Preparing dental students for independent practice: a scoping review of methods and trends in undergraduate clinical skills teaching in the UK and Ireland

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Key points

Draws developments from the literature in one place, and shows the reported impact of innovations on the efficacy and delivery of dental clinical skills teaching in a range of clinical disciplines.	Identifies some concerns expressed by stakeholders regarding certain clinical areas where there is a reported risk of under-preparedness for independent practice.	Useful for those involved in teaching methods development at undergraduate level and to those involved in the undergraduate/foundation training interface.

Abstract

Introduction The governing bodies for dentistry in the UK and Ireland require dentists, at graduation, to possess the knowledge, skills and attributes which enable them to practise safely, without supervision. The means by which dental schools achieve this may differ and may undergo modification in response to changes in the expectations of governing bodies and challenges within the teaching environment. It is therefore important to identify which of these approaches works well and to disseminate good practice described in the literature.

Objectives To use a scoping review to identify from the published literature the methods used to teach clinical dental skills, including innovations, motivations for changes, and factors affecting the delivery and quality of teaching.

Method Scoping review methodology was used to select and analyse 57 articles published between 2008 and 2018.

Results Innovations in didactic teaching were facilitated by advances in IT and development of virtual learning environments, which promoted independent, self-directed learning. Pre-clinical practical teaching took place in clinical techniques laboratories utilising mannequin heads, with a minority of dental schools using virtual reality simulators in addition. Clinical experience was gained mainly in multi-disciplinary clinics and offsite outreach teaching centres. Insufficient numbers of suitable patients, increasing student numbers and a fall in teaching staff contributed to a reported reduction in clinical experience of certain treatments.

Conclusions Contemporary clinical dental skills teaching produces new graduates who possess excellent theoretical knowledge, are prepared and confident in basic clinical skills, but are lacking in experience of complex treatments which may result in a reduced preparedness for independent practice.

Introduction

It is incumbent upon dental schools to equip their graduates with the skills and knowledge to enable them to practise competently, compassionately and independently, without supervision, as described in *Preparing for practice*.[1]

The Dental Council of Ireland sets down codes of practice defining their expectations across a range of clinical areas.[2,3,4,5]

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Although the outcomes of the undergraduate programme in each jurisdiction are clearly defined, each dental school is free to design their own programmes. Teaching underpinning theory, safe practising of key operative skills before patient exposure and honing of skills on patients under supervision are key elements.

Most new graduates in the UK enter a one-year, NHS-funded programme called foundation training, in which they treat NHS patients within selected primary care practices, under the mentorship of what are known as educational supervisors (formerly foundation trainers). Trainees attend a minimum of 30 compulsory study days at their local postgraduate deanery for structured supplementary learning. The curriculum is designed by the UK Committee of Postgraduate Dental Deans and Directors.[6]

This course must be satisfactorily completed in order for the dentist to apply for a performer number and enter general practice, or to enter hospital service in the following year.

In Ireland, the newly graduated dentist enters general practitioner (GP) or hospital posts without further training.

Objectives

The aim of this research project was to carry out a scoping review of the literature to examine and map the range of methods being used to teach clinical dental skills at undergraduate level in dental schools in the UK and Ireland, in order to identify whether new methods of teaching had been developed and why, whether the teaching environment had changed, the staff's and students' perceptions of the

teaching, and how well the teaching prepared students for life in dental practice.

Methods

The objectives of the research outlined above were suited to scoping review research methodology. Scoping reviews are an ideal tool to determine the scope or coverage of a body of literature on a given topic, and are used to produce an overview of the nature and volume of available research evidence. In this way, knowledge gaps can be identified, which in turn suggest topics for systematic reviews.

The methodology of this scoping review followed the framework described by Arksey and O'Malley,[7] and refined by Levac et al.[8] This framework consists of a six-step mechanism designed to guide the researcher at each point of the review process.

In summary, five stages of the framework were followed for this scoping review, beginning with: identification of the research questions (stage 1); identifying relevant studies (stage 2); selecting the studies for review (stage 3); analysing the data (stage 4); and presenting results (stage 5). The sixth stage, consultation, was omitted. While Levac et al.[8] feel it is an essential step in the scoping review methodology as the rigour of the research is enhanced by the scrutiny of stakeholders, Arksey et al.[7] suggest that this step is optional.

