

Variations in Provision of Dental General Anaesthetic (DGA) for Children in England

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Abstract

Introduction

Dental general anaesthetic (DGA) remains one of the main modalities to deliver treatment to paediatric patients. The main central registry system which is used as a proxy measure of DGA provision is the Hospital Episode Statistics (HES) data on hospital admission of children for dental extractions. This database does not accurately reflect the number of DGAs as it omits non-hospital-based providers and the data includes treatment under sedation.

Aims:

The aim is to describe the paediatric DGA service provision across England and determine type of provider (NHS Trusts or Community Dental Services CDS), type of lists (extraction or comprehensive care) and the specialty planning the service.

Methods:

Potential providers were identified using the provider level analysis in HES database (for NHS trusts), and the NHS Business Services Authority (NHSBSA) and internet-based search engine (for CDS providers). All potential providers were contacted (n=204) and provided with a proforma to collect data.

Results:

Response rate was 82% and 115 providers confirmed provision of paediatric DGA. These were mostly NHS trusts (72%). Not all providers appeared in the HES database (25%). Half of the providers provided separate lists for exodontia versus comprehensive care. Only 32% of the lists were planned by specialists in paediatric dentistry. All regions, apart from London, had some comprehensive care lists planned by non-paediatric dentists.

Conclusion:

The results highlighted the inaccuracies in the HES, variation in service provision across England and the lack for paediatric specialty led DGA services. Paediatric DGA need to be better recorded and commissioned.

Key words: Dental general anaesthesia, Hospital episode statistics, comprehensive care, paediatric patients.

Key points:

- 1- Children's access to paediatric specialty led DGA is variable across England.
- 2- There is not an available comprehensive registry system for paediatric DGA.
- 3- This paper will provide evidence on the gap in Hospital Episode Statistics (HES) and variations across NHS regions.

1. Introduction

Caries management is cited as one of the most common reasons for a child to be admitted to hospital, 177 procedures a day (for mostly extractions) were provided in England for the under 18s.¹ It is likely that most of these admissions will be for a dental general anaesthetic (DGA), an expensive procedure with a risk of morbidity and mortality.^{2,3,4} However, no central database for DGA exists.

Admission data is currently centrally stored in the Hospital Episodes Statistics database HES. Admission data is submitted to NHS Digital so that providers are paid for their activity. HES database is used to record data related to diagnoses, operations, patients' demographics, methods of admission and geographical information. The admission data only differentiate between A and E attendances and outpatient appointments at NHS hospitals in England. The HES database is a powerful tool that can be used to monitor NHS hospitals activity trends, assess delivery of care and its equality, and support and inform decision making and commissioning.⁵ While this might be right for assessing services generally delivered in NHS hospitals, DGA service provision by itself cannot be evaluated by solely depending on the HES database.

The limitations of the HES database in assessing DGA have been raised previously^{6,7,8} principally that admissions do not differentiate between general anaesthetic and other treatment modalities (such as inhalation or intravenous sedation) and it also lacks the data from non-hospital based providers.²

The multiplicity of services providing DGA (e.g., Community Dental Service, Maxillofacial units in District General Hospitals, Paediatric Dentistry and Oral Surgery units in University Hospitals) adds a further layer of difficulty when trying to determine provision across the country.

Robertson et al.⁹ in 2012 called for the development of a national database of DGA providers to allow audit and service evaluations, and to help plan provision of services. The Hospital Dentistry Report¹⁰ published recently has also focused on the limitations of the HES database. In its recommendations, the report stressed how vital it is to understand the work being done and who is doing it. Amongst the multiple recommendations, it was advised to record the type of anaesthesia used for all dental day cases.

Data from a pilot survey illustrated the variability of DGA provision across the areas surveyed, with 10% of areas surveyed providing no service and 12% only providing extractions.⁷ More importantly this pilot work also demonstrated the difficulties in obtaining this information. However, this pilot survey used a convenience sample, a large proportion of the country was not included. Therefore, it did not provide an adequate coverage for DGA service provision across England and further work is needed.

Therefore, the aim of this study was to describe DGA provision for children in England and determine type of provider (NHS Trusts or Community Dental Services CDS), type of lists (extraction or comprehensive care) and the specialty planning the service. It also aimed to check whether the HES database captured a comprehensive picture of DGA service provision.

