**How is paediatric dentistry taught? A survey to evaluate undergraduate dental teaching in dental schools in the United Kingdom.**

**Abstract**

**Introduction:** The quality assurance of undergraduate dental education in the UK is regulated by the General Dental Councilwho describe thecompetencies expected of the newly qualified dentist or “safe beginner”. While the literature has explored the level of undergraduate training in a number of dental specialties within the UK, there is a paucity of information on the UK curriculum for undergraduate paediatric dental teaching.

**Aims:** This study aimed to assess the undergraduate teaching of paediatric dentistry within dental schools in the UK. **Methods:** An anonymous questionnaire was distributed to all 16 UK dental schools via e-mail. **Results:** Twelve questionnaire were completed, giving a response rate of 75%. First exposure to both academic and clinical teaching in paediatric dentistry ranged from years 1-4. While there were broad similarities between units with regards to core components of the curricula, there were notable differences including the teaching of regenerative endodontics (75%) and the use of the titanium trauma splint (58%). Silver diamine fluoride was only used clinically in one unit (8%) and non-vital pulpotomy was taught by 2 units (16% ). There was also considerable heterogeneity in assessment methods between universities.

**Conclusion:** The undergraduate paediatric dental curriculum is broadly similar between UK dental schools. However, there are discrepancies in assessment methods and the teaching of new advances.

**Keywords:** paediatric,undergraduate, education, United Kingdom.

**Introduction**

The quality assurance of undergraduate dental education in the UK is regulated by the General Dental council (GDC), which has a statutory obligation to ensure a high standard of dental education and training.[[1]](#endnote-1) The main concern of the GDC is that an undergraduate dental curriculum meets the required standard to in order to graduate undergraduate dental students whom are eligible to apply for registration. Additionally, higher education within the UK is quality assured by the Quality Assurance Agency for Higher Education, which ensures that students receive the highest possible standard of teaching[[2]](#endnote-2).

The commissioning standard for paediatric dentistry states that level 1 clinicians should have a competence level as defined by the dental foundation training curriculum or its equivalent. Clinicians at this level should be able to assess the oral health needs of paediatric patients, complete routine and urgent treatment and be aware of when to appropriately refer patients for further assessment[[3]](#endnote-3).

The GDC have described the competencies expected of the newly qualified dentist or “safe beginner” in the “Preparing for Practice” document and undergraduate curricula are generally blueprinted to this. However, there may be some individual variation in the methods of teaching and assessment. This document is not prescriptive regarding the teaching of paediatric dentistry at undergraduate level, allowing flexibility for the various higher institutions in the range of procedures they teach.

A “safe beginner” dentist is expected to work independently, treating children with a range of dental, medical and behavioural needs, possibly under the supervision of a foundation trainer for a period of one year. Various studies have investigated the undergraduate curriculum in the UK. Macluskey and Durham (2012) investigated the teaching of oral surgery in undergraduate units within the UK and found that, although all of the dental schools taught a curriculum designed to meet the competency framework of the GDC, there was considerable variation between schools in terms of content and delivery.[[4]](#endnote-4) However, a later paper assessing the teaching of periodontology in UK universities concluded that there is consistency between units with regard to teaching this topic.[[5]](#endnote-5) While the literature has explored the level of undergraduate training in a number of dental specialties within the UK, [[6]](#endnote-6),[[7]](#endnote-7) ,[[8]](#endnote-8),[[9]](#endnote-9),[[10]](#endnote-10) there is a paucity of information on the UK curriculum for undergraduate paediatric dentistry teaching. This study aimed to assess the undergraduate teaching and assessment of paediatric dentistry within dental schools in the UK.

**Methods**

An electronic questionnaire comprising of 27 questions was developed using the Online Surveys website (previously the Bristol Online Survey tool). The survey aimed to gain information regarding undergraduate teaching in paediatric dentistry within dental schools in the United Kingdom. The questions covered a range of topics including subjects, methods of teaching and assessment.

Ethical approval was granted by the University of Manchester research ethics committee prior to launching the online questionnaire. The survey was piloted in 3 academic units, and feedback was used to inform the final questionnaire’s content and layout. The 3 institutions included in the pilot study were the paediatric departments at the University Dental Hospital of Manchester, the School of Dentistry at the University of Liverpool, and the Leeds Dental Institute. In December 2018 the survey was launched and the website address emailed to the academic leads of each university’s paediatric dentistry department, including the 3 in the pilot study, offering an undergraduate dental programme (16 units in total). An email reminder asking to complete the questionnaire was sent to all units after 6 weeks, and the survey was closed after 12 weeks. The responses were anonymous.

