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Kirby, J., Walshaw, E.G., Yesudian, G. et al. (1 more author) (2020) Repeat paediatric dental general anaesthesia at Sheffield Children's NHS Foundation Trust: a service evaluation. British Dental Journal, 228 (4). pp. 255-258. ISSN 0007-0610

https://doi.org/10.1038/s41415-020-1256-9

Repeat paediatric dental general anaesthesia at Sheffield Children's NHS Foundation Trust: a service evaluation

J. Kirby[1], E.G. Walshaw[1]*, G. Yesudian[1], C. Deery[1],[2]

Affiliations:

1. Paediatric Dentistry, Charles Clifford Dental Services, Sheffield Teaching Hospitals NHS Foundation Trust, Wellesley Road, Sheffield, UK: Sheffield Children's NHS Foundation Trust
   Western Bank, Sheffield, UK, S10 2TH
2. Unit of Oral Health, Dentistry & Society, School of Clinical Dentistry, University of Sheffield, Claremont Crescent, Sheffield, UK

***Corresponding author:**

E.G. Walshaw
Dental Core Trainee
Paediatric Dentistry
Charles Clifford Dental Hospital
Wellesley Road
Sheffield
S10 2SZ

Tel:
E mail: emma.walshaw@nhs.net

Abstract

Introduction: The use of general anaesthesia in paediatric dentistry should be appropriate and justified. During the treatment of children, a clinician should have foresight into the future dental requirements of the patient and whether a future general anaesthetic will be required in quick succession. Efforts should be made when possible to avoid this. **Aims:** This service evaluation was performed to gather information regarding repeat dental general anaesthetics within Sheffield Children's Hospital NHS Foundation Trust. **Methods:** All children's records who had experienced a repeat dental general anaesthetic between 1st January 2015 and 31st December 2018 were analysed. Those who had experienced a repeat dental general anaesthetic within 2 years were investigated. **Results:** Overall, 0.63% of children had a repeat dental general anaesthetic within a 2 year period. These repeat dental general anaesthetics were mainly justified due to new dental caries. 43.9% had modifying factors, such as a complex medical history, that could have impacted the need for a second dental general anaesthetic. **Conclusion:** The repeat rate in Sheffield Children's Hospital NHS Foundation Trust is low. We believe this is as a result of Specialist treatment planning and appropriate use of both extraction only, and restorative and extraction general anaesthetic lists.

Key Points

(1) Repeat dental general anaesthetics should be avoided wherever possible, however there are modifying factors that make some children more likely to experience them.
(2) The social, emotional and financial burden of repeat dental general anaesthetics should be considered prior to treatment planning in children.
(3) Specialist paediatric dental treatment planning produces low repeat GA rates
(4) Public health measures and targeting preventative dental visits reduce the repeat dental general anaesthetic rate.

Introduction

Dental extractions are the most common reason a child is admitted to hospital for a general anaesthetic (GA) in the U.K. [1] In 2017/2018 46,000 children were admitted to hospital for dental extractions under General Anaesthesia.[2] In Sheffield the Paediatric Dentistry Department provides dental care to 10,000 children and young people each year. We provide two forms of GA for our paediatric patients; exodontia (extraction only) and comprehensive care (restorative dental care and extractions). These admissions are clearly associated with very significant morbidity and are not without the risk of mortality and therefore are not to be taken lightly and in particular repeat procedures are to be avoided if possible.[3,4] This service evaluation describes the experience of our Department regarding repeat GAs for children requiring dental treatment, between the years of 2015-2018.

Aims

The aims of our service evaluation were as follows:

- To determine the frequency of repeat paediatric dental GAs within 2 years
- To determine the justification for the repeat dental GA in our paediatric patients
- To provide data to healthcare commissioners when making funding decisions

Standard

There is no published standard for the repeat rate for dental GA for paediatric patients. It is recognised that young patients may develop new dental disease and the presence of high levels of dental anxiety or medical, behavioural/learning difficulties means that the child cannot be treated with any other treatment modality than GA. An accepted agreement from many paediatric dental units is that following a dental GA no child should need a repeat GA within the following two year period.