2. Methods

The protocol of this project was registered as an audit at the Royal National ENT and Eastman Dental Hospital. The collected data was stored confidentially in line with the General Data Protection Regulations GDPR 2018.

▪ Identify providers

NHS England was contacted initially to check if there was a central database of DGA providers for children in England. There was no national database available to answer the questions of this project or to map the service delivery. The only data available was the Hospital Episodes Statistics (HES).

The community dental services (CDS) were identified through the NHS Business Services Authority NHSBSA and using internet-based search engine (Google) to look up CDS providers. The HES (Hospital Admitted Patient Care Activity 2019-20) were used to identify any potential NHS trusts involved in DGA provision. In particular, the Provider Level Analysis published through HES under admitted patient care was used. This is the only document that linked data to providers. Additionally, potential providers were identified through personal contacts with professionals at different regions.

Potential providers in the HES were identified by looking at the following specialties; Oral surgery (OS), Paediatric dentistry, Oral and maxillofacial surgery (OMFS), Special care dentistry, general dental practitioners (GDP) and community dental services (CDS), who operated on the mouth.

Primary diagnosis of identified potential providers was: Diseases of oral cavity, salivary glands & jaws (coded K00 to K14). The 3-character primary diagnosis (coded K00 to K04) was: Disorders of tooth development and eruption, Embedded and impacted teeth, Dental caries, Other diseases of hard tissues of teeth or Diseases of pulp and periapical tissues.

Phone number, email, address, county, sustainability and transformation plan (STP) and NHS region were recorded for each provider identified.

▪ Data recorded

Data on DGA provision in England during 2019 was collected by one of the authors through email contact using proformas piloted and developed as part of the study.

For each DGA provider, the following data was gathered initially using their own websites and the NHS Digital Organisation Data Service ODS:

- Hierarchy data: NHS region and Sustainability and Transformation Partnerships (STP) for the purpose of mapping and disclosing variations across regions.
- Contact details: address, telephone and email (either personal contact or freedom of information FOI). These were used to contact potential providers and collect data

The potential providers were then contacted to collect the following data related to DGA lists:

- a. type of DGA list: This can be extraction only and/or comprehensive care. Comprehensive care lists involve delivering restorative treatment (preformed metal crowns, restorations, prevention such as fluoride varnish and fissure sealants) in addition to extractions whenever required. Extraction only lists involve only extractions of any decayed teeth. Other types of lists e.g. short paediatric extraction case done at the end of an adult list will be recorded under 'other' and described individually. These were described as piggyback lists/ cases.
- b. Frequency of the list and number of children seen in 1 year: this was used to calculate the average number of children treated per list by dividing the total number of patients seen in one year by the total number of lists. The timeframe of the collected data was 2019 (either as a calendar year or a financial year that ends in 2019 to avoid the effect of COVID-19 pandemic) depending on the way each provider records their own data.
- c. Age range permitted on the list: this is to ensure that the data provided is linked to paediatric lists only
- d. Criteria for DGA admission: the reasons to deliver treatment under general anaesthetic may include special needs, age, quantity of treatment, or lack of co-operation for example.
- e. The specialty and grade of clinician planning paediatric DGA: this is to highlight whether all children across England have access to specialists in paediatric dentistry planning their care.
- f. The specialty and grade of clinician delivering paediatric DGA

The personal contact details were used to acquire the data where possible (n=24). Providers where no personal contact was available, the FOI department was contacted instead. FOI was also contacted whether or not a reply was received through personal contacts to either verify or collect data. The timeframe of 3 working weeks to get replies from FOI was often exceeded to few months due to staff being redeployed to help with the NHS response to the COVID-19 pandemic.

▪ **Data analysis**

The seven different NHS regions were used as the unit of analysis. Data from multiple providers was combined to give an overall picture of DGA provision for each region.

Descriptive, frequency and crosstabulation statistics were used to analyse the data. SPSS software and Microsoft Excel were used to plot the data.

3. Results

All identified potential providers were contacted (n=204). These were a mix of 137 NHS trusts (67%), 46 CDS (23%) and 21 independent providers (10%). Independent providers are non-NHS sites which provide NHS care.

Table 1 shows a breakdown of the total contacted identified potential providers, how many replied and how many confirmed their provision of paediatric DGA. Not all potential providers appeared in the HES database (54 out of total 204 providers). This represents 26.5% of all identified potential providers. Replies were received from 168 providers achieving 82% response rate. Out of these who replied, 115 providers confirmed they are providers of children DGA (or part of another provider). 25% of these confirmed paediatric DGA providers did not appear in the HES database.

