# The undergraduate preparation of dentists: Confidence levels of final year dental students at the School of Dentistry in Cardiff

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**In brief**

- Provides an insight into the relationship between clinical experience and confidence in the new graduate.
- Highlights areas of clinical practice that a new graduate is most likely to feel least confident.
- Discusses the complexity of the relationship between competence and confidence and the link with clinical experience.
- Highlights the role of foundation training as a continuum of undergraduate education.

**Objective** To investigate the self-reported confidence and preparedness of final year undergraduate students in undertaking a range of clinical procedures. **Methods** A questionnaire was distributed to final year dental students at Cardiff University, six months prior to graduation. Respondents rated their confidence in undertaking 39 clinical procedures using a 5-point scale (1 = can undertake on own with confidence, 5 = unable to undertake). Students also responded yes/no to experiencing four difficulties and to three statements about general preparedness. **Results** 71% (N = 51) responded of which 55% (N = 28) were female. Over half reported being 'anxious that the supervisor was not helping enough' (57%) and 'relying heavily on supervisor for help' (53%). Eighty percent 'felt unprepared for the clinical work presented' and gender differences were most notable here (male: 65% N = 33; females: 93% N = 47). Mean confidence scores were calculated for each clinical procedure (1 = lowest; 5 = highest). Confidence was highest in performing 'simple scale' and 'fissure sealant' (mean-score = 5). Lowest scores were reported for 'surgical extractions involving a flap (mean-score = 2.28)', 'simple surgical procedures' (mean-score = 2.58) and the 'design/fit/adjustment of orthodontic appliances' (mean-score = 2.88). **Conclusions** As expected complex procedures that were least practised scored the lowest in overall mean confidence. Gender differences were noted in self-reported confidence for carrying out treatment unsupervised and feeling unprepared for clinical work.

## Introduction

The transition from undergraduate dental student to the workplace is an important but difficult step. In the UK this step is staged through dental foundation training (DFT) which is a one year programme where new graduates work within dental practices being mentored by a foundation trainer (FT) and in a structured training environment. Traditionally, a student's readiness to graduate was measured by written and oral examination combined with the completion of a target number of clinical procedures. This method of assessment is increasingly being replaced by competence based methods where students are required to demonstrate the achievement of a number of learning outcomes defined by the General Dental Council.[1] European guidance is also provided in the form of competencies under seven domains.[2]

This change in approach 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 in a variety of different contexts. Anecdotal evidence confirms this concern in the general dental population.[3,4] The belief that performing a procedure a number of times increases not only expertise, but also confidence is common. Conversely, experience alone may not improve performance unless this experience is structured.[5,6] The most recent GDC outcomes document refers to a new graduate as a 'safe beginner' which is a move away from its previous interpretation of a new graduate as an independent practitioner.[1] However, this understanding of the nature of a new graduate is not fully appreciated by the profession and is of particular concern to those dentists who act as foundation trainers. Graduation marks the end of formal teaching for the dental student, yet does not signify an end to learning as the dentist has a responsibility to learn and develop throughout their career; 'to update and develop professional knowledge' (GDC Standard 7.3).[7]

To ease the transition from undergraduate student, working in an academic environment, to a clinician who can work independently, foundation training (previously known as vocational training) became mandatory in 1993. Its intention was 'to prepare dental graduates for independent practice through

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supervised education and training, and to promote high standards of patient care'.[8]

Buck *et al.*[9] found that dental trainers rank good clinical skills as the most important component of a 'good' dentist and that the main aims of the dental school curriculum from their perspective should be to prepare graduates who are competent and confident in clinical skills. This suggests that many of the learning outcomes prescribed by the GDC may be less valued or understood by some trainers.

There have been few studies that explore dental student preparedness for practice. Confidence is not measured directly, and self-perceived confidence is used as a proxy for preparedness.[10] Patel *et al.*[11] undertook a survey of preparedness for practice in newly qualified vocational dental practitioners (VDPs) which indicated that students felt well prepared for practice in history taking, diagnosis, treatment planning, routine restorative dentistry and oral pathology. The results also suggested that they felt less prepared for more complicated procedures such as molar endodontics, surgical endodontics, surgical extraction of teeth and the practice of orthodontics. Similar studies by Bartlett *et al.*[12] demonstrated comparable results where respondents had high confidence in simple procedures such as simple periodontal treatment but reduced confidence in more complicated procedures such as surgical extraction and molar endodontics.

The current move to outreach placements in a number of schools has been reported to increase confidence levels prior to graduation.[10,13,14] The objective of these placements is to give a greater understanding of dentistry in the wider community and to broaden a student's range in clinical experience.