Methods

Our service evaluation was completed as a retrospective review of hospital episode statistics and patient clinical records. An information request was made to Sheffield Children's Hospital NHS Foundation Trust for the total number of children who had a dental GA between 1st January 2015 – 31st December 2018, and, from those patients, the total number who had a second dental GA within 2 years of their first GA. This evaluation was registered with the Hospital Clinical Effectiveness Unit in accordance with local governance criteria (CEU Ref CA1834). All children who were having either exodontia (extractions of primary and permanent teeth only) or comprehensive dental care (all

dental preventive, restorative and surgical treatments) GAs were included. Children admitted under another medical/dental speciality were not included, e.g. oral and maxillofacial surgery or oral surgery.

Individual clinical records (both Sheffield Children's Hospital and Charles Clifford Dental Hospital records) of children who had two or more dental GAs were reviewed (by J.K. and E.W.) to obtain the following information:

- Socio-demographic data
- Known recorded safeguarding concerns
- Pre-assessment challenges e.g. limited examination or difficulties obtaining radiographs
- GA details, including date, type of GA, number of extractions etc.
- Preventative dental care provided prior to the first GA and ongoing dental care follow up
- Recorded justification for the repeat dental GA
- Modifying factors, such as developmental delay etc., that increase caries risk status

Results

In total, 6467 dental GAs were undertaken between January 2015 and December 2018 in Sheffield Children's Hospital. The majority of patients experienced exodontia (68%, n=4368) which is reflective of the service provision provided under general anaesthesia. Within our service evaluation period 75 children had two or more GAs, however only 41 children had two or more GAs within a 2 year period. Therefore, 0.63% of children had a second dental GA within two years of their first dental GA.

Further analysis of these results is based on the 41 children who experienced two or more dental GAs. The greatest proportion of children had a comprehensive dental care as their first GA experience (70.7% n=29). If the child had comprehensive care as their first GA, they were more likely to have a comprehensive care as their second GA, see Figure 1. Similarly, if a child had exodontia for their first GA, they were more likely to have exodontia as their second GA (75%, n=9).

Figure 1

The average number of primary extractions in the first GA experience was 3.8 teeth (range 0-13) and permanent extractions was 0.6 teeth (range 0-6). During the second GA this number reduced, as the average number of primary extractions was 1.93 (range 0-8) and 0.59 teeth for permanent extractions.

For those children who had a repeat GA within 2 years, the average age at their first GA was 5 years and 7 months for exodontia (range 2y2m-9y1m) and 7 years 9 months for comprehensive care (range 2y3m-14y5m). The average time between the first and second GA was 1 year 2 months (range 14 days – 1y11m).

As demonstrated in Table 1 the majority of children lived in areas of deprivation (85.4%, n= 35). Three children had noted safeguarding concerns due to multiple missed dental appointments, extensive dental disease and other known vulnerabilities. The Index of Multiple Deprivation quintile group was produced by the University of Oxford and discovered through the patient's postcode.[5]

Table 1

Prior to their first dental GA, just over half of patients attended a dedicated preventative visit - which included oral hygiene instruction, dietary analysis and application of fluoride varnish (51.2%, n=21). Furthermore, nearly a fifth of clinical examinations prior to listing for GA were recorded as limited within the clinical notes (19.5%, n=8).

Dental radiographs were only possible in 22 out of the 41 children prior to their first dental GA. Of the children who did not have dental radiographs pre-operatively, 78.9% were listed for comprehensive dental care at their first dental GA.

Following their first dental GA the majority of children were discharged from the Paediatric Dental Department (n=23, 56.1%). Of the children who continued to be seen within the department (n=16), all but two attended on a regular basis. One child was discharged from the department who was not registered at a local General Dental Practitioner and a further two children had no follow up documented in their clinical notes.

Most children required a repeat dental GA after developing new carious lesions (73.2%, n=30). When clinically indicated, the majority of teeth that developed caries had fissure sealants placed prior to or during their first dental GA (n=19/28, 67.9%). Other reasons for the second dental GA included diagnoses such as trauma and molar incisor hypomineralisation; see Table 2 for further details. Two children unfortunately had a second dental GA to remove symptomatic root fragments which were left after the first GA.

