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Exploring the declared and the formal and informal taught curricula at a UK dental school through the lens of pulp management.

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Abstract

Introduction: This paper explores the declared and formal and informal taught endodontic curriculum within an undergraduate dental programme in the UK, as part of a wider study which also investigates the learned curriculum. Management of the dental pulp was chosen due to the availability of clear internationally recognised guidelines.

Method: The declared curriculum was identified through existing course guides, seminar and practical session plans. The formal taught curriculum was identified by cataloguing all lectures, practical teaching sessions, seminars and handouts available to dental students. Questionnaires using clinical vignettes were used to explore the informal taught curriculum.

Results: Valid responses to the questionnaire were received from 25/40 (62.5%) clinical supervisors. Disparities between national guidelines, the declared and taught curriculum were primarily due to broad learning objectives and disparate information from lectures and supervising clinicians. Although the majority of formal teaching aligned with national guidelines, the main deviation occurred within the informal taught curriculum.

Conclusion: This study highlights disparities between current evidence-based guidelines, the declared and the taught curriculum in relation to pulp management in a UK dental school.

Recommendations: all policies, procedures and protocols are updated and aligned to a

contemporaneous evidence base annually, and engagement with clinical lecturers to enable more standardised teaching.

Keypoints:

Disparities exist between current evidence-based guidelines, the declared and taught endodontic curriculum at a UK dental school. The main deviation occurred within the informal taught curriculum during patient encounters in the clinical environment.

Recommendations include: Clear delivery of current guidelines during lectures; all policies, procedures and protocols to be updated and aligned to a contemporaneous evidence base annually; clinical teacher training to allow for more standardised teaching in the clinical environment.

Introduction

In the United Kingdom (UK), the importance of an evidence-based approach to dental care is acknowledged by the General Dental Council (GDC), in their ‘Standards for the Dental Team’ which states in standard 7.1 that “You must provide good quality care based on current evidence and authoritative guidance”.² Similarly, in relation to dental education, providers are required to underpin their curriculum with an evidence base, and in order to graduate as a safe beginner students must be able to ‘Explain, evaluate and apply the principles of an evidence-based approach to learning, clinical and professional practice and decision making’. Further to this, the Association for Dental Education in Europe (ADEE) provides a framework, ‘The Graduating European Dentist’ that reflects best academic practice for European undergraduate dental education to support educators to deliver a contemporaneous curriculum to dental students.³ It would therefore be realistic to expect that the curriculum of dental programmes would be founded on the current evidence base, and would need to be reflexive to changes in that evidence base.

Whilst the changing nature of the evidence base may pose a challenge for providers of dental education programmes in updating and aligning their curriculum these are hypothetically more easily controlled than the ‘informally’ taught curricula. A curriculum is ‘the planned and guided learning experiences and intended learning outcomes, formulated through the systematic reconstruction of knowledge and experience, under the auspices of the school, for the learner’s continuous and willful growth in personal social competence’.⁴ The declared curriculum is the stated and intended curriculum, which an institution claims is being taught and is described in a course syllabus or guide.⁵ However it is also recognised that important learning takes place via interactions within the workplace and organisational culture and this is often described as the informal, or hidden curriculum’.⁵ Student learning can be influenced

by informal learning through peers, clinicians and the increasing use of social media, which may or may not align with current best practice.^{6,7}

Gaining an understanding of how and why the declared and informal curriculum may differ from the evidence base and also from each other is an important aspect of quality assurance of programmes. A recent UK cross sectional survey identified outdated endodontic practices such as the use of calcium hydroxide for a direct pulp cap were common in UK primary care, irrespective of the number of years since graduation,⁸ and anecdotal evidence suggests that undergraduate students may also undertake the same practice.

This study therefore aims to explore potential differences between the formally declared and formal and informally taught curriculum in a dental undergraduate programme using the lens of endodontics in relation to current guidelines. Objectives include to identify the declared and formal and informal taught curriculum at a UK Dental School in relation to deep caries management, direct pulp caps and symptomatic irreversible pulpitis. In addition, to identify any differences between the declared and formal and informal taught curriculum in relation to current guidelines, and potential reasons for such discrepancies.

Context:

At the School of Dental Sciences, Newcastle University, restorative dentistry (particularly in relation to endodontics) is taught via a mixture of lectures, seminars, practical teaching sessions using models, three-dimensional printed teeth, extracted teeth and clinical attachments where students provide treatment for patients under the supervision of clinical educators including restorative consultants, registrars or associate clinical lecturers and specialty doctors.