The research questions were defined by the objectives of the review, which were to investigate what the literature shows regarding:
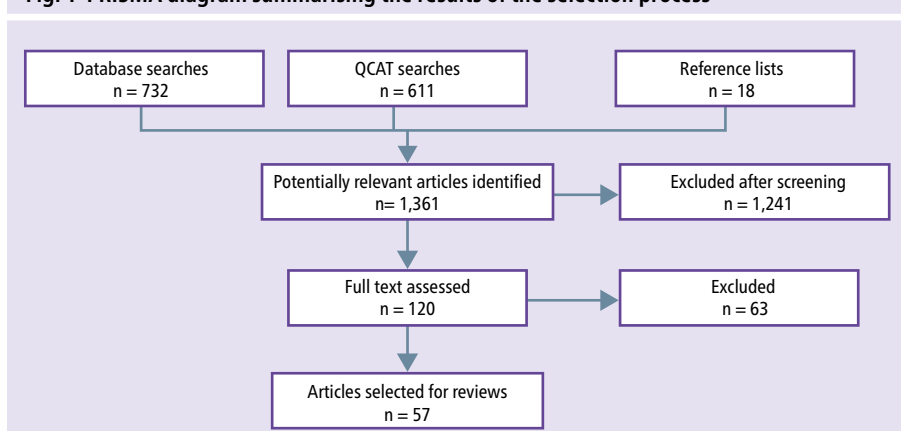
- How clinical dental skills are taught in dental schools
- The changes/innovations that have taken place in the last ten years
- The reasons given for the development of new methods of teaching
- The clinical disciplines/areas of dentistry involved
- Stakeholders' (students, clinical teaching staff, patients) perceptions of their experiences of clinical skills teaching in dental schools and their preparedness for practice.

The Medline All database was searched using the Ovid platform to identify the first tranche of articles. This pilot search provided keywords used in subsequent searches. The Wiley and ERIC databases were searched (EBSCO platform) using the keywords 'dental education AND clinical skills teaching' OR clinical skills teaching'. The *British Dental Journal* and the *European Journal of Dental*

Education were searched using the keywords ('dental education' AND 'clinical skills teaching' OR 'clinical skills development').

A selection protocol was designed to ensure that articles were selected consistently and contained information which could be expected to address the research questions (Table 1). The reference lists of selected articles were examined for any further relevant articles. A summary of the results of the selection process is given in the PRISMA diagram in Figure 1.

A data charting sheet was created to capture the key features and findings expected to be present from the characteristics of articles selected.[7] The full text of selected articles was analysed to identify themes.

Results

Fifty-seven articles were selected for inclusion in the literature review, having met the criteria set out in the selection protocol. A list is provided in the online supplementary information.

The articles were the work of teams of researchers working in 11 dental schools (61% of dental schools in UK and Ireland) (Fig. 2).
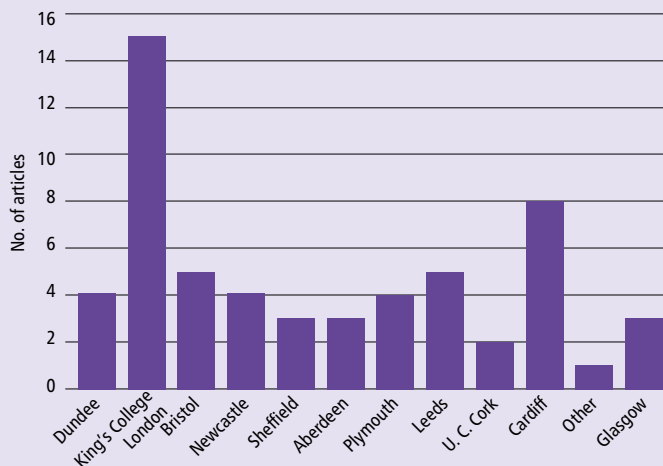
The 57 articles that met the criteria for inclusion in the review considered diverse aspects of clinical dental skills teaching across a range of clinical disciplines. By analysis of the article content, each article was grouped according to the clinical discipline involved. In some cases, articles dealt with clinical skills teaching in a single clinical discipline. Others considered clinical dental skills or specific teaching scenarios which were relevant to more than one clinical field. The group entitled 'other' denotes articles of the latter type.