Table 2

Of the 41 patients who had a repeat GA within 2 years, 43.9% (n=18) had modifying factors which may result in an increased caries risk and/or a child not being able to accept dental care with any other treatment modality. These modifying factors included cancer, autism, developmental delay or osteogenesis imperfecta (see Table 3 for further details). Eleven of these children are routinely seen within Specialist Paediatric Dental Services (10 seen within the Paediatric Dentistry Department and 1 seen within the Community Dental Services). Six children with these modifying factors were discharged back to their General Dental Practitioner (GDP) in primary care, and one child had no follow-up plan recorded in their clinical notes.

Table 3

Discussion

The mean age of a child referred for a dental GA at Sheffield Children's Hospital was 6-years-old in 2009, and on average children had 7 teeth extracted. In our experience between the years of 2015-2018, children were of a similar age when having a dental GA, but fewer teeth were extracted on average.

Following dental treatment under GA a child may suffer considerable post-operative symptoms including: feeling sick; headaches; sore throats; pain and bleeding. However, of greatest consideration for a child having a GA is the small chance of a significant complication occurring that results in the child's death or brain-injury.[6] Therefore, a National guideline for the use of GA in paediatric dentistry recommends that that all the dental treatment that a child requires is carried out under a single GA episode.[7] Moreover, poor treatment planning has been identified as a contributing factor to a child needing a potentially avoidable repeat dental GA.[8] The suggested minimum time interval between repeat dental GAs for exodontia in the U.K. has been identified at 2 years.[9,10]

The number of children undergoing a second GA for dental care in Sheffield is low. Within the evaluation period of three years, 74 children had two or more dental GAs. However, only 41 of these children had a repeat GA within the two year period. The repeat dental GA over a 2 year period of 0.63% is lower than a previous evaluation conducted from 2013-2015 where the repeat rate was 0.8%. These figures are lower than other published repeat GA rates in various centres in the United Kingdom. For example, the two-year repeat dental GA rate for children having dental extractions at Liverpool has been previously reported as 5%.[10] Furthermore, a study showed a repeat dental GA rate in six district hospitals in the northwest of England ranged from 12-37%.[11] The low repeat GA rate within Sheffield could be attributed to the Paediatric Dentistry Consultant-led service assessment and treatment provided by the Paediatric Dentistry Department in keeping with the

current guidelines.[7] The case for a Paediatric Dentistry Specialist to lead the GA service and for a thorough examination to be provided, including radiographs, either prior to or during the GA have been made.[12,13]

The most common reason for a child to undergo a second GA was dental caries. In Sheffield children in the most deprived areas had decay levels four times higher than in the least deprived areas.[14] Therefore, it is not surprising that the majority of children within this evaluation who had a repeat GA within two years were from the most deprived areas (IMD 4 and 5). A Canadian study found that medical co-morbidities and a less than fully erupted primary dentition were major predictors of a repeat dental GA in children.15 This service evaluation found similar findings.[15]

Interestingly, this evaluation showed that the majority of children who had a repeat GA had experienced a comprehensive dental care approach for this second procedure. This treatment modality may be influenced by many factors including parental wishes and clinically related factors (including the ability to conduct a high quality clinical and radiographic assessment prior to listing for GA). In our evaluation, only 53.7% (n=22) of children managed dental radiographs prior to their first GA. This could be due to the child's young age, dental anxiety, medical or behavioural problems being a barrier to children accepting dental radiographs. Of these children 78.9% (n=15) were subsequently listed for comprehensive dental care which enables dental radiographs to be taken under GA. This ensures these children are appropriately treatment planned by a Specialist Paediatric Dentist under GA. Children with modifying factors may always require a GA for any invasive dental treatment, even as they progress into adulthood and transition into Special Care dental services. In these cases, the prevention of more frequent repeat dental GAs could be avoided by Specialist Paediatric Dental treatment planning from initial presentation to dental services and regular preventative dental care.[13] Consideration therefore should be given on a case-by-case basis as to whether these children require ongoing specialist dental care, in keeping with the Commissioning Standards for Paediatric Dentistry, or shared care with both their GDP and specialist dental services.[16]