Recent evidence based guidelines in relation to deep caries management and symptomatic or asymptomatic or both irreversible pulpitis have been by the international caries consensus collaboration (ICCC),⁹ the European Society of Endodontology (ESE)¹⁰ and the American Association of Endodontists.¹¹ The changing nature of the evidence base in endodontics poses a particular challenge for educators in aligning the declared and the formal and informally taught curricula resulting in students deviating from best practice such as using calcium hydroxide (CH) instead of calcium silicate cements (CSCs) for direct pulp caps (DPCs).^{9,10} The recent guidelines therefore provide a useful model for investigating the declared and taught curriculum and are summarised in figure 1.⁹⁻¹¹

Ethical approval was awarded by Newcastle University Research Ethics Committee (REF: 12993/2020).

Method

The declared endodontic curriculum

To identify the declared curriculum, relevant course guides, seminar plans and practical session plans were obtained from the course leads for undergraduate BDS students.

Recognising that the curriculum content may have changed since having been delivered to the students in earlier stages of the programme, the version of documents pertinent to the current final year students were obtained. Learning outcomes were noted in relation to caries management, direct pulp caps and symptomatic irreversible pulpitis.

The formal taught endodontic curriculum

The formal taught endodontic curriculum was identified by sourcing all lectures, practical teaching sessions, seminars and handouts given to current final year dental students in relation to deep caries management, direct pulp caps and symptomatic irreversible pulpitis.

Their content was cross-checked against current guidelines with a focus on alignment or deviation.

The informal taught endodontic curriculum

A questionnaire was designed aimed at exploring clinical teachers' advice to students at Newcastle Dental Hospital via clinical vignettes based on deep caries management and management of the exposed pulp (figure 1). The questionnaire consisted of closed questions supported by a radiograph of deep caries and pictures of carious exposures (supplemental information). The questionnaire was designed and distributed electronically using JISC Online Survey in June 2021.¹² A questionnaire pilot was delivered to 10 hospital dentists not involved in teaching, including general professional trainees, dental core trainees and specialty trainees. Following this feedback, minor amendments were made before the questionnaire was emailed to all 40 restorative clinical teachers responsible for delivering undergraduate clinical supervision (including dentists working in general practice, the community setting, specialist in practice, staff grades, restorative registrars and consultants). A reminder email was sent 1 week later. The aim of the questionnaire was to explore the informal taught curriculum. Following the checking and removal of any duplicate responses, data were pseudonymised, cleaned, coded and analysed with IBM SPSS (Version 25, Chicago, IL, USA). Descriptive statistics were used to explore key themes. Variables investigated included if the clinical teachers worked mainly in the hospital or primary care setting, if they had a formal postgraduate qualification and their awareness of the ESE position statement.

Univariate analyses of differences in responses to questions using X^2 was undertaken. Exact p -values were calculated without Bonferroni correction and where assumptions of cell counts were violated in cross tabulations (<5 in $\geq 20\%$), Fisher's exact test was used.¹³

Results

The declared endodontic curriculum

Table 1 shows all learning outcomes identified in the declared curriculum in relation to caries management, direct pulp caps and symptomatic irreversible pulpitis in the final year students' education from September 2016 to July 2021. Learning objectives were generally broad based and did not directly reference current national guidelines. They did not state specific materials or techniques in different clinical scenarios.

The formal taught endodontic curriculum

Twelve lectures and seminars relating to deep caries management, management of the cariously exposed pulp and symptomatic irreversible pulpitis were identified. The ESE 2019 position statement was quoted and listed as suggested reading, but guidance from the ICCC was not mentioned. Three of these lectures/seminars taught students the wrong information in relation to current guidelines or they did not discuss all the methods and materials that could be used (Table 2).

The informal taught endodontic curriculum- clinician questionnaire

Participant demographics for the questionnaire are shown in Table 3. Valid responses were received from 25/40 (62.5%) supervising clinicians (Table 4).

Deep caries management

When shown a bitewing radiograph (supplemental information) of a deep carious lesion of the UR6, the majority of clinicians (14/25; 56%) stated that they would teach a selective caries removal technique, 7/25 (28%) would teach a stepwise technique and 4/25 (16%)

would teach a non-selective technique (Table 4). Clinicians working mainly in primary care were more likely to choose a selective technique than those working in hospital (9/13 [69.2%] v 5/12 [41.7%]), however this was not statistically significant ($p=0.165$).