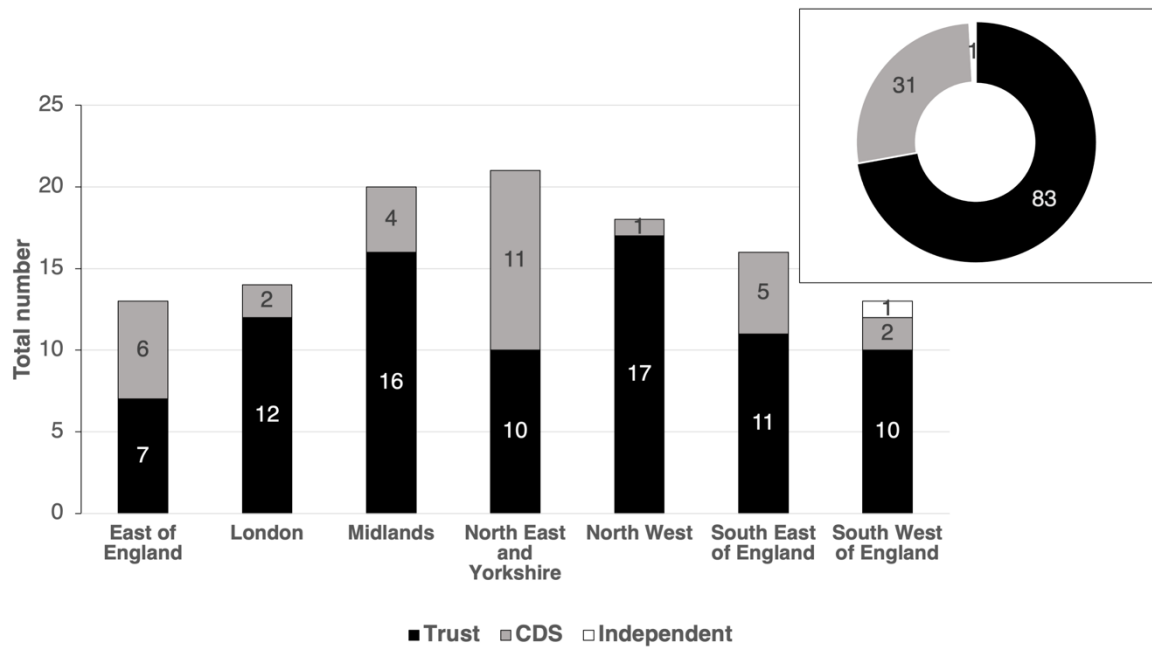
Region	No reply	Replied				
		Not a provider	Confirmed DGA provider			Total replies (response rate)
			HES	non-HES	Total confirmed	
East of England	8	7	8	5	13	20 (71%)
London	4	8	11	3	14	22 (85%)
Midlands	9	7	17	3	20	27 (75%)
North East and Yorkshire	2	6	14	7	21	27 (93%)
North West	3	8	14	4	18	26 (90%)
South East of England	5	7	11	5	16	23 (82%)
South West of England	5	10	11	2	13	23 (82%)
Total (n=204)	36 (18%)	53	86 (75%)	29 (25%)	115	168 (82%)
HES	150 (73.5%)					129 (77%)
Non-HES	54 (26.5%)					39 (23%)

Table 1 also gives region-based breakdown of the type of responses received; not a provider, a provider which appeared on the HES database or a provider which did not appear in the HES database. It also shows the number of providers which did not reply in each region and the total response rate (which is the sum of replies whether they were confirmed as a provider or not).

The providers who did not reply within the timeframe of this project were spread across the seven NHS regions. These were 36 providers (18% of the total 204 which were contacted), 58% of them were on the HES database and 42% were not.