**Results**

**Demographics**

Out of a possible 16 units which provide undergraduate dental programmes in the UK, 12 questionnaires were completed, giving a response rate of 75%.

When asked about what courses each university provides, 10 units offered 5 year undergraduate programmes, with 2 offering 4 year graduate entry programmes. Four units also reported that they deliver a 6 year undergraduate entry with foundation year programme. There was a wide range of number of students accepted annually across the units ranging between 20 and 160 per year.

**Undergraduate training in Paediatric Dentistry**

Academic teaching in paediatric dentistry was reported to begin as early as first year in 2 of the units, with the majority of responses reporting that this was delayed until second or third year (9/12). One department reported that academic paediatric dentistry was first taught in the 4th year of undergraduate training.

Clinical teaching including laboratory and phantom head work showed similar responses when compared to the students’ first exposure to academic paediatric teaching. One department reported that their students start their clinical teaching in paediatric dentistry in first year. Another unit reported that they incorporated their paediatric clinical skills within their general restorative in year 2.

There was a general trend towards the later years of the course when students begin to manage paediatric patients clinically. Students start their paediatric patient contact in third year within 6 of the units. A further 2 of them begin their clinical exposure in fourth year, with the remaining 4 units starting as early as in their second year of undergraduate education. Half (n=6) of the universities provide their clinical teaching in paediatric dentistry predominantly within a university dental hospital. However, 33% (n=4) of responses indicated that their students gain most of their clinical teaching in an outreach setting. One department said that their students had equal teaching both in the hospital and in outreach, whilst the final response indicated that their students gain paediatric clinical exposure in a primary care setting.

With regards to outreach teaching, the majority of responses (n=10) indicated that this takes place in a community setting. Only one unit listed general dental practice as a location for outreach teaching, and a further two units reported that their students receive additional learning opportunities on paediatric general anaesthetic exodontia lists.

**Assessment methods**

Universities reported a wide range of methods used to assess clinical competencies. These included; milestones, competencies, logbooks & mandatory clinical attainments or totals. Three of the responses discussed using data from an online portfolio called ‘Liftupp’ in the assessment of their students. Two of the responses also discussed using paediatric case presentations as one method of assessment.

All responses reported using multiple choice examinations in the assessment of their student’s knowledge of paediatric dentistry, with all except 1 unit also reporting that they utilise short answer questions. Just over half (58%, n=7) of the universities that completed the survey reported using vivas as an assessment method. Most of the respondents (83%, n-10) reported using objective structured clinical examinations (OSCE) with the remaining 2 using integrated structured clinical examinations (ISCE) to assess their students. Posters or group presentations are used as methods of assessments in half (n=6) of the universities.

**Curriculum content**

The curriculum content of participating universities covering; types of behavior management techniques, caries prevention techniques, primary and permanent tooth restorative techniques, tooth isolation techniques, primary and permanent tooth pulp management techniques, interceptive orthodontic techniques taught by participating universities, dental trauma management techniques and anaesthetic techniques are presented in figures 1-10.

**Figure 1**

Bar chart showing types of behavior management techniques taught by participating universities.

**Figure 2**

Bar chart showing types of caries prevention techniques taught by participating universities.

**Figure 3**

Bar chart showing types of primary tooth restorative techniques taught by participating universities.

**Figure 4**

Bar chart showing types of tooth isolation techniques taught by participating universities.

**Figure 5**

Bar chart showing types of permanent tooth restorative techniques taught by participating universities.

**Figure 6**

Bar chart showing types of primary tooth pulp management techniques taught by participating universities.

**Figure 7**

Bar chart showing types of permanent tooth pulp management techniques taught by participating universities

**Figure 8**

Bar chart showing interceptive orthodontic techniques taught by participating universities.

**Figure 9**

Bar chart showing types of dental trauma management techniques taught by participating universities.

**Figure 10**

Bar chart showing types of aesthetics techniques taught by participating universities.

**Discussion**

The results of this survey showed that there are marked similarities in some of the core teaching in undergraduate paediatric dental departments in the UK, but also some key and interesting differences. The identification of these differences in particular may enable individual departments to identify potential gaps in their undergraduate curricula.