In deep caries management, 11/25 (44%) clinicians stated they would not use a lining/indirect pulp cap when restoring the tooth with a composite restoration. For those that would place a lining, 3/14 (21.4%) would teach the use of either GIC or CSC, meaning 11/14 (78.6%) would not teach aligned with the recent consensus statement.¹⁰

Direct pulp cap

About half of clinicians (12/25; 48%) stated they would teach the use of a cotton wool pledget soaked in CHX or sodium hypochlorite (NaOCl) to arrest haemorrhage after a pulp exposure, following current recommendations.¹⁰ Clinicians who were aware of the ESE position statement were more likely to teach cotton wool/NaOCl compared to those with no knowledge of the ESE position statement ($p=0.041$). Regarding which material to use for a direct pulp cap, CH was the most popular choice (13/25; 52%), going against current recommendations, whereas CSC would be taught by 10/25 (40%) of clinicians, aligning with current guidelines.¹⁰ Those aware of the ESE position statement were more likely to use CSCs and those clinicians who were not aware were more likely to use CH ($p=0.011$ and $p=0.003$ respectively, Table 4).

Symptomatic Irreversible pulpitis

When presented with the emergency appointment scenario of a tooth displaying symptoms of symptomatic irreversible pulpitis, most clinicians (15/25; 60%) would manage the case with a pulpectomy rather than a pulpotomy. Around half (13/25; 52%) would choose CH to dress the tooth rather than using an antibiotic/corticosteroid dressing, despite recent guidelines by

the British Endodontic Society recommending such dressings,¹⁴ although it is acknowledged there is a dearth of evidence around the effectiveness of antibiotic/corticosteroid dressings.

Discussion

The findings of this study show that there are likely to be disparities between the content of current evidence based endodontic guidelines, the formal and informal taught curriculum.

The declared curriculum

Learning outcomes are, ‘broad statements of what is achieved and assessed at the end of a course of study’.¹⁵ For students, learning outcomes provide building blocks to construct their knowledge and skills around a subject and they guide teachers on the delivery of a course.¹⁶

Learning outcomes form only a part of the curriculum however since there is an interplay between the learner and the clinical environment, which is later described.

In the UK, the GDC defines the learning outcomes for a dental graduate but allows education providers autonomy in planning and delivering the undergraduate curriculum in a way that suits their circumstances.¹⁷ The learning outcomes described in *Preparing for Practice* by the GDC tend to be very broad and non-specific for example the learning outcome pertaining to endodontics states that graduates should be able to: Assess, diagnose and manage the health of the dental pulp and periradicular tissues, including treatment to prevent pulpal and periradicular disease.

However, there are numerous learning outcomes which refer to the need ‘apply the principles of an evidence-based approach to learning, clinical and professional practice and decision making’, maintain contemporaneous knowledge and comply to guidelines, for example: (to explain numbering further)

- 1.8.5 Comply with current best practice guidelines

- 7.1 Be familiar with and act within the GDC's standards and within other professionally relevant laws, ethical guidance and systems

- 9.4 Develop and maintain professional knowledge and competence and demonstrate commitment to lifelong learning

- 9.5 Recognise and evaluate the impact of new techniques and technologies in clinical practice.

In writing such broad learning outcomes the GDC are almost certainly acknowledging that specific legislation, guidelines and best practice cannot be explicitly referenced because such content is liable to frequent change and that the responsibility lies with the practitioner to maintain their own knowledge. Similarly, the present learning outcomes at Newcastle University are also very broad and do not make specific reference to guidelines and techniques (Table 1). This enables teaching to react and adapt to emerging evidence, consensus statements and guidelines, without being overly prescriptive. It has been suggested that to assure the delivery of teaching aligns to current guidelines, a system of learning outcomes can be cross referenced against current guidelines on a yearly basis.³

The formal taught curriculum

Whilst the majority of teaching material aligned with current guidelines, guidance from the ICC⁹ was not mentioned in lectures, although the ESE 2019 position statement was quoted

and listed as suggested reading. Incorrect information was occasionally delivered in lectures and seminars such as use of CH for direct and indirect pulp caps, but the majority of formal teaching material delivered relevant and up-to-date information. The ADEE suggest dental schools should ensure that all policies, procedures and protocols are updated and aligned to a contemporaneous evidence base.³ In line with this we recommend that lecture content is checked against the latest guidelines when delivered and for staff regularly lecturing on specific topics, this should be completed at least yearly. At Newcastle, the ‘Update in Endodontics’ lecture given in final year is an ideal opportunity to discuss the latest relevant guidelines to adequately prepare students for their final examinations and be best prepared for practice. This approach could be used in other disciplines and would be effective at other institutions.

