



Difficult tracheal intubation in neonates and infants. Neonate and Children audit of Anaesthesia pRactice IN Europe (NECTARINE): a prospective European multicentre observational study. Disma, N. et al. BJA. 2021; 126 (6): 1173-1181.

Study Type: Secondary analysis of the NECTARINE study (European multicentre/multinational prospective observational cohort study). Aims are to identify the incidence of difficult tracheal intubation in neonates and infants, along with the associated effect on morbidity & mortality.

Methods: Complex statistical analysis of data from the original NECTARINE study.

Findings: Difficult intubation occurred more commonly (5.8%) than expected. Significant desaturation occurred in 40% of these cases with no identifiable risk factors for this. Fortunately, there was no increased in morbidity or mortality as a result of these events at 30 and 90 days.

Commentary: The authors identified a higher than expected number of difficult intubations, where the latter is defined as requiring 3 or more attempts at tracheal intubation. This may still be underreported as most of the participating sites were specialised paediatric centres. The rates in non-specialist centres could be even higher. Of concern, 13% of difficult intubations were also difficult to mask ventilate. Nearly half of these patients desaturated significantly during this process. However, through statistical modelling, no identifiable risk factors could be identified indicating that the physiological differences of this age group are the cause for this. The authors highlighted evidence reporting the benefit of passive oxygen delivery via nasal prongs during laryngoscopy and utilising video laryngoscopes to optimise the first pass success rate. The adult world has demonstrated the power of apnoeic oxygenation via high flow nasal oxygen (HFNO) in the prevention of desaturation during shared airway cases. The HAMSTER trial is currently evaluating this in the paediatric population with encouraging results on the prolongation of oxygen saturation. I suspect the addition of HFNO in neonates and infants will become a standard tool during laryngoscopy in time. Given the evidence, this population should be considered potentially high risk for difficult intubation and the best available equipment and most experienced personnel should be immediately available during planned airway management. These results also highlight the importance of non-technical skills and communication with your anaesthetic team. Discussing the primary airway plan and backup options is vital prior to these cases.

Reviewed by Dr Nathan Hewitt

NECTARINE, APRICOT and more

This is an interesting collection of papers to consider together. The first is a large multicentre European study of anaesthetic interventions and perioperative outcomes of neonates. The two review articles share authors with the NECTARINE study and provide us with a strong analysis of associated research.

The NECTARINE[1] study follows the APRICOT[2] study and closely resembles it in its methods of recruitment & data collection, and so shares many of its strengths and weaknesses. The study is the detailed prospective capture of neonatal and infant perioperative care and outcome data, including severe critical events and their treatment, in 31 European countries. It provides a snapshot overview of what are considered triggers for anaesthetic intervention in this population,

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however its voluntary nature and methods of recruitment may introduce a reporting bias as well as missing unusual cases and practices. Subgroup analysis of the APRICOT trial revealed differences in outcomes in different jurisdictions, perhaps due to differences in the types of centres recruiting and differences in training [3, 4]. Further investigation of this with the NECTARINE data will be difficult due to the differences in patient numbers (NECTARINE n=5609 vs 31,127 in APRICOT). The paper makes the point that a major finding is that more than 60% of the interventions for hypoxaemia were triggered by a SpO₂ of less than 85%, regardless of age but does not investigate the contribution that cardiac (8.5% of surgical cases) or thoracic (1.1%) surgery has on this. Also of interest was that interventions for hypothermia occurred often well below 36°C. It is a useful paper in that it provides insight into what anaesthetists think are important parameters to defend, in the face of a lack of strong evidence. Its major issues are around the lack of differentiation between case types, anaesthesia experience or location.

The review paper by Habre and Disma[5] reflects what could be imagined to be the major frustrations incurred during the above study, namely the need to standardise clinical practice in paediatric anaesthesia and the need for translational and clinical research to determine the thresholds for physiological parameters that should trigger interventions in neonatal and paediatric populations and the implementation of common outcome sets for each age-specific group by the Paediatric Perioperative Outcomes Group. The major interventions discussed are the increased use of Dexmedetomidine and NIRS as well as video laryngoscopy and nasal cannula oxygenation during intubation of small children.