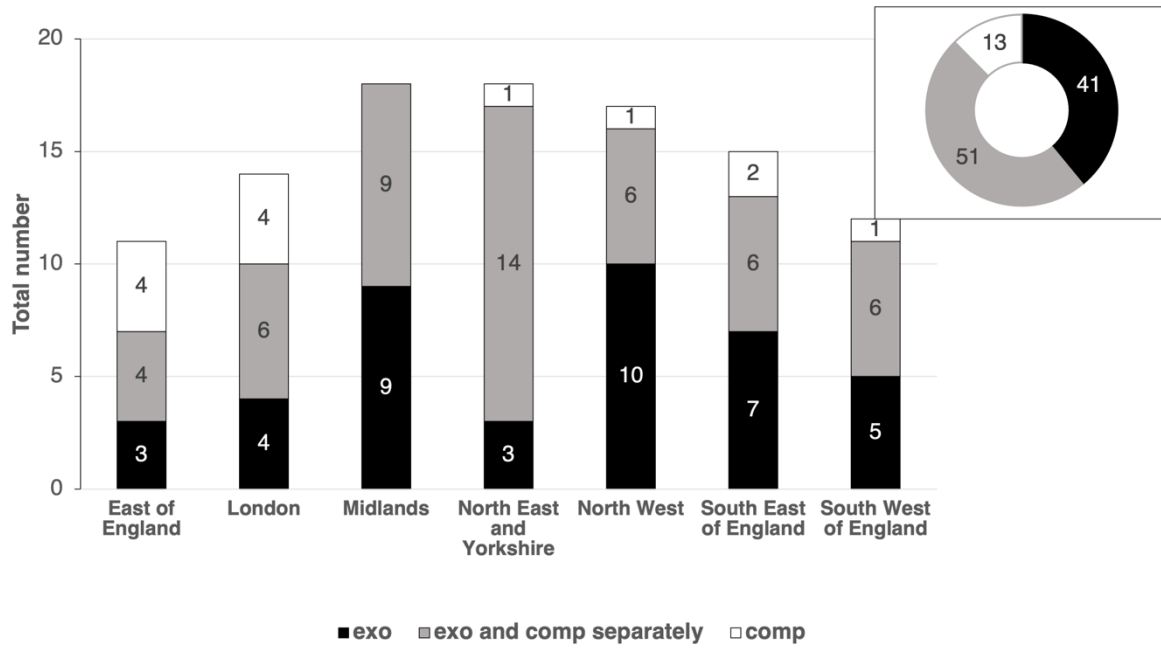
The confirmed DGA providers (n=115) were spread across the NHS regions where the results varied from 13 to 21 providers per region.

These providers were 83 NHS trusts (72%), 31 CDS (27%) and only 1 independent provider (1%) in South West of England. In general, most confirmed providers in each region were NHS trusts, followed by CDS (Figure 1).



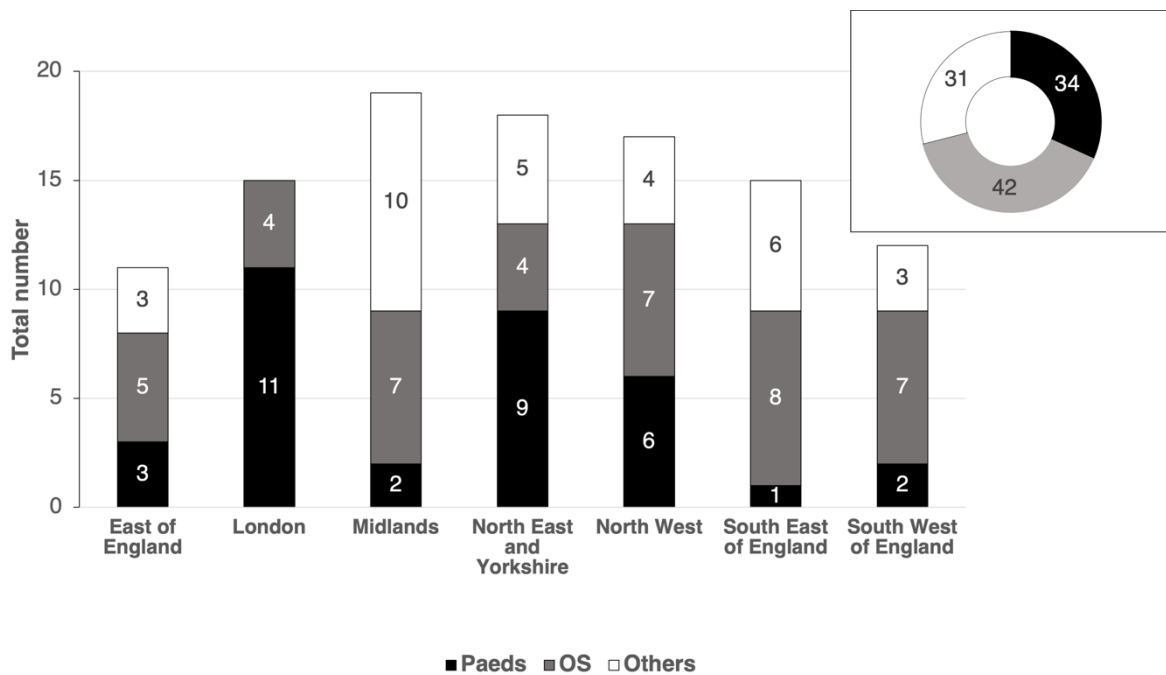
The type of provided lists were either extractions only, comprehensive care only (which includes extractions when required) or separation between the two types in some locations, i.e., provide two separated lists (extraction only cases go into separate list).