Articles dealing with the teaching of communication skills and the development of reflective practice were placed in the group entitled 'soft skills.' In many dental schools, students treat adult patients in multi-disciplinary clinics where all aspects of their oral health are addressed. The group 'total patient care' refers to articles which described the clinical teaching initiatives in this setting.
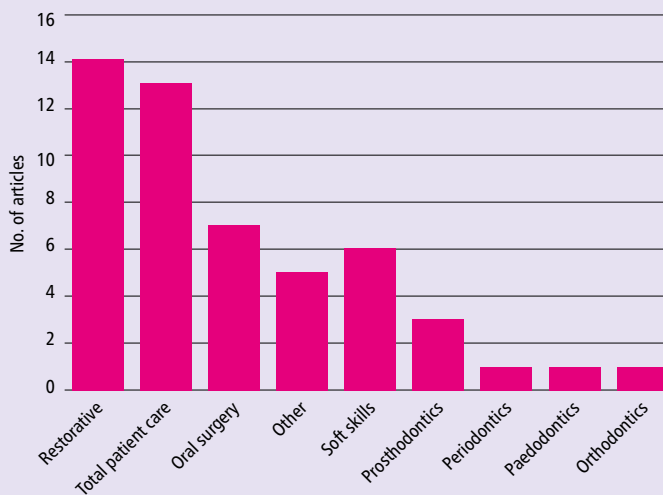
A summary of the distribution of the 57 reviewed articles from the perspective of clinical discipline is illustrated in Figure 3.

After analysis of the data, five key themes emerged, each with a number of subthemes.

Table 1 Selection protocol

Inclusion criteria for population and context	Exclusion criteria
Peer-reviewed journal article	Postgraduate participants
Conference papers	Non-UK and Ireland dental schools
Full text available in English online	Publication before 2008
Publication date range around 2008 to present	Articles where student population included postgraduates
BDS or equivalent undergraduates (any year group)	Articles where student population included other students of other courses
Clinical dental skills teaching (any clinical discipline)	
Teaching innovation (any type)	
UK and Ireland dental schools	

Fig. 1 PRISMA diagram summarising the results of the selection process
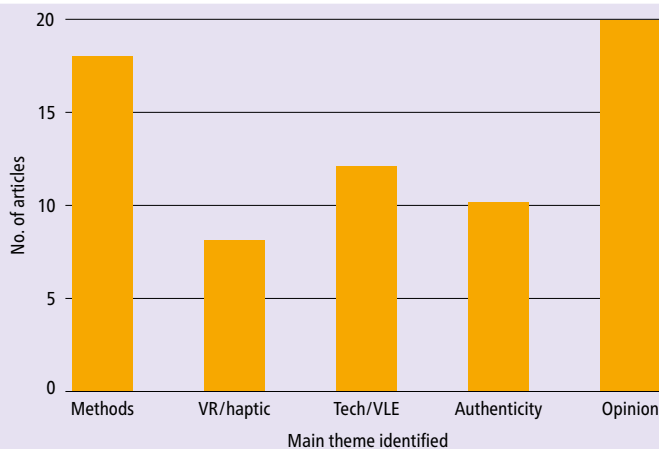
Fig. 2 Article distribution by university affiliation of lead author

Fig. 3 Distribution of reviewed articles by clinical discipline

Fig. 4 Article distribution according to theme

the articles, the opinions theme provided an important 'student voice' (Fig. 4).

Teaching of theory

There was considerable consistency in teaching methods of theoretical concepts, albeit with a wide variation reported for time devoted to didactic teaching depending on discipline. Lectures, seminars and tutorials were reported in all dental schools, with a minority utilising problem-based learning. The use of technology to enhance (possibly dull) content by audio-visual means during conventional teaching sessions was found to be widespread.

Clinical academic staff (both senior and junior), GPs and subject specialists (for example, radiologists) delivered the teaching. Hard-copy resources had largely been replaced by online portals through which students accessed their course resources.

Practical skills

Pre-clinical stage

Pre-clinical teaching of clinical skills in all dental schools took place in phantom head laboratories. Rotary instruments, hand instruments and x-ray equipment were identical to those used in clinics, thereby developing familiarity with equipment, ergonomics and patient safety in addition to learning operative dental skills in a simulated environment. Teaching commenced in first and second years for basic restorative skills, with teaching of endodontics, fixed prosthodontics and oral surgery in later years (third to fifth).

Live demonstrations of clinical skills had largely been replaced by video resources provided by the dental schools' virtual learning environment (VLE). Teachers included university clinical teachers and general practitioners. A small number of dental schools had installed virtual reality simulators.