The paper by de Graaff et. al. [6], does an excellent job of clarifying the data around safety in paediatric anaesthesia. It finds that anaesthesia in healthy children above 1 year of age has reached the level where the risk for fatal adverse events is less than 1 in 100,000 general anaesthesia procedures. As expected, mortality, morbidity and near miss rates are much higher in infants. The paper also provides evidence that years of experience of the anaesthetist (1% reduction in respiratory events and 2% reduction cardiovascular events for each year experience) as the annual number of days delivering anaesthesia to children (> annually 73 days) result in better outcomes. It also reinforces the commonly acknowledged themes of young age being a risk factor and respiratory events being the most common adverse outcomes.

Taken together these papers summarise and extend what has been an exciting decade in the advancement of quality and safety in paediatric, and especially neonatal anaesthesia. This started with the concerns raised around anaesthetic neurotoxicity and then progressing into the investigation into the standardisation of conduct and reporting, through the “National Paediatric Anesthesia Safety Quality Improvement Program”[7] APRICOT and NECTARINE trials and the formation of Paediatric Perioperative Outcomes Group[8].

Reviewed by Dr Donald Hannah

1. Disma, N., et al., Morbidity and mortality after anaesthesia in early life: results of the European prospective multicentre observational study, neonate and children audit of anaesthesia practice in Europe (NECTARINE). *BJA*, 2021. 126(6): p. 1157-1172.
2. Disma, N., et al., A systematic review of methodology applied during preclinical anaesthetic neurotoxicity studies: important issues and lessons relevant to the design of future clinical research. *Paediatr Anaesth*, 2016. 26(1): p. 6-36.

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3. Engelhardt, T., et al., Incidence of severe critical events in paediatric anaesthesia in the United Kingdom: secondary analysis of the anaesthesia practice in children observational trial (APRICOT study). *Anaesthesia*, 2019. 74(3): p. 300-311.
4. Hansen, T.G., et al., Incidence of severe critical events in paediatric anaesthesia in Scandinavia: Secondary analysis of Anaesthesia PRactice In Children Observational Trial (APRICOT). *Acta Anaesthesiologica Scandinavica*, 2019. 63(5): p. 601-609.
5. Habre, W. and N. Disma, A decade later, there are still major issues to be addressed in paediatric anaesthesia. *Current Opinion in Anesthesiology*, 2021. 34(3): p. 271-275.
6. de Graaff, J.C., et al., Best practice & research clinical anesthesiology: Safety and quality in perioperative anesthesia care. Update on safety in pediatric anesthesia. *Best Practice & Research Clinical Anaesthesiology*, 2021. 35(1): p. 27-39.
7. Kurth, C.D., et al., National pediatric anesthesia safety quality improvement program in the United States. *Anesthesia & Analgesia*, 2014. 119(1): p. 112-21.
8. Muhly, W.T., et al., A systematic review of outcomes reported in pediatric perioperative research: A report from the Pediatric Perioperative Outcomes Group. *Pediatric Anesthesia*, 2020. 30(11): p. 1166-1182.

Pediatric airway management. Grace Hsu, Britta S. von Ungern-Sternberg, and Thomas Engelhardt, *Current Opinion in Anesthesiology*; 2021; 34(3): 276-83

Study Type & Method: Narrative Review

Commentary: This article presents an excellent overview of the current research pertaining to paediatric airway management with a focus on safety improvement. The authors review the current research on airway complications in children from observational studies (2019-2021). This is put into context with a discussion of the anatomy and physiology of the paediatric airway as well as pathology that presents with the difficult airway. To improve safety for the normal infant airway, the authors suggest that video laryngoscopy may improve the success rate of the first attempt at intubation. For infants with difficult airways, standard blade video laryngoscopy is associated with higher first attempt success rates compared with non-standard blade video laryngoscopy. In order to reduce the rates of paediatric mortality and morbidity associated with airway management, the authors suggest the implementation of a Department “Difficult Airway Clinical Lead” whose role is to “disseminate knowledge, lead quality improvement initiatives, and collaborate with other specialties in their hospital to improve the standard of care for airway management”. In conclusion, the authors present a paediatric-specific, universal airway management framework with the goal of enhancing the safety of paediatric airway management.

Reviewed by Dr Renee Burton

Virtual reality for pediatric periprocedural care. Wang E, Thomas JJ, Rodriguez ST, Kennedy KM, Caruso TJ, *Curr Opin Anesthesiol*. 2021; 34(3):284-91.

Article type: Narrative review

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Summary: This narrative review covers the available literature on the use of Virtual Reality (VR) around the time of procedures in good breadth but is clearly informed by practical experience. The paper usefully breaks up the applications into preprocedural use, intraoperative use and postoperative use in a manner that is constructive for clinicians with an interest. Crucially it is up front about the challenges to implementation including the importance of patient selection, support with the right people and careful use of protocols. It does not veer into the sort of wide-eyed idolatry that can accompany reviews of new tech options. This is reinforced by the inclusion of a whole section on design and implementation considerations.