The pie chart at the top right corner of Figure 2 shows that almost half of the providers (49%) provided separate exodontia and comprehensive care lists, while 38% provided only exodontia under DGA. The bar chart in Figure 2 shows a region-based breakdown of the type of lists provided by the confirmed providers. Exodontia and comprehensive separated lists formed 49% (n=51) of the total provided lists, followed by exodontia only lists (39%, n=41) and finally Comprehensive lists (without separation from exodontia lists) which formed only 12% (n=13) of the provided lists. 23% of the lists which involved comprehensive care were dedicated only to children with special needs or complex medical history, not merely for lack of cooperation or failed inhalation sedation.

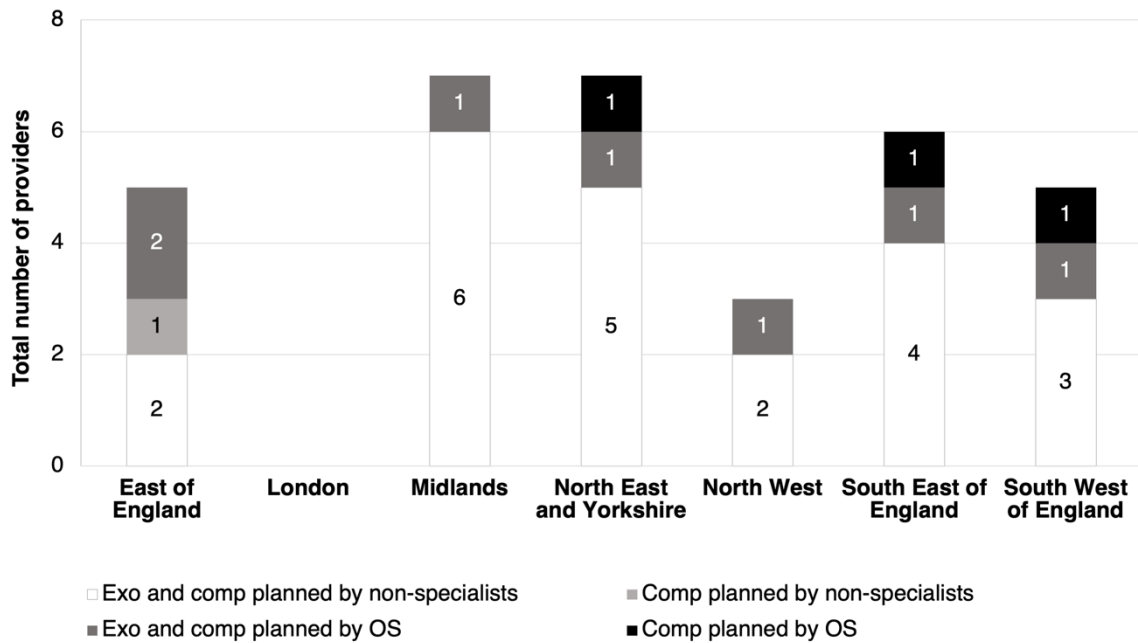


On average, 8 lists were operated a month with a mean of 6.4 patients per list across England. Out of 115 providers, 37 provided piggyback cases where they accommodated a child case into adults list (usually in the beginning of the list) or provided multidisciplinary treatment with other medical specialties (MDT).