The informal taught curriculum

It was found that the informal taught curriculum appears to be highly variable with clinical teachers deviating from accepted clinical guidelines. More than half would advise students to use CH for a direct pulp cap and some would advise non-selective caries removal to manage deep caries. However, in a recent study of primary dental care practitioners in the UK, 41.4% of dentists would use a non-selective caries removal technique to manage deep caries⁸ and respected researchers continue to use this approach,¹⁸ particularly in cases of extremely deep caries.¹⁹ This is reasonable given the extensive bacterial presence in the pulp, and its inflammatory status in ‘extremely deep caries’ where there appears to be caries into pulp,¹⁹ but in cases of deep caries where there appears to be intact dentine present, as in the clinical vignette used, selective techniques offer superior clinical outcomes.^{20,21} For many years CH was considered the ‘gold standard’ for a DPC²² and considering that 52% of the clinical supervisors have been qualified for >20 years, they would have plenty of experience and

expertise with this material. Although differences in opinion from clinical supervisors may confuse students, if channeled correctly it will allow them to become reflective and take charge of their own learning and practice by implementing an evidence-based approach. Importantly, where teaching does not follow evidenced based guidelines, the pragmatic approach of general practitioners compared to 'by the book' strategy of hospital-based clinicians may enrich student's education by preparing them for 'real world' practice whilst being a 'safe beginner'. Limited availability of materials is one of many issues new graduates will have to contend with when treating patients in primary care. In fact, this experience may help to bridge the 'tension' gap between dental schools and dental foundation trainers, however this should not come at the expense of good clinical outcomes for patients. For example, using CH for a DPC deviates significantly from accepted best practice and may result in sub-optimal outcomes for patients. Research has found that treatment options and the environment in UK dental schools did not correspond to those prevalent in the NHS for some clinical situations,²³ but students should strive for best practice.

As clinicians have been teaching students information that conflict with current guidelines, one suggestion from this study is for clinical supervisors to have formal training at the start of their position to standardise techniques and protocols and provide uniform teaching. Another suggestion would be to conduct an annual CPD teachers training day with updates on topics such as dental materials. ADEE recommends structured and regular staff training to achieve these aims.³ It has been shown that the majority of clinicians (75%) involved in teaching undergraduate students feel their teaching would benefit from additional training.²⁴ However, what is not clear is the nature of training that would be most beneficial, for example training around pedagogy or ensuring content alignment? Nonetheless the delivery of training, whilst

hopefully improving student experience and outcomes, may also result in clinical teachers (particularly those working less than full time in the educational environment) feeling more valued by providers and encouraged to further develop their careers as teachers, which frequently does not happen and is a major complaint of clinicians.^{24,25} Currently in the UK, there is a shortage of clinical academic staff²³ and the above approach may also increase staff retention.

Limitations

As with all questionnaire surveys, bias and self-reporting can be problematic. One question in the questionnaire referred to the use of a liner under a posterior composite restoration, which are not routinely placed under the publicly funded National Health Service in England and Wales²⁶ and is only used for pregnant patients and children. Clinicians may not have been so familiar with the best approach to using this material.

Conclusion

Our findings suggest that in this one example there are some disparities between current evidence-based guidelines, the declared and taught endodontic curriculum. Most of the deviation from best practice appears to be delivered through the informal taught curriculum in the clinical environment. Further research is needed to explore if and to what degree this influences students' knowledge of current guidelines and hence the learned curriculum requires investigation. Recommendations from this research include:

- in lectures, a clear delivery of what the current guidelines are,
- ensure all policies, procedures and protocols are updated and aligned to a contemporaneous evidence base ideally annually and
- improved clinical teacher training to allow for more standardised teaching.

The authors suggest the above measures can be implemented by other dental schools within the UK to ensure a curriculum that is both contemporaneous and evidence- based is delivered to undergraduate students.

Conflict of Interest

The authors have no conflict of interest to declare.

Author Contribution Statements

The authors confirm contribution to the paper as follow: study conception and design: LB, DE, JF, JE; data collection: LB, DE; analysis and interpretation of results: LB, DE; draft manuscript preparation: LB. All authors reviewed the results and approved the final version of the manuscript.

Consent Statement

All participants consented to participate in the study and for their data to be used as part of the research and published.

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