This slightly heterogenous teaching amongst different departments is not unique to paediatric dentistry. Karim and colleagues (2009) noted differences in course content, extent of experience and assessment methods between undergraduate psychiatry curricula in the UK and Ireland.[[11]](#endnote-11) Similarly, Gehanno et al (2014) found variability in occupational medical undergraduate curricula between medical schools in Europe.[[12]](#endnote-12) We report that there was a relatively high level of discrepancy amongst universities with regards to the behaviour management techniques taught. It is perhaps unsurprising given its widespread acceptance and recommendation that tell-show-do was universally taught for practice and knowledge.[[13]](#endnote-13) It is encouraging that methods such as hand-over-mouth technique, and restraint with the papoose board were not taught in a number of units as these techniques are generally considered socially unacceptable and evidence shows dentists feel most uncomfortable about this practice[[14]](#endnote-14). Clinical holding was also not taught in a number of units which may be reflective of the complexity of the consent issues involved with this technique and the need for specialised training.[[15]](#endnote-15)

It is interesting that one unit did not teach systematic desensitization, which would be a potentially useful technique for the newly qualified dentist to utilize in practice[[16]](#endnote-16). The fact that two units did not teach cognitive behaviour therapy as a concept may be reflective of its relatively novel popularity within the paediatric dentistry community and it may be that more universities incorporate this technique within their curricula over time, once there is more evidence supporting its efficacy[[17]](#endnote-17).

Teaching of sedation techniques appeared to be less consistent. Whilst inhalational sedation and general anaesthesia were commonly taught there was greater variation in the teaching of oral and intravenous sedative techniques. Five units (42%) did not teach these techniques at all. As the utilisation of these techniques is less common potentially this level of teaching is better suited to postgraduate study, however it is a recommended learning outcome for a graduating European dentist[[18]](#endnote-18). However graduates of dental schools may find themselves in a position to refer to specialist paediatric care following graduation and a background knowledge of these techniques may assist in ensuring appropriate referral. Interestingly, just over half of the dental schools surveyed train UGs to treat children under sedation and GA rather than just for knowledge. The current survey did not involve detailed assessment of such training, which could be the focus for future assessment.

Dietary analysis and advice, application of fluoride varnish and fissure sealants were universally taught for both knowledge and use, which is in line with national guidance.[[19]](#endnote-19) The use of fluoride supplements and the use of silver diamine fluoride were less commonly taught. There is no standard guidance regarding these practices so these results could potentially have been anticipated. Although the use of fluoride supplements was universally taught, this was for knowledge only in half of universities. This may be reflective of the documented difficulties with patient compliance in using these supplements.[[20]](#endnote-20) The use of silver diamine fluoride as a preventative concept is one that may be more challenging despite the proven caries-preventive benefits.[[21]](#endnote-21) Currently the use silver diamine fluoride would be on an off-licence basis in the UK, although approved for use in North America. It could not be anticipated therefore that this technique would form part of a core undergraduate curriculum.

When the various methods of primary teeth restoration were investigated, there was universal teaching of direct composite restorations and the placement of preformed metal crowns using the Hall technique, which is in keeping with appropriate management of the primary dentition by newly-qualified dentists. Placement of preformed metal crowns using the conventional technique was still taught in most units, a trend which may change as the evidence for the effectiveness and ease of application of the Hall technique increases.[[22]](#endnote-22) The placement of glass ionomer cement (GIC) restorations was commonly taught (80%) which may represent their use as a temporary restoration in the primary dentition. It is unsurprising that the use of preformed crowns for the restoration of anterior incisor teeth and indirect restorations for infra-occluding primary molars are not uniformly taught as these techniques are complex and more suited for postgraduate training. Aesthetic crowns for the primary dentition were not taught by the majority of units and in fact, are not taught for clinical use in any unit in the UK. This may be reflective of the relative complexity of the procedure, extent of tooth preparation required and the associated financial implications for the unit[[23]](#endnote-23).

There was universal teaching of cotton wool isolation and rubber dam techniques with the majority of units also teaching the use of dry dam for the isolation of anterior teeth. The only isolation technique not taught by the majority of units is the optragate method.

As for the primary dentition, the placement of a direct composite restoration was a universally taught technique in the permanent dentition. GIC restorations were also taught by the majority of units. Unsurprisingly, the use of amalgam was not taught by 50% of schools, although 25% of schools reported teaching this technique for clinical use. Since the implementation of the article 10(2) of regulation (EU) 2017/852 on mercury, use of amalgam for the restoration of primary or permanent teeth is not permitted for children under the age of 15 years.[[24]](#endnote-24) Preformed metal crowns for permanent molars was also a universally taught technique, with 75% of units teaching this clinically. This technique involves the delivery of local analgesia and tooth reduction and its popularity may lie in the management of hypomineralised molars due to their low failure rate[[25]](#endnote-25). The majority of units did not teach a resin infiltration technique for the restoration of the permanent dentition and, as with the use of silver diamine fluoride, only one university taught the technique clinically. This may be reflective of the relatively novel nature of the intervention, or it’s predominant use as an aesthetic treatment in the paediatric patient[[26]](#endnote-26).

