected (mYPAS score), as well as an emergence delirium score (PAED) and a pain score (FLACC). Of note, 58% were recorded as having emergence delirium, a relatively high proportion, which was attributed to a high representation of children undergoing ophthalmological and ENT surgery.

Regression analysis of the data found that the non-emergence delirium group had lower rates of behavioural disturbance post-op than those who had emergence delirium. As one might expect, pre-operative anxiety and emergence delirium were related.

General thoughts and Take Home Messages

In this study, the children routinely had a cannula inserted pre-operatively and many of them had intravenous midazolam or ketamine pre-medication (they do not say how many had pre-medication) followed by sevoflurane anaesthesia. For those anaesthetists who practice high volumes of propofol-based anaesthesia these findings may not be applicable to their practice. Furthermore, the low numbers in this study make it impossible to determine whether pre-medication had any effect at mitigating any pre-operative anxiety.

The findings of this study become relevant if we can now determine meaningful ways in which to reduce emergence delirium in our local institutions. Perhaps identifying those children who are particularly anxious pre-operatively and intervening at this stage would be helpful. The study used a somewhat cumbersome assessment of anxiety which would not be practical in most busy hospitals. There may be a role for shorter and simpler scales to identify and treat at-risk children and their families.

Overall the results of this study may not be surprising, but they are a reminder that hospital encounters can be stressful. Exactly what methods we may use to lessen the risk of post-operative behavioural disturbance remains an area in need of further examination.

Reviewed by Dr. Amanda Dalton

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



Bronchopulmonary Dysplasia

A Schmidt and C Ramamoorthy, *Paediatric Anaesthesia*, 2022; 32(2):174-180

Bronchopulmonary dysplasia (BPD) is a respiratory disease of prematurity with a spectrum of severity. This educational review article summarises current literature and developments in understanding and definitions of bronchopulmonary dysplasia. Risk factors for the disease are antenatal (IUGR, infection), at birth (prematurity, SGA) and post-natal (high inspire O₂ concentration and mechanical ventilation).

Pathophysiology has largely changed with the advancement in ventilation strategies and neonatal care leading to a ‘new’ picture of bronchopulmonary dysplasia with milder clinical manifestations. It is important to note that some of these patients particularly the extreme preterm can still present with a severe picture.

New pathophysiology is thought to be due to ‘growth arrest’ of the pulmonary system

- Alveolar simplification (hypoplasia, remodelling of extracellular matrix and overall reduced surface for gas exchange)
- Pulmonary vascular dysangiogenesis (thickened muscle layer of vasculature with increased resistance and development of pulmonary hypertension)
- Exposure to pro-inflammatory stimuli (infection, oxygen toxicity, these mediators lead to cell apoptosis and further mal-development of the airways)

The previous definition as a need for oxygen at a postnatal age of 28 days or corrected gestational age of 36 weeks does not account for severity of the disease. A definitive prospective study of 2677 premature infants by the National Institute of Child Health and Human Development in 2019 has shown the best predictor for severe respiratory morbidity is the type of respiratory support required at a corrected age of 36 weeks which was independent of the FiO₂ used.

TABLE 1 Grading of bronchopulmonary dysplasia based on the National Institute of Child Health and Human Development prospective study²

Grade	iPPV	nCPAP or niPPV	nasal cannula
I (mild)	no	no	flow <2 L/min
II (moderate)	no	yes	flow >2 L/min
III (severe)	yes	no	no

Note: Criteria are applied at 36 weeks corrected gestational age or discharge.

Abbreviations: iPPV, invasive positive pressure ventilation; nCPAP, nasal continuous positive airway pressure; niPPV, non-invasive positive pressure ventilation.

Adoption of minimally invasive ventilation strategies where possible in the form of non-invasive ventilation, CPAP, and for those requiring invasive ventilation alteration of parameters to tolerate lower saturation targets to limit the FiO₂ (90-95%), tolerating higher CO₂ levels (55-65mmHg) and use of smaller tidal volumes, have all shown improved outcomes in these patients.

Child and adult patients with a background of BPD often have a quality of life similar to those preterm infants without BPD, although they are at higher risk for respiratory tract infections,

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



reactive airways disease, reduced exercise tolerance and significant impairments of forced expiratory volumes in 1s (FEV1). Appropriate screening and assessment of these patients is therefore important pre-anaesthesia. For those patients with pulmonary hypertension that present the highest anaesthetic risk in this subgroup of patients, a more thorough work up should be performed with consideration to post-operative destinations.

Summary

A new classification system has been developed to try to address long term prognosis of BPD. More research will be required to validate this tool. Awareness of long-term implications of BPD and assessing risk for anaesthesia will become a more prevalent consideration. With the advancement in neonatal care of extreme premature babies, the likelihood of encountering these patients for future anaesthetics will increase. Identification of long-term complications in these patients and awareness of the risks of both childhood and adult patients presenting with a history consistent with BPD in the perioperative period will help to address anaesthetic risk.