Most of the lists were planned by specialists in oral surgery (39%, n=42) followed by paediatric dentists (32%, n=34) and non-specialists (29%, n=31) as shown in the pie chart in the top right corner of Figure 3. Those lists planned and delivered by paediatric dentists were mostly located in London (11 providers), followed by North East and Yorkshire (9 providers) and North West (6 providers). All other regions had only 1 to 3 providers led by paediatric specialty (Figure 3).



As mentioned before, some providers had comprehensive care lists (including exodontia) while others separated them into two lists. However, there was no indication of different specialties planning the lists. It was merely due to technicalities of operating two different kinds of lists. Figure 4 shows that London region had no lists with comprehensive care involvement led by any other specialty apart from paediatric dentistry. All other regions had either oral surgery or non-specialised dentists planning comprehensive care for children.



DGA service delivery data overlapped with the specialty planning care. Almost all providers, however, expressed that trainees at different levels helped deliver the treatment.

4. Discussion

Collected data have focused on DGA provision in England during 2019 as it was the most recent year before services were affected by the COVID-19 pandemic. Many hospitals suspended elective DGAs and dental staff were redeployed to help with the response to the pandemic. ¹¹ Using HES database of 2019-2020 helped ensure no potential providers were missed out.

At present there is no central registry for DGA provision in England. HES, as defined by NHS Digital, is “a database containing details of all admissions, A and E attendances and outpatient appointments at NHS hospitals in England”. ⁵ It does not differentiate between modalities such as general anaesthetic or sedation (intravenous/ inhalation). It only analyses data based on whether admissions were elective or emergency, day case or ordinary overnight. Therefore, there is a lack of a central database which provides an understanding and a detailed picture of DGA. The latest GIRFT report about Hospital Dentistry has commented on similar gaps discovered while looking at hospital dentistry data and recommended recording anaesthetic type in the HES. ¹⁰ Despite the extensive work to improve HES ¹², the previously mentioned issues were not addressed and the HES database is still falling short as an important tool to better commission the provision of DGA for paediatric patients across England and help levelling up regions and ensuring service equity. ⁸ It worth mentioning that most NHS trusts use the HES only to facilitate reimbursement, while some still use Payment by Result (PbR) which partly explains why HES did not capture all the potential DGA providers.

Another problem with the HES database is that it does not capture data from all providers of DGA. A communication sent by a senior contract manager to all NHS Hospital Trusts and CDS in Central Midlands has flagged that treatment provided by the CDS is not always being recorded under the HES database when the CDS uses the NHS trust facilities to provide DGA despite being a requirement. This was proven by the data presented in the results section above as 25% of the confirmed DGA providers did not appear on the HES database.

Additionally, on a national level, not all NHS trusts use the HES system to report activity. Therefore, the national picture of care provision is often not precise. The increase in episodes related to dental treatment, for example, might be merely due to the increase in reporting data and not higher disease prevalence. ^{6,9} Chaollai et al. highlighted a similar issue of reporting data in Yorkshire and the Humber hospitals. ¹³

The seven NHS regions were used as a unit of analysis instead of the 42 Sustainability and Transformation Partnerships (STP). This is due to the dental commissioning using the same regions and to avoid breaking down and diluting the data to a degree where variations are less likely to be flagged out. Therefore, although STP information was collected for all providers in the beginning of this study to try to create a heat map of the distribution of those providers across England, the seven NHS regions were then used to report results.

Number of confirmed DGA providers per region varied considerably but this needs further analysis in comparison to the number of children in that region to ensure equity. This is also complicated by the prevalence of dental disease amongst children in each specific region.

Access to specialty led services is also a source of concern. The results show that London has the highest number of DGA services led by paediatric dentists while regions like the South East and South West of England and the Midlands have very limited access to care led by specialists in paediatric dentistry. This is widely in good agreement with Mills et al.¹⁴ map of paediatric specialists across the UK which showed that 44% of the postal areas had no specialist in paediatric dentistry. Dental disease is affecting children in all regions. While the prevalence of dental caries varies across England, the burden of the disease affects all regions. Therefore, the variations in accessing paediatric dentistry is a postcode lottery and not based on the needs of each region. This will result in less effective treatment, possible repeated procedures, higher cost to the NHS and replacing DGA with the less effective treatment under inhalation sedation if restorative treatment is required.^{15, 16} Additionally, the guidance of commissioning standards and the latest GIRFT report both state that paediatric DGA should be led by specialists in paediatric dentistry or else must be aligned to a specialist-led paediatric dental MCN (managed clinical network).^{10, 17, 18} However, the data presented here not only shows that this was not the case, but that also comprehensive care was planned by different specialties or non-specialised dentists. It was also noted that number of providers which provided extraction only lists were higher in regions with limited access to specialists in paediatric dentistry.