The most commonly taught methods for management of the primary pulp were indirect pulp therapy and ferric sulfate pulpotomy, which was to be expected due to the high success rates for both techniques. [[27]](#endnote-27),[[28]](#endnote-28) However, although more novel pulpotomy agents such as MTA and Biodentine are taught for knowledge in most universities, only two units reported the clinical teaching of these techniques and two units reported that they do not teach them at all. Pulpectomy of the primary molar is also commonly taught as a concept, but, similarly to the MTA/Biodentine pulpotomy, two units reported they do not teach knowledge of the technique. It was unsurprising that no unit in the UK teaches the formocresol pulpotomy technique, given the potential carcinogenicity of this material and concerns regarding its safety.[[29]](#endnote-29),[[30]](#endnote-30) Perhaps the most interesting result from the survey was that two units teach a non-vital pulpotomy technique in primary molars. Maybe this can be explained as a technique to reduce acute pulpal inflammation prior to pulpectomy or extraction rather than as a definite intervention.

There was far greater homogeneity between units with regard to the teaching of pulp therapy in the permanent dentition, with universal teaching of direct and indirect pulp capping. The Cvek pulpotomy technique was also universally taught, however, three units reported the teaching of this technique for information only rather than clinical use. The stepwise caries removal technique was also taught by the majority of units with only one unit not teaching it. It is surprising that one unit does not teach pulpectomy as a pulp treatment for permanent incisors as this would be a common intervention following both traumatic dental injury and for the extensively carious, non-vital permanent incisor tooth. However it is possible that the students are being taught this by their restorative department.

The management of traumatically injured teeth was uniformly taught with wire and composite splint being the most commonly utilized splinting technique. Titanium trauma splint was only taught in 58% of units, the reason for which is unclear but potentially the higher cost associated with this technique may influence the integration of this technique into clinical teaching. Four (25%) units reported that they teach a composite only splinting technique, which is not the optimal technique due to its lack of physiological mobility and fracture risk [[31]](#endnote-31). It’s notable that regenerative endodontic treatment is taught in the majority of units, with 16% of units also teaching it for clinical use. Aesthetic techniques appear to be taught quite uniformly across units with microabrasion being by far the most commonly taught procedure.

A diverse range of assessments were used across the UK universities which is in accordance with published literature on medical undergraduate curricula. Hill et al noted variation in assessment methods amongst UK undergraduate ophthalmology curricula.[[32]](#endnote-32) All schools who responded to a European questionnaire also used a combination of different assessment methods of their students.[[33]](#endnote-33)

The diversity in teaching practices may be a result of historic usage of certain techniques in certain departments. As with all evaluations of teaching a reasonable question is whether this diversity substantially influences the capability of the resultant graduate. This was not the purpose of this study but given the diversity identified it is reasonable to assume, that there will be some variation in the preparedness for newly graduated dentists when treating paediatric patients according to their university. As a community of paediatric dentists it directly follows whether this is acceptable, as the overall goal is to ensure the best dental health for children. Whilst the core values seem to be shared amongst universities, relatively few questions were answered identically by all respondents. This echoes results of an earlier European study which reported how clinical and academic teaching varied broadly between dental schools.33 Furthermore, this is also consistent with dental schools in Chile with discrepancies in curricula between different units being reported.[[34]](#endnote-34) Before suggesting a universal curriculum for all universities, it is clearly necessary to assess whether the somewhat heterogeneous teaching patterns may influence competence and confidence in the newly qualified dentist but most importantly patients’ outcomes. In the future this could lead to collaborative work between units in order to standardise paediatric teaching and curricula, and there are already published European documents which could be of use in this endeavour.[[35]](#endnote-35) This study is the first step in identifying that diversity is present but will require further evidence to confirm or refute whether this impacts effectiveness of graduates longitudinally.

**Conclusion**

This survey highlights a common core structure for paediatric dentistry teaching within the UK. However, there are discrepancies in the teaching of some newer techniques and variations in the techniques taught for clinical use rather than for knowledge only.

**Data Availability Statement**

The data that support the findings of this study are openly available in “figshare” at https://doi.org/10.6084/m9.figshare.11861112.v1

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