The Bottom Line: This is a comprehensive review which also covers crucial practical considerations in the implementation of VR as a perioperative option. Worth the time for those interested in the area.

Reviewed by Dr Andrew Weatherall

Coronavirus disease 2019 and paediatric anaesthesia. Tan, J. et al.; Current Opinion in Anaesthesiology; 2021; 34(3): 292-98

This review article looks back at the lessons learned since the start of the coronavirus pandemic for providing safe and effective care to paediatric patients with known and suspected covid 19 infections as well as identifying continuing gaps in our knowledge with regards to children. Key points focus on the much lower likelihood of typical symptomatology of covid 19 in children with respect to adults. This leads to the important as yet unanswered question determining the sensitivity and optimal timing of pre procedure tests in children as there remains suspicion that not only might children be silent asymptomatic spreaders of the disease, but they may in fact have a higher viral load in the upper airways than some critically ill adults.

General principles in the operating room involve appropriate PPE during AGPs, different airway techniques and vaccination. The risk of aerosol spread from newborns appears to be much lower but the risk of transmission from any child remains unquantified and is mitigated by the factors mentioned above as well as attention to pre procedure testing and safe transport of patients throughout their perioperative journey.

Of particular note to children is the rare but well documented physiologic response of multisystem inflammatory syndrome in children (MIS-C). Long-term implications remain unknown and should alert the treating physician to conduct a thorough review of systems focusing specifically on any cardiac issues which may lead to haemodynamic instability. Further questions remain on the optimum timing of rescheduled surgeries following infection with regard to perioperative complications as well as transmission risks to staff. Some have suggested 10 days, but this remains open to debate.

In conclusion we can and have successfully provided care to children during this pandemic. Questions remain regarding how further mutations of the virus may influence infectious risk, vaccination success and transmissibility in the future. In addition, the large number of unvaccinated children combined with the unknown perioperative risks and timing of surgery in

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infected individuals will continue to raise questions and anxiety for paediatric anaesthetists who must adapt their practice in line with updated knowledge and evidence.

Reviewed by Dr Katherine Lanigan

Dexamethasone and surgical-site infection. Corcoran, T. B. et al.; NEJM; 2021; 384:1731-41

Study Type: Randomised controlled trial

Method:

- 8 mg dexamethasone vs. placebo
- International, multi-centre, triple-blind, non-inferiority against placebo
- 8880 participants with modified intention-to-treat (mITT) analysis
- Inclusion: non-urgent, non-cardiac surgery of >2 h, skin incision >5 cm, and overnight or longer stay, ASA I-IV (those who did not meet inclusion criteria post-recruitment were excluded in the mITT analysis; any subsequent non-trial glucocorticoids were also excluded.)
- Exclusion: pre-existing infection, HbA1C >9%, or surgical/medical indication of dexamethasone.
- Primary outcome: SSI within 30 days of surgery

Findings:

- Non-inferiority of dexamethasone in mITT and per-protocol analyses
- Subgroup analyses of patients with diabetes (DM) also demonstrated non-inferiority (note HbA1C >9% excluded)
- Secondary outcome analysis demonstrated slightly higher risk of chronic post-surgical pain (CPSP) at 6/12 with dexamethasone. Dexamethasone also seemed to be protective against acute post-op sepsis in the secondary outcome analyses.

Commentary:

- Methodologically and statistically valid and powerful results which should assure anaesthetic and surgical clinicians of the safety of intraoperative single-dose dexamethasone 8 mg in adults meeting the inclusion criteria when considering post-operative SSIs. Results are likely to be translatable to paediatric practice given mechanistic likeness. Clinicians are probably going to adopt results into paediatric practice. While this scientifically warrants specific investigation, equipoise will probably diminish with widespread adoption into practice.
- Several unanswered questions remain, some with higher clinical relevance including
 - 1) What is the weight-based equivalence in paediatric practice to 8 mg in adults in terms of SSIs?
 - 2) What about patients for emergency surgery?
 - 3) What about patients with poorly controlled or severe DM?
 - 4) Is intraoperative single-dose dexamethasone associated with a higher incidence of CPSP?

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Reviewed by Dr Philip Cheung

Edited by Dr Su May Koh

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