

Use of an index to assess need for sedation and general anaesthetic in children.

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1. Introduction

1.1 Dental caries and its management

Many children in the UK currently experience some level of caries despite dental decay being a preventable disease. Around 42,000 children and young people under 19 were admitted to hospital for a primary diagnosis of dental caries in England in 2014–15, (NHS England, 2016) making dental caries by far the most common reason for children aged between five and nine to be admitted to hospital. Not only is the process of undergoing a general anaesthetic a distressing experience for children and their families, it is also expensive for the NHS, with £30 million spent on hospital based tooth extractions for children aged 18 years and under in 2012–13. (Health and Care Social Information Centre; 2014)

Guidelines for the management of children requiring dental treatment under general anaesthetic recommend that it is mandatory that dental extractions should only be performed under general anaesthesia when this is considered to be the most clinically appropriate method of management. (Association of Paediatric Anaesthetists of Great Britain and Ireland 2011). Full assessment must be carried out prior to general anaesthesia to determine the dental needs, medical status, anxiety level and behavioural abilities of the patient to determine whether general anaesthetic is a suitable method of managing the patient.

An alternative method for managing anxiety and improving co-operation for treatment for children is the use of conscious sedation. Standards for Conscious Sedation (The Dental Faculties of the Royal Colleges of Surgeons and the Royal College of Anaesthetists, 2015) states “Behaviour management, local analgesia or general anaesthesia may each have a role in facilitating patient care. A practitioner must therefore make a careful, thorough assessment of the patient and his or her needs before deciding that the use of conscious sedation is indicated.”

In both these guidelines no indication is given as to how to measure treatment complexity, behavioural development, psychological development or anxiety.

1.2 Methods of assessment

The lack of an evidence based assessment of need for sedation or general anaesthetic means that decisions regarding management of dental treatment in children are made using subjective judgement and that judgment may vary between treatment centres and even between clinicians in the same setting. This could lead to overprescribing of general anaesthetic or sedation resulting in unnecessary complications and increased risk of morbidity for patients and unnecessary costs for health services.

There is evidence for the value of measuring anxiety, treatment need and medical and behavioural factors individually and in combination as a predictor of sedation modality and treatment outcome in patients who are being referred for treatment under sedation or general anaesthetic. (Coulthard et al 2011)

1.2.1 Measuring anxiety

Anxiety is a key factor identified as contributing to a patient's need for sedation. Both dental fear and phobia are more common in young children, reflecting the influence of child's psychological development on his or her ability to cope with dental treatment (Klingberg and Broberg 1997)

There are several methods of assessing anxiety towards dental treatment. These include subjective assessment by the clinician, physiological measures and a variety of anxiety assessment tools which can be used to measure patient self-reported anxiety. One of the most commonly used and well researched is the Modified Dental Anxiety Scale (Humphries et al 1995)

Anxiety can be assessed through use of patient administered questionnaires and is a significant factor in predicting sedation need. (Newton et al 2012) Assessing anxiety of children through self-administered questionnaires is well validated through research, (Wong and Humphries 1998),(Howard and Freeman 2007).

1.2.2 Measuring behaviour

In children and young people behavioural issues can be a barrier to receiving care and is often a reason for referral for sedation or general anaesthetic. Behavioural assessment scoring is not frequently used in practice to assess patient's ability to cope with treatment in the dental surgery. There are a number of rating systems which have been published and validated as being of use in assessing behavioural co-operation of children receiving dental treatment. Hosey and Blinkhorn (1995) found that The Visual Analogue and Global Rating Scales are simple to use and reliably evaluate the responses of anxious child patients to treatment.