In general, comprehensive care only lists were unusual, with most providers separating exodontia and comprehensive care. Additionally, over a third of providers (38%) delivered exodontia lists only. Delivering exodontia only DGA lists represents a suboptimal standard of care. Restoration of primary teeth is effective and evidence based, and there is no rationale for withdrawing or not offering this under general anaesthetic. Additionally, there is no justification from an anaesthetic point of view for the dental procedure to be kept as short as possible since the airway is stabilised by the laryngeal mask. On the other hand, separating extraction from comprehensive care inevitably leads to a short exodontia waiting time and longer comprehensive care waiting time. This discriminates against children requiring restorations and can lead to inappropriate treatment planning so that an extraction list can be prescribed. The idea of an extraction only list should be revisited. Furthermore, a quarter of the comprehensive care lists in this study were only available for children with special needs or complex medical history, which represents another discrimination factor.

During data collection and personal communications, it was clear that there are massive variations in arrangements in commissioning DGA across the different regions. Despite the high response rate in this study, the whole picture is still not clear, and a national improved registry system should be introduced or change the way the data is recorded in the HES database. This will help inform future

decisions to ensure equality of service provision.^{7,9} Solutions to better recording may vary. While a new revamped registry system might be beneficial, the HES system is still a useful tool but just needs to be improved to reduce its limitations. These changes must include all activity to be recorded into one system to make reporting more unified across Trusts, thus ensuring all providers activities are captured. When Trust sites are used by CDS, this must also be recorded clearly into the same system. Coding of treatment modalities and types of treatment must be introduced and/or improved.

It is easy to suggest increasing the number of specialists in the field to solve this problem. However, this is more complicated than only expanding workforce. Different work systems can be introduced to allow non-specialty led services to have access to specialist input. This is based on the concept that these services will have the capability to deliver treatment but not planning it. Having direct access to specialist input will amplify the volume of children receiving high quality care planned by specialists. This needs to be done carefully to avoid swamping specialty hospitals with referrals. Introducing combined posts where one day of the week can be spent in CDS or in units lacking specialists can be a viable answer. This is already applied across many CDS centres and proving beneficial for the patients. With the extensive recent use of technology and digital virtual meetings, virtual consultations without the need for seeing the patients in tertiary hospitals can also ensure those children are having access to high quality treatment planning.

5. Conclusion

Children access to paediatric specialty led DGA is variable, with children in certain regions being advantaged. The HES database has many problems and not capturing a realistic and holistic picture of the provision of DGA for children across England. This need to be addressed urgently to allow better future planning.

6. Declaration of interests

The authors declare that they have no conflict of interest.

7. Author contributions statements

All authors contributed to the conceptualisation of the project. NA developed methodology, acquired and analysed data and drafted the manuscript. HS, CW, ZM and PA all provided manuscript review and input into discussion and interpretation of results. PA provided supervision and approval of the final manuscript.

8. Acknowledgements

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Figures legends:

Figure 1 Provider type (NHS trust, CDS or independent provider) based on the NHS regions. The pie chart at the top right corner of the chart shows the confirmed provider type across England.

Figure 2 Region-based breakdown of the type of lists provided by the confirmed providers; Exodontia only, exodontia and comprehensive care separately, or comprehensive care (which includes exodontia). The pie chart at the top right corner represents the total number of type of lists across England.

Figure 3 Region-based breakdown of the specialty responsible for planning DGA lists provided by the confirmed providers; Paediatric, Oral surgery or others (non-specialty led services). The pie chart at the top right corner represents the total number of lists provided by different specialties across England.

Figure 4 Region-based breakdown of the comprehensive care lists or the exodontia/ comprehensive care lists planned by oral surgery (OS) or other non-paediatric dentistry specialties.

Table legend:

Table 1 Total numbers of contacted potential providers, response rate and numbers of providers who confirmed provision of paediatric DGA. Data breakdown based on NHS regions and whether providers appeared in the HES database or not. The percentages in brackets are colour coded for easier understanding of the origin of total number it was based upon.