Communication skills teaching was workshop-based, using fellow students and specially briefed actors as simulated patients, to practice communication scenarios before patient contact, although video technology was used to demonstrate best practice and allow students to assess their own performance.

At pre-clinical level, students extracted teeth from Thiel-embalmed cadavers to improve verisimilitude.

Clinical stage (dental school clinics)

Multi-disciplinary clinics, in which all the patient's treatment needs were met in one clinic rather than in many single-discipline clinics, were

Some articles contained data on several themes; for example, information on both the teaching of theoretical concepts and methods of practical clinical skills teaching delivery. The opinions theme, mainly composed of questionnaire-type research, reflected the views of stakeholders including heads of department, researchers and patients. In addition to this, with direct quotes representing 2,042 student participants' opinions, given within 16 of

utilised in most dental schools and considered by many authors to be a better model of primary care practice.

Feedback was given by clinical supervisors in response to students' performance of clinical procedures, and subsequent reflection upon feedback then informed future performance of similar skills.

Those with responsibility for such 'chairside teaching' were likely to have completed some form of postgraduate training in education.

Clinical stage (outreach centres)

Authenticity at clinical level was reported as having been enhanced by the use of multi-disciplinary clinics in dental schools and development of offsite small clinics known as outreach centres. The outreach programmes form an integral part of senior student training, with final-year students spending up to 50% of their time in such clinics. Purpose-built clinics, NHS community dental clinics and GP placements were utilised. Supervising dentists varied with type of site, as did the type of clinical experience gained due to patient variation. Students experienced working with other dental care professionals and gained insight into inter-professional referral. Reported benefits included a greater number and diversity of patients in outreach centres compared to dental school clinics.

Patients providing feedback to students in dental school clinics were described.

Technology
Virtual reality/augmented reality

Virtual reality workstations have been developed as an alternative to the conventional phantom head units for pre-clinical skills training in a small number of dental schools. Students wore 3D eyewear to create the virtual reality environment. Audio-visual and aural cues gave objective, instant performance feedback to the operator. Students worked in a self-directed manner. A variety of procedures were available, from simple cavity preparations suitable for novice students, to crown and bridge preparations aimed at senior students. Reported advantages were a reduction in required supervision, the potential to increase work rate compared to traditional supervisor-led classes and a reduction in running costs.

Computerised virtual reality simulators (CVRSs) combined conventional phantom head units and equipment with infrared cameras and computers to create a 3D virtual reality of the cavity, which overlaid the student's attempt with an ideal preparation onscreen.

Virtual reality/haptic devices augmented rather than replaced conventional methods, with students reportedly preferring a combination of supervisor and computer feedback.

Technology (virtual learning environment)

Most dental schools utilised a VLE which enabled students to access resources and participate in online activities such as webinars, tutorials and lectures with varying degrees of interactivity. The reported benefits of VLEs were greater flexibility and independence, where the student sets the pace, time and place for learning. Online resources created by parent dental schools themselves (and from many other sources created nationally and internationally) resulted in the globalisation of learning. Frequently, e-learning and traditional face-to-face learning were found to be combined (blended learning). This approach was thought to be more effective than either method employed alone.

Laptops were made available in clinics in some dental schools, allowing students to access VLE resources during treatment sessions.

Self-development
Peer assessment

The experience of giving and receiving diplomatic criticism improved peer integration in tasks. Reflection and critical skills were noted to have been developed by students.

Self-direction and group learning

Tutor-less group work, where students directed their own workshops using resources supplied by the dental school VLE, was seen as an effective way of developing both self-direction and collaborative skills, which are required in independent practice.

Reflective portfolios

The use of portfolios (progress files) and e-portfolios were used in most dental schools. Such portfolios created an official record of achievement and experience, deepened understanding by reflecting on experience, and were a good way of developing professionalism and the skills of self-assessment.

Factors influencing clinical dental skills acquisition
Shortage of suitable patients for undergraduate treatment

There was a reported shortage of suitable patients to meet the demand for clinical experience. Possible explanations included unreliable attendance of patients, longstanding

patients having little primary disease, patient noncompliance and inaccessibility of sites.

Screening and assessment clinics were recommended to boost patient availability. Some articles raised concerns that lack of clinical exposure to certain treatments could cause problems when foundation trainees encountered such treatments in practice.