Reviewed by Dr Jennifer Aldis

Anesthesiologist-related factors associated with risk-adjusted pediatric anesthesia-related cardiopulmonary arrest: a retrospective two level analysis

R Christensen et al, *Paediatric Anaesthesia* 2021; 31(12):1282-1289

Introduction

This single-centre, retrospective study examines the impact of anaesthesiologist-related factors on anaesthesia-related cardiac arrest and is an attempt to replicate the results of the work by Zgleszewski et al, in 2016. The latter showed a higher risk of anaesthesia-related cardiac arrest for anesthesiologists with lower annual days of delivering anaesthetics.

Methods

The 10-year data from a tertiary paediatric hospital included potential patient-related, system-related, and provider-related risk factors of anaesthesia-related cardiac arrest. Cases were filtered from an anaesthetic information management system and institutional and national databases.

Results

109775 anaesthetics were delivered over the decade. There were 240 confirmed cases of cardiac arrests of which 34.2% were identified as anaesthesia-related.

Anaesthesia-related cardiac arrest was statistically more prevalent with increasing ASA-PS ($P<0.001$), <180 days postnatal age ($P<0.001$), cardiac surgery ($P<0.001$), emergency cases ($P=0.004$), and trainee supervision ($P=0.09$). Most anaesthesia-related cardiac arrests occurred in operating rooms (75%), during daytime hours (91%) and on weekdays (95%).

Anaesthesiologist factors (provider characteristics and years of experience) were not associated with increased incidence of anaesthesia-related cardiac arrest.

Comments

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



This study reported a significantly higher anaesthesia-related cardiac arrest rate than previously reported in national registries and other single-institution studies. This may reflect this study's population of significantly more patients with ASA-PS >3 and postnatal age <180 days.

The results of this study should be interpreted with caution for several reasons- this is a retrospective, single-centre study. Cases missed when searching the database and the exclusion of paper anaesthesia records may have resulted in undercounting. Unmeasured variables such as congenital heart disease or patients with pulmonary hypertension undergoing noncardiac surgery may also have impacted the results.

The study was unable to replicate the association between proportion of clinical time and anaesthesia-related cardiac arrest. A multicentre study may be needed to address these questions.

Reviewed by Dr Mei-Foong Yeoh

Hypoxemia in Young Children Undergoing One-lung Ventilation: A Retrospective Cohort Study

Templeton, TW et al; for the Multicenter Perioperative Outcomes Group

Investigators

Anesthesiology, 2021; 135:842–53

One lung ventilation in children remains a specialised practice in children performed by either endobronchial intubation or use of a bronchial blocker. With low case numbers, assessment of best practice is difficult. This retrospective cohort study interrogated data from a large multicentre cohort of children (aged 2 months to 3 years) undergoing one-lung ventilation for non-cardiac procedures. Investigators analysed 306 cases across 15 sites looking at factors that influenced likelihood of hypoxaemia during one-lung ventilation, primarily the relationship between lung isolation technique and incidence of hypoxaemia.

Findings

Investigators noted hypoxaemia was common with 26% of children saturating at less than 90% for 3 min or more and 18% of children saturating at less than 90% for 5 min or more (continuous). Bronchial blocker use was found to be associated with a lower risk of hypoxemia during one-lung ventilation. Investigators also noted left-sided surgery had reduced incidence of hypoxemia, however this finding did not reach statistical significance when controlled for other factors. Hypoxaemia risk had no relationship with lower tidal volume ventilation, younger age, lower preoperative saturations, or increased duration of one-lung ventilation after controlling for other factors.

Commentary

This study adds to the limited multicentre data available on one lung ventilation in children. Most data to date derives from individual experience and single centre case series. Notably, multicentre studies have not previously looked at factors such as age, surgical side, or lower tidal volume

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.



ventilation with respect to risk stratification for the outcome of intraoperative hypoxaemia during one-lung ventilation. However, limitations of this study include the relatively small sample size and retrospective method. While it is of interest to paediatric anaesthetists that bronchial blocker use was associated with less hypoxaemia in children undergoing one-lung ventilation in this cohort, study limitations mean this finding cannot be taken as evidence of causation.

Take Home Message

This study provides impetus for us to reconsider our choice of practice between endobronchial intubation and bronchial blocker use due to the potential benefit of less hypoxaemia during one-lung ventilation with bronchial blocker use in children undergoing non-cardiac thoracic procedures. A definitive change of practice recommendation regarding choice of lung isolation technique for such patients is not recommended based on this study due to limitations outlined. Individualised risk benefit including factoring in technical expertise of the proceduralist is always the safest approach.

Reviewed by Dr Chloe Heath

Edited by Dr Su May Koh

Disclaimer:

The views contained in this commentary are the personal interpretations of its authors and are only intended to be general in nature. The views expressed do not reflect the opinions or position of the APA or SPANZA. The APA and SPANZA holds no liability or responsibility for the contents of the commentary including but not limited to copyright issues, inaccuracies or mistakes.