The aim of this study was to determine the self-assessed need for assistance levels in clinical skills of final year students from the School of Dentistry in Cardiff, UK. The intention was to use the results to inform undergraduate curriculum review and development. Dental education providers need to prepare graduates who are confident and competent and ready for foundation training as well as ensuring that they have successfully completed all of the GDC prescribed learning outcomes.

**Fig. 1 Overview of confidence in clinical experience. Percentage of students who responded yes to, 'in the final year have you ever experienced any of the following**

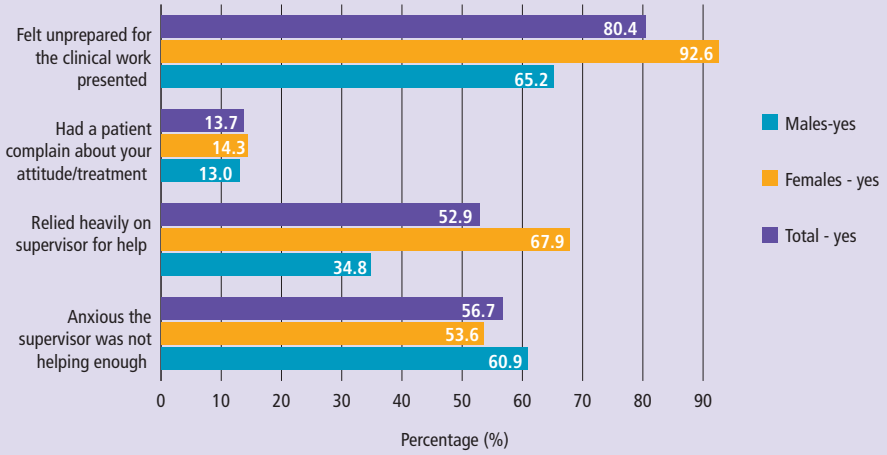
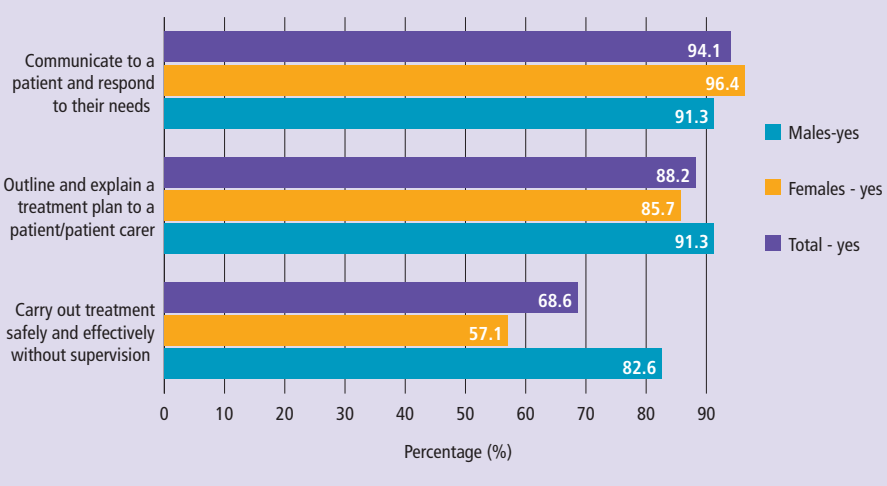



**Fig. 2 General feelings of preparedness. Percentage of students responding yes to, 'with the prospect of graduation approaching, do you feel able to'**




## Materials and methods

Prior to commencement of the study, ethical approval was granted by the School of Dentistry Research Ethics Committee at Cardiff University. The questionnaire was distributed to all final year dental undergraduates (N = 72) in February 2012 studying at Cardiff University. Students were issued with a standardised cover sheet outlining the purpose of this study and explaining that participation was voluntary and anonymous. Consent was implied by responding to the questionnaire. Respondents included all those in the final year within six months of graduation, regardless of whether they had completed greater than five years at university due to completion of another degree, intercalation, resits or a foundation year. Questionnaires were collected from a designated area to ensure anonymity.

The questionnaire was divided into three sections: Section A was designed to collect generic data and to give a general overview of the students' confidence in their clinical abilities and their perceived need for assistance; Section B allowed respondents to demonstrate how prepared they felt about the prospect of graduation; and Section C was where respondents were required to self-rate their confidence in undertaking 39 individual clinical procedures using a five point scale. The scale ranged from: 1 (on my own with confidence); 2 (on my own with limited confidence, slowly); 3 (on my own following advice); 4 (with difficulty, needing assistance); and 5 (unable to undertake). Respondents were also able to select 'have not yet undertaken' for any procedure.