Despite dental caries being the most common reason why a child requires a GA in the UK, and the most common reason why a child required a second GA in this evaluation, just over half of children had a dedicated preventative visit prior to their GA. Consideration should be given to whether all children who require dental care under GA for caries management should have a dedicated preventative visit to aid minimising their future caries risk status. General dental practitioners should be regularly providing preventative care under the guidance of Delivering Better Health[17]; however the same messages reinforced by specialist services could be of further benefit. Although this may have increased pressures on waiting lists within specialist services, utilisation of the full dental team,

including dental nurses with extended duties and undergraduate dental students, could aid the accommodation of this. Within our own department we currently have a dental nurse with extended duties who has a specifically booked prevention clinic; it is worth nothing that none of the patients who had repeat GA exposures had been seen on this clinic. Training in the use of a brief intervention such as motivational interviewing for those conducting these clinics may also be beneficial.[18] A recent study showed a 29% reduction of new caries experience after dental nurse-delivered motivational interviewing.[19] The role of GDPs and Community Dental Services in preventing further dental caries is significant, in the overall goal of reducing children's experiences of dental GA.[11]

It is out with the scope of this service evaluation but public health measures such as ChildSmile in Scotland(20) or Public Health England's Dental Check by One and Change4Life initiatives are welcome and necessary if we are going to prevent caries and therefore reduce the number of GA's due to dental caries. Public Health England's own modeling suggests that for every £1 spent on targeted supervised toothbrushing schemes would have a return on investment of £3 over 5 years.[21,22]

In 2015/2016, £50.5 million was spent on dental extractions by NHS hospitals within the UK; undeniably a large financial cost that could be utilised into dental prevention and treatment of other unpreventable dental diseases.[23] There is of course a financial burden when providing general anaesthetics, however this does not play in to our individual treatment planning for children with dental disease.

Recommendations

- As a Department, we will continue to strive to minimise avoidable repeat dental GAs for our patients. We will consider the efficacy of a mandatory preventative visit prior to any GA which is requiring the management of dental caries.
- As discussed the importance of accurate treatment planning, and in particular radiographic assessment, is imperative. We should ensure all children have radiographs prior to their GA, or that there are facilities to access radiographs during their GA.
- Children will particularly modifying factors should have clear documentation as to why and how they require ongoing specialist paediatric dental care.
- As a Department we will perform a further service evaluation in approximately 2 years, to monitor our progress with reducing our repeat GA rate.

Conclusion

As a Department, we are pleased to have a low dental GA repeat rate. We are aware that the role of preventative dental care, whether it be in a Specialist or GDP setting is vital in our reduction of avoidable repeat GAs.

Acknowledgements

The authors would like to thank Jack Hiscock, Audit and Effectiveness Officer, Sheffield Children's Hospital for obtaining and collating the hospital episode statistics.

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Tables

Table 1. Index of Multiple Deprivation of children who had two dental GAs within 2 years.

Index of Multiple Deprivation	Number of children (n=)	Percent (%)
1 - least deprived	3	7.3
2	0	0
3	3	7.3
4	8	19.5
5 - most deprived	27	65.9

Table 2. Justification for a child's second dental GA.

Indication for second dental GA	**Number (n=)**
Caries	30
Dental trauma	3
Molar Incisor Hypomineralisation	3
Extract tooth fragment left in-situ after 1st GA	2
Planned two GAs to allow root canal treatment after dental trauma	1
Severe non-carious tooth surface loss	1
Removal of supernumerary tooth	1

Table 3: Modifying factors of the children requiring a second dental GA.

Modifying factors	**Number of children (n=18)**
Behavioural issues - including ADHD, autism, developmental delay, or a combination of these diagnoses.	8
Oncology – including leukaemia and solid tumours	6
Osteogenesis Imperfecta +/- Dentinogenesis Imperfecta	2
Cleft palate	1
Microcephaly, Kabuki syndrome + Autism	1

Figures

Figure 1. Demonstrates the pattern of GA type for children experiencing repeat GAs.