Workforce composition

The composition of the workforce on the clinic in restorative dentistry showed an increased reliance on part-time GDPs and clinical teachers, with the role of senior clinical academics become more of an overseeing, strategic responsibility for specific areas of curriculum content. In total, 16/57 (28%) articles referred to a shortage of clinical staff, at both teaching and supervisory level.

The age profile of UK dental educators showed most were over 50.

Increase in student numbers

Student numbers were shown to have increased significantly in recent years. Coupled with the reduction in teaching staff described above, this has affected staff/student ratios and it was felt that this could compromise the quality of teaching provided.

Link between students' self-reported confidence, clinical experience and preparedness for practice

Students equated confidence with preparedness interchangeably and considered themselves most confident with skills in which they had the most experience.

Changes in clinical dental skills assessment methods

Several studies referred to the shift in assessment methods from systems involving quotas or targets (in which a minimum number of procedures must be carried out in order to graduate) to competency-based systems (which combine the assessment of appropriate supporting knowledge and professional attitudes with reliable performance of clinical skills in a natural setting without assistance).

Variations between independent practice and undergraduate experience

Several articles found that the treatment options and environment in dental schools in the UK did not correspond to those prevalent in NHS practice for some clinical situations. Such issues represented a possible source

of what was described as 'tension' between dental schools and dental foundation training personnel.

Discussion

From the beginning of the new millennium, there was speculation in the literature on the potential for technology to revolutionise teaching in dentistry.[9,10,11,12]

The most universally adopted technological innovations have been those designed to enhance traditional teaching methods. In the hands of a savvy operator, presentation and audience response system software creates interactivity in their lectures and a more engaging learning experience.[13,14]

The establishment of the VLE online, facilitated by advances in mobile computing devices and secure WiFi networks, allows an anytime/anywhere pattern of study to become commonplace and has resulted in the development of online teaching resources in all dental schools.

VLEs facilitate the self-directed learning process by allowing clinical educators to provide bespoke resources online for use by students before classes take place, and even to develop completely tutor-less modules and collaborative activities.[15,16,17,18] Thus, there has been a shift away from teacher-focused to learner-focused approaches.

The teaching of reflective practice is now widespread in dental schools according to the findings of this scoping review.[19,20,21]

The promotion of self-direction and reflection in learning is supported by current educational theory, which proposes that adult learners actively construct understandings based on previous experiences, perceptions and knowledge, and assimilate new ideas and information in different ways and rates, often in collaboration with others.[22]

Perhaps the most eagerly anticipated technological advances were virtual reality and augmented reality (VR/AR) simulators. This review found evidence of three dental schools who have integrated virtual reality/haptic simulators into their teaching environment (23% of dental schools).[23,24,25,26,27,28,29] As these dental schools pioneer the use of VR/AR, it is possible that others may follow.

Research from Sheffield,[26] Leeds[23,25] and King's College London[24,26,27,28] described the integration of virtual reality units into their pre-clinical teaching programmes. Inexperienced students produced speedy, inaccurate cavity preparations (consistent with unconscious incompetence), whereas more experienced students with a greater appreciation of the task in hand produced fewer preparations with greater accuracy (consistent with the development of conscious competence).[23,29] The ability to reset the simulator and carry out the same procedure repeatedly, with continuous feedback, was seen as a major advantage.[25] The objective, numerical feedback on skill performance means that VR/AR simulators were said to have potential applications for use in formative assessments and in permitting tutor-less learning, which may go some way towards addressing some reported issues around staffing, according to articles in this review.[24,27,28] Although expensive to buy, virtual reality simulators require no additional equipment, whereas students using traditional phantom head simulators use thousands of plastic teeth per year in their training. While non-differentiated plastic teeth are inexpensive, artificial teeth that simulate caries or root canal systems reportedly cost from £16 per tooth, so the virtual reality units may actually work out to be more cost-effective in the long run.[26] Budget constraints and a lack of definitive evidence of the efficacy of the technology in student training are cited by authors in the articles reviewed by this study as possible explanations for the slow uptake of this technology to date.