1.2.3 Measuring medical factors

There are many medical conditions that can affect the patient's suitability for treatment under conscious sedation or general anaesthetic. (Scully C, 2014) This is recognised in the Guidelines for Conscious Sedation (The Dental Faculties of the Royal Colleges of Surgeons and the Royal College of Anaesthetists, 2015) and general anaesthesia (Association of Paediatric Anaesthetists of Great Britain and Ireland 2011) in which a full medical evaluation and health risk assessment is advised. Health of the patient may be evaluated using a risk-stratification scoring system such as the Physical Status Classification of the American Society of Anesthesiologists (2014)

1.2.4 Measuring treatment need

As treatment amount and complexity increases it will become more difficult for patients to tolerate and may trigger more anxiety (Newton et al 2012)

There is some evidence that treatment need or number of decayed teeth is a significant predictor of need for treatment under general anaesthetic in children. Carson and Freeman (2001), (Macpherson et al 2005)

1.2.5 Combined assessment of need

The Indicator of Sedation Need (IOSN) tool was developed for use in adults by Coulthard et al (2011) as an assessment tool to support clinicians in their decision making about conscious sedation and also potentially to aid in referral management. The authors have devised a ranking system for measuring anxiety, medical and behavioural indicators and treatment complexity which convert into the component scores for the IOSN.

Section 1 of the IOSN assesses patient anxiety by using the Modified Dental Anxiety Scale (MDAS) questionnaire (Humphris et al 1995).

Section 2 of the IOSN is the medical status component which is largely based on the patient's ASA class (American Society of Anesthesiologists 2014). There are considerations for behavioural problems such as learning difficulties or a strong gag reflex which indicate an increased need for sedation.

Section 3 is the treatment complexity component and a guidance list of treatments is provided based on a range of treatments offered to adults.

Due to its fairly recent development there is limited evidence for the use of the IOSN and its value as a predictor of sedation need for adults.

2. Aim

The aim of this study is to investigate through a review of the literature, whether the use of an index or scoring system to measure sedation or general anaesthetic need for children under 18, would better identify whether a patient can have treatment with local anaesthetic alone, requires conscious sedation or requires general anaesthetic in order to complete their treatment, when compared to current subjective means of assessment. In a PICO format that is;

Population: children under 18

Intervention: use of an index for assessment of need for conscious sedation or general anaesthetic

Comparison: any other methods of assessment

Outcome: successful completion of treatment

3. Method

A literature search was conducted on Medline Ovid database using a combination of MeSH terms and keywords related to the area of research. These terms were also searched on NICB Pubmed and Google. References and citations were cross-checked. Guidelines on sedation and general anaesthesia were also accessed and references checked where relevant. The papers were assessed for quality and a summary of the evidence regarding the different outcomes measured in these papers was produced using The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach (GRADE handbook 2015).

4. Results

Eleven papers were found relating to the topic of assessment of patient sedation or general anaesthetic need. Seven papers directly addressing the use of an index for sedation were identified. One paper was the original paper describing the IOSN tool (Coulthard et al 2011). Two of the papers looked at the use of the IOSN at a population level so were not analysed in detail. (Goodwin and Pretty 2011 and Pretty et al 2001) Four papers directly addressed the use of an index for predicting and measuring sedation need as compared to other methods and were analysed in detail for this study (Goodwin et al 2012, Liu et al 2013, Yuan et al 2015, Gerrard 2016). The same studies were found in the other database searches. One additional unpublished study relating to the use of the IOSN for children was found by searching on Google. (Madouh 2013) There was no evidence that any index or tool is currently used in the UK for measuring sedation or general anaesthetic need in children and young people.

4.1 Evidence for use of IOSN

Looking in more detail at the outcomes from each paper there is some evidence to support the use of the IOSN.

4.1.1 Use of IOSN as a referral tool

Its use as a referral tool was assessed by Goodwin et al (2012). Looking at operator agreement with IOSN assessed need for sedation, in the IOSN high/very high need group the operators said that they would not have been able to carry out the treatment without sedation for 75% of patients. In the IOSN low need for sedation group the operators said they would not have been able to complete treatment without sedation for 45% of patients i.e. just over half the patients could have been treated without sedation.

This was a significant difference ($p < 0.05$) between the two groups when analysed with Fishers exact test.

