Conscious sedation in children: the need to strengthen the evidence base remains

Ashleigh J. Stamp,[1] Sarah L. Rolland,[1] Katherine E. Wilson[1] and Chris R. Vernazza[2]

A Commentary on

Ashley P F, Chaudhary M, Lourenço-Matharu L.
Sedation of children undergoing dental treatment. *Cochrane Database Syst Rev* 2018; CD003877. DOI: 10.1002/14651858.CD003877.pub5. PubMed PMID: 30566228.

Practice points

- There is wide variation in sedation agents and techniques employed globally; readers must carefully consider the relevance of study findings to UK sedation practice.
- Widespread inconsistencies in study design and reporting make it difficult to draw useful conclusions regarding the efficacy of different sedation agents.
- The strongest evidence presented was for the use of oral midazolam, however, the range of dosages, variable outcome measures and risk of bias challenge the ability to make firm recommendations.
- There is a distinct need to offer dental care professionals a strengthened evidence base to inform conscious sedation practice.

Abstract

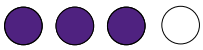
Data sources Cochrane Oral Health's Trials Register, Cochrane Central Register of Controlled Trials (CENTRAL), Medline and Embase. The US National Institutes of Health Ongoing Trials Register (ClinicalTrials.gov) and World Health Organisation International Clinical Trials Registry Platform were searched for ongoing trials. Reference lists of eligible studies were checked for additional studies and specialists in the field contacted for any unpublished data. No restrictions were placed on language or publication date.

Study selection Studies were selected which met the following criteria: randomised controlled trials of conscious sedation undertaken by a dentist, anaesthetist or one of the dental team comparing two or more drugs/techniques/placebo in children (up to 16 years of age) receiving dental treatment. Crossover trials and studies involving complex surgical procedures were excluded.

Data extraction and synthesis Two authors independently selected studies for inclusion, extracted data and assessed for risk of bias. Results were compared and inconsistencies noted, with disagreements resolved by discussion. Where information was unclear or incomplete the authors of trials were contacted for clarification.

Results Fifty studies (3704 participants) were included and grouped into placebo-controlled, dosage and head-to-head comparisons. There was wide variation in sedation technique and agent(s) employed across studies (34 different sedatives with or without nitrous oxide). Risk of bias was high for forty studies (81%), low for one study and unclear for the remaining nine studies (18%). Meta-analysis of available data for the primary outcome measure (behaviour) was possible for oral midazolam versus placebo only. There is moderate-certainty evidence from six small clinically heterogeneous studies at high or unclear risk of bias, that oral midazolam in doses between 0.25 mg/kg to 1 mg/kg is associated with more co-operative behaviour compared to placebo. It was not possible to draw conclusions regarding secondary outcome measures (completion of treatment, postoperative anxiety, adverse events) due to inconsistent and/or inadequate reporting.

Conclusions There is some moderate-certainty evidence that oral midazolam is an effective sedative for dental treatment in children. Improvements and greater consistency in the design and reporting of future research will enable further evaluation of sedation agents and their potential implications for practice; with it being suggested future trials evaluate experimental regimens in comparison with oral midazolam or inhaled nitrous oxide.

GRADE rating 

Commentary

An update to previous Cochrane reviews in 2005[1] and 2012,[2] this work further evaluated the efficacy and relative efficiency of differing conscious sedation agents and dosages for behaviour management of children undergoing dental procedures. Readers will appreciate the variation in sedation practice across the globe; with this giving rise to the range of techniques and agents, both alone and in combination, included within this systematic review. Despite the inclusion of 14 additional studies since the most recent update in 2012,[2] the range of interventions, variations in study design and outcome measures as well as influence of bias, limit the ability to draw firm conclusions to inform sedation practice. Recognising this, and the resulting difficulties in undertaking such a review, the authors highlight the need for further research which is both well-designed and well-reported.

The authors did however identify that six trials provided moderate-certainty evidence to support the use of oral midazolam in the sedation of children (versus placebo). Differences in midazolam dose (non-titratable orally) and outcome measures employed, however, resulted in heterogenous data, with the studies being reported as demonstrating high or unclear risk of bias. Additionally, there is a need for readers to consider the above in line with UK conscious sedation guidance and recommendations relating to 'standard' and 'advanced' sedation techniques.