Other digital technologies such as intraoral scanning and robotics are expected to be incorporated to improve the versatility, variety and realism of the simulations available.[23,24,26,29]

The articles in this scoping review felt that the virtual reality devices in the hands of more experienced students and clinicians offered great opportunities for utility. For example, in 2017, East Midlands deanery (in partnership with Sherwood Forest Hospitals) outfitted their postgraduate dental training suite with three Moog Simodont dental training units at a cost of £120,000.[30] The investment is anticipated to allow postgraduate dentists who are felt to require further clinical experience in a simulated environment to practise basic techniques. Experienced dentists returning to work after career breaks and those wishing to refresh skills are also expected to use this facility.[30] It seems reasonable to assume that virtual reality units will became available more widely if their usefulness can be demonstrated convincingly.

According to the findings of this review, the greatest innovation to have taken place in dental clinical skills teaching for students who have progressed to treating patients is the development of outreach teaching centres. The improvement in authenticity was recommended by the General Dental Council and the introduction of outreach centres was the response to that recommendation.[31,32,33,34,35,36]

A small number of schools involve general practices in outreach programmes.[31] Students gain valuable insight into how a GP practice works, observing practice management in addition to the increased clinical experience and teamwork benefits noted by non-GP outreach centres. With more GPs developing postgraduate skills in areas of special interest such as implantology, endodontics and orthodontics, students in some GP placements had the opportunity to observe these procedures taking place in primary care settings.

However, some suggested that the time spent offsite at outreach centres contributes to a reduction in clinical experience in some key areas, notably restorative dentistry,[36,37] endodontics[38] and oral surgery.[39]

Many of the articles in this study give unexpected reasons for the impetus to develop their innovations. Articles describing VLEs, virtual reality and tutor-less teaching innovations stated that they had been developed, at least partly, as a means of alleviating problems posed by a lack of tutor availability.[15,16,17,18,29]

Articles reviewed for this study reported issues arising from reducing numbers of senior, full-time academic staff. One author warned: 'An appropriate workforce balance is vital for ensuring a quality dental education. Consideration should therefore be given to the knowledge and skill mix of the workforce with particular reference to the level of staff and the appropriate use of part time staff'.[37]

The *Survey of dental clinical academic staffing levels* (2018) found that there were 607.3 full-time equivalent clinical academics employed at UK dental schools. This represented an overall increase of 2% since 2016. Clinical teachers made up the largest full-time equivalent of clinical academic dentists, with the majority of these coming from general dental practice. However, the number of the most senior clinical academics (professors) fell by 8.3% in the same timeframe.[40]

The review found reports of student numbers increasing significantly from 2008 and a near doubling of numbers in some dental schools since 1995 to present,[23,37,41] which in turn was reported as causing difficulty in the delivery of teaching in clinics.[37]

This coincides with a reported shortage of suitable patients available for undergraduate students to work with.[37,38,39,42,43,44] With fewer

patients to go around, there has inevitably been a significant reduction in clinical experience compared to previous years.

Recent articles which sought the opinions of educational supervisors in the UK regarding their trainees' preparedness for independent practice have been published in the wider dental literature.[45,46,47] Educational supervisors were satisfied with their trainees' preparedness in the areas of health promotion and disease prevention, communication skills, theoretical knowledge and basic clinical procedures.[45,47]

However, in the areas of treatment planning, removable prosthodontics, endodontics (particularly multi-rooted), extraction of teeth (particularly surgical extraction), and crown and bridgework, educational supervisors expressed dissatisfaction.[47]

Heads of department[37,42,43,44,48] and students[38,39,49] cited these procedures as the most difficult for which to provide clinical experience at undergraduate level. Some trainees may be encountering treatments for the first time in foundation training rather than as an undergraduate.[37,50,51] Educational supervisors also reported that a lack of clinical experience was the cause of the problems at transition from dental school to foundation training.[45]

Several articles suggested that the adoption of competencies without minimum experience requirements contributed to the reported lack of experience, with a 'knock-on' effect of reduced confidence and perceived preparedness for practice.[36,38,44,50]

One author said: 'This change in approach [in assessment] has caused some concern as once competence has been reached, it could be argued there is little incentive for the student to continue refining the skill'.[50] Another found that almost 60% of dental schools did not have minimum experience thresholds in prosthodontics and expressed concern that, as a result, 'it is possible for dental students in the UK and Ireland to graduate without any clinical experience of providing FPDs'.[36] Similarly low levels of clinical experience in endodontics, especially in multi-rooted teeth, were reported at graduation.[38]