Looking at patient agreement with IOSN sedation need, in the high/very high sedation need group 85% of patients said they would not have gone ahead with their appointment if sedation had been unavailable. In the IOSN low need for sedation 43% of patients said they would not have gone ahead with their treatment if sedation was unavailable. There is a significant difference ($p < 0.05$) between the two groups with Fishers exact test.

4.1.2 Determining threshold for intravenous sedation and general anaesthetic using IOSN

Liu et al (2013) assessed the IOSN threshold values to determine if they were appropriate for identification of intravenous (IV) sedation and general anaesthetic cases from a referral population.

The use of the IOSN was found to increase the percentage of patients correctly predicted for sedation from 54.3% to 80%. The study found that as IOSN score increased the sedation outcome moved from local anaesthetic through to general anaesthetic.

There was a significant difference in the IOSN score when comparing the local anaesthetic group to the IV sedation group and the general anaesthetic group ($p = 0.0001$).

4.1.3 Value of IOSN in predicting sedation modality

A study by Yuan et al (2015) examined the additional explanatory value of the predictive components of the IOSN and compared and combined them with other assessment systems for predicting sedation need. Overall this study found that two components of the IOSN- the anxiety score and the dental treatment complexity score were predictors of the practitioner's choice of sedation modality.

4.1.4 Use of IOSN to predict sedation need in patients referred for oral surgery

Gerrard (2016) looked at use of IOSN in adult patient referrals for oral surgery in a hospital. It found that the IOSN was not accurate in predicting need for sedation and the author suggests that the location of the study in a different part of the country to earlier studies, may have led to conflicting results due to different patient demographics. Also in circumstances such as oral surgery where patients often have extreme anxiety the IOSN is not sensitive enough and it may only be of value for certain types of referral which limits its value as a tool.

4.2 Paediatric IOSN (p-IOSN)

An unpublished study by Madou 2013 looked at adaptation of IOSN for paediatric patients. The author adapted the IOSN tool by modifying each section to make it relevant to children, using children's anxiety questionnaires and modifying the treatment component list to reflect treatments usually provided to children. Comparison of P-IOSN scored patients with non P-IOSN scored patients found no significant difference in treatment outcomes. The study was seriously biased as the p-IOSN was not used to assess patients need for sedation before referral, but was applied to a group of patients who had already been selected for treatment in a paediatric sedation department. Additionally the sample

size for the P-IOSN group was much smaller than the control group. Despite the unreliability of the results of this study it is valuable in that the authors have designed a paediatric IOSN tool which could be used in further studies.

5. Conclusion

Despite its relatively recent development there is some evidence to show that combining need indicators in the form of the IOSN, improves accuracy of prediction of sedation need when compared to other methods of assessment or operator judgement alone, to a statistically significant level. As the IOSN has not been widely tested it is not known if it is effective in varied circumstances. The evidence also suggests that the medical/ behavioural component of the IOSN contributes little towards the outcome. Varying medical issues will make different sedation modalities and anaesthesia options more or less suitable for a particular patient which does not easily convert to a sliding scale of need. Behavioural issues have been included in the medical section for the adult IOSN to reflect adults with learning disabilities or severe gag reflex, but for paediatric patients behavioural issues are a big contributor to sedation need.

There is evidence that children's psychological development and maturity which may not directly correlate to their age will affect their ability to accept care. This should be considered separately to their medical status and highlights the importance of using valid and reliable measures of the child's ability and willingness to comply.

Given the lack of evidence for the medical and behavioural section of the adult IOSN and the importance of considering behaviour and co-operation when predicting paediatric sedation need, it may be more useful to devise a paediatric IOSN which scores behaviour and co-operation alongside anxiety and treatment complexity.

The development of a Paediatric Indicator of Sedation Need which incorporates an anxiety assessment and treatment complexity assessment, based on the adult IOSN, and which also incorporates a behavioural assessment could be a useful tool for clinicians in primary and secondary care when referring and assessing patients for sedation. It could also aid in developing effective care pathways for the delivery of sedation and general anaesthesia to children and young people.

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