Despite crucially delineating 'conscious' sedation from 'deep' sedation/general anaesthesia at the outset of the review, the authors did note a lack of clarity within some studies about the level of sedation employed. This, combined with multi-drug or multi-route sedation techniques (potential to increase risk of adverse events),[3,4] concomitant use of nitrous oxide in addition to sedation agent being investigated (26% included studies), and routine use of restraint (32% included studies), seriously limits their ability to inform 'standard' or 'routine' conscious sedation practice within the UK.

Despite being a mainstay in the management of anxious paediatric dental patients,[4,5,6] it is unfortunate insufficient research exists to evidence nitrous oxide/oxygen inhalation sedation within the review. In less widely employed or accepted techniques, such as single-drug intravenous conscious sedation with midazolam in young people (12–15 years), a lack of evidence could lead to trepidation about their use. Furthermore, with the mean approximated age of patients of included studies being 4.8 years, with some including children as young as one-year-old, difficulties in applying review findings to the adolescent cohort are clear.

Of particular note are inconsistencies in approach to adverse event reporting between included studies. Unable to draw any conclusions on this secondary outcome measure, the authors did, however, note significant adverse events associated with chloral hydrate and ketamine sedation. The use of standardised reporting tools such as the World SIVA Adverse Sedation Event Reporting Tool[7] within future research may have potential to aid assessment of sedation safety. Readers must, however, be mindful that safe practice for any sedation agent/regime is dependent upon appropriate training, experience, technique and clinical environment.

Although practitioners should note the potential merits of published literature outside the scope for inclusion in Cochrane reviews, there is still a distinct need to offer dental care professionals a strengthened evidence base to inform conscious sedation practice. Indeed, guidance and recommendations by the Intercollegiate Advisory Committee for Sedation in Dentistry,[4] Scottish Dental Clinical Effectiveness Programme,[5] and the National Institute for Health and Care Excellence[6] are largely based upon expert opinion. Key to evaluating differing sedation regimens will be greater uniformity in recording and reporting of outcome measures. To those working within the field, it is clear each patient must be managed according to their individual needs, with a number of factors contributing to patient acceptance of care, and a desire to improve the evidence base must not be seen as a wish to implement 'one size fits all' approaches.[5]

References

1. Matharu L M, Ashley P F. Sedation of anxious children undergoing dental treatment. *Cochrane Database Syst Rev* 2005; CD003877. DOI: 10.1002/14651858.CD003877.pub2.
2. Lourenco-Matharu L, Ashley P F, Furness S. Sedation of children undergoing dental treatment. *Cochrane Database Syst Rev* 2012; CD003877. DOI: 10.1002/14651858.CD003877.pub4.
3. Academy of Medical Royal Colleges. Safe Sedation Practice for Healthcare Procedures: Standards and Guidance. London: Academy of Medical Royal Colleges, 2013. Available at https://www.rcoa.ac.uk/system/files/PUB-SafeSedPrac2013.pdf (accessed May 2019).
4. Academy of Medical Royal Colleges. Standards for Conscious Sedation in the Provision of Dental Care. London: Academy of Medical Royal Colleges, 2015. Available at https://www.rcoa.ac.uk/system/files/PUB-STDS-CONSC-SEDN-DNTL-2015.pdf (accessed May 2019).
5. Scottish Dental Clinical Effectiveness Programme. Conscious Sedation in Dentistry. 2017. Available at http://www.sdcep.org.uk/published-guidance/sedation/ (accessed May 2019).
6. National Institute for Health and Care Excellence. Sedation in under 19s: using sedation for diagnostic and therapeutic procedures. 2010. Available at https://www.nice.org.uk/guidance/cg112 (accessed May 2019).
7. Mason K P, Green S M, Piacevoli Q, International Sedation Task Force. Adverse event reporting tool to standardize the reporting and tracking of adverse events during procedural sedation: a consensus document from the World SIVA International Sedation Task Force. *Br J Anaesth* 2012; **108:** 13–20.

Address for commentary

[1]School of Dental Sciences, Newcastle University, UK; [2]Centre for Oral Health Research, Newcastle University, UK

Email: Ashleigh.Stamp@newcastle.ac.uk

Evidence-Based Dentistry (2019) **20**, 62-63. doi: 10.1038/s41432-019-0032-7