These procedures are encountered on a daily basis, and if a trainee is ill-prepared to independently manage these treatments, this is cause for concern, both for patient safety and the confidence of the trainee.[36,38,44,49,50,52]

There was agreement between the findings of articles reviewed for this study regarding the perceived confidence and preparedness

for independent practice of graduating students[36,38,39,44,48,49,50,53] and the opinions of educational supervisors in both the areas of excellence and those of concern.[45]

The articles in this review which cited patients' opinions of dental students' performance found that those patients praised the students warmly for their friendliness and professional mien and manner.[54]

Perceived preparedness increased with more clinical experience, so there is consensus among the various sources regarding the solution to the problem – more experience.[31,32,33,34,35,36,44,50,51] Since even an excellent knowledge of the theoretical underpinning of clinical skills cannot replace the learning experience derived from performing the skills, it would seem that recruitment of patients to dental schools in sufficient numbers needs to be urgently addressed.

Articles in this review raised concerns that friction could develop between dental schools and foundation training, as variations in treatment provided in dental schools compared to that seen in NHS general practice, as well as differing clinical experience and assessment methods between dental schools, means that trainees have differing clinical experience or may even be encountering treatment modes for the first time as a foundation trainee rather than as an undergraduate.[35,37,45,51] Some educational supervisors are unaware of these variations, which then influences their expectations of their trainees.[47]

A minority of dental schools have involved foundation training personnel in the teaching of senior students; for example, dental foundation trainers/advisers were teachers in the outreach clinical teaching programmes of 31% of dental schools in the UK.[46] Closer links by those involved at the transition point means that the challenges and developments in both undergraduate programmes and the clinical reality of foundation training are fully understood, and thus mutual needs can be proactively addressed.[46,51]

Conclusions

Contemporary methods of clinical skills teaching and learning encourage students to take ownership of their own learning, facilitated by the anytime/anywhere environment that the VLE provides.

New graduates are considered to have excellent theoretical knowledge, and have received teaching to improve their ability to

be reflective critical thinkers and empathic communicators. In basic clinical skills, students are well prepared for practice and confident that they can provide safe, high-quality treatment for patients.

However, where more complex or high-risk treatments were considered, they feel much less confident. In more complex skills, the level of clinical experience has been shown to be low. This may cause problems initially for some new graduates as they enter foundation training. Closer integration of all stakeholders involved in the transition from dental school to foundation training may improve cohesion and clarity between those involved at this crucial transition point, and would be a useful research topic.

Changes in teaching methods and increasing the numbers of clinical teachers from general practice seek to improve staff/student ratios, and the adoption of outreach teaching centres are reported as having been put in place as potential solutions to increase clinical experience and authenticity. Research to assess the efficacy of these measures would be useful.

Research designed to assess methods of optimising patient recruitment to dental schools for treatment by undergraduate students could prove useful in addressing the current patient shortfall.

Research focusing on the transition experiences of new graduates who enter independent practice without participating in a foundation training programme in the UK and Ireland, and whether those experiences differ in comparison to those who complete foundation training, would be valuable.

Finally, the impact of the global COVID-19 pandemic in 2020 must be mentioned, as the existence of online learning platforms coupled with global communications technologies has allowed dental schools to provide bespoke remote teaching, as well as online assessments, during the lockdown to students who were dispersed all over the world, thereby permitting the continuation of course progression for many students. A clearer demonstration of the utility of online learning and IT systems could hardly be envisaged.

Significance of this research

This research draws developments from the literature in one place, identifies several gaps in the published literature which would indicate topics for further research and highlights the effectiveness of a scoping review methodology to do this.

It shows the reported impact of innovations on the efficacy and delivery of dental clinical skills teaching in a range of clinical disciplines.

It identifies some concerns expressed by stakeholders regarding certain clinical areas where there is a reported risk of under-preparedness for independent practice. It is hoped that this research has utility for those involved in teaching methods development at undergraduate level, and for those focusing on the interface between undergraduate and foundation training who may provide alignment in expectations for all stakeholders.

Limitations of this research

The omission of the consultation step and the fact that stages 1–4 were carried out by one researcher introduces a potential for bias. Scrupulous reflexivity and consultation with the second researcher when needed was employed to mitigate bias and maintain the rigour, reflexivity and validity of the research project, and any potential findings.

The exclusion of internationally based literature, grey literature and the likely existence of methods in the UK which have not been published means that there inevitably will be innovations that have not been identified.

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