## Results

Fifty-one of the 72 final year students responded to the questionnaire giving a response rate of 71%. Of the respondents, 55% (N = 28) were female, which is a slightly higher representation as 48.6% of the year questioned was made up of female students. Respondents addressed all the questions with no missing data.

Preliminary questions were asked to ascertain students' perceived overall confidence and preparedness during their final year. The data were examined to identify any disparity between male and female students and the results are illustrated in Figure 1. The statements were specific to how the students felt in their final year only.

Over 80% (N = 41) of students felt 'unprepared for the clinical work presented'; percentages were greater amongst female students (93%; N = 26 compared to 65%; N = 23 amongst male students). Gender differences were further highlighted as a majority of female students (68%; N = 19) reported 'having relied heavily on supervisors for help' compared to a minority of their male counterparts (35%; N = 8). There was less disparity in relation to 'feeling anxious the supervisor was not helping enough' (female students: 54%; N = 15, male students: 61%; N = 14)

Figure 2 compares responses to the general statements that were asked with regard to how students felt about the forthcoming graduation and DF year. A gender disparity of over 25% was noted in students reporting feeling able to 'carry out treatment safely and effectively without supervision', with only 57% (N = 16) of female students feeling able to do this, compared to 83% (N = 19) of male students.

However, high percentages were reported by all students with regards to being able to 'communicate to a patient and respond to their needs' (male students: 91%; N = 21, female: students 96%; N = 27), with a slightly higher proportion of female students responding positively to this statement. Gender responses were most similar for being able to 'outline and explain a treatment plan to patients/patient carer' (male students: 91% N = 21, female students: 86%; N = 24).

Self-reported confidence levels for clinical procedures are illustrated in Table 1, including differences between female and male students. The table is ordered so that procedures reported to have the overall highest mean confidence are at the top and the lowest mean confidence at the bottom. The mean was worked out using the five point scale. Respondents who answered 'on my own with confidence' (most confident) were given a score of five, whilst respondents who were least confident 'unable to undertake' were awarded a score of 1. The mean scores were then calculated.

The two procedures that rated the highest in overall confidence were carrying out a 'simple scale' and 'fissure sealant'; with the highest possible mean score of 5.00. Abilities that followed were 'administration of local anaesthetic' (4.97), 'anterior composite restorations' (4.97) and 'preventative education plan' (4.92).

The procedure that all students felt least confident in was undertaking 'surgical extractions involving a flap' (2.28) along with 'simple surgical procedures' (2.58) and being

**Table 1 Mean confidence score by clinical procedure**

| Clinical procedure | Overall mean of confidence | Confidence mean of female students | Confidence mean of male students |
|---|---|---|---|
| Simple scale | 5 | 5 | 5 |
| Fissure sealant | 5 | 5 | 5 |
| Local anaesthetic | 4.97 | 4.93 | 5 |
| Anterior composite restorations | 4.97 | 4.93 | 5 |
| Preventive education plan | 4.92 | 4.93 | 4.91 |
| Periodontal exam | 4.91 | 4.86 | 4.96 |
| Posterior composite restorations | 4.81 | 4.79 | 4.83 |
| Impression taking | 4.78 | 4.64 | 4.91 |
| Rubber dam application | 4.68 | 4.61 | 4.74 |
| Management of anxious patients | 4.56 | 4.54 | 4.57 |
| Health promotion | 4.49 | 4.46 | 4.52 |
| Complex care | 4.49 | 4.46 | 4.52 |
| Examination and diagnosis | 4.48 | 4.21 | 4.74 |
| Extraction erupted teeth | 4.47 | 4.15 | 4.78 |
| Acrylic partial | 4.47 | 4.32 | 4.61 |
| RCT incisor/canine | 4.45 | 4.25 | 4.65 |
| Radiographs | 4.42 | 4.1 | 4.74 |
| Orthodontic assessment | 4.36 | 4.54 | 4.17 |
| Children (routine) | 4.23 | 4.64 | 3.82 |
| Chrome partial | 4.17 | 4.07 | 4.26 |
| Adults in pain | 4.16 | 3.96 | 4.35 |
| Treatment planning | 4.05 | 3.93 | 4.17 |
| RCT premolar | 4.05 | 3.96 | 4.13 |
| Crowns/veneers | 3.86 | 3.57 | 4.08 |
| Dental emergencies | 3.85 | 3.43 | 4.26 |
| Acrylic complete | 3.85 | 3.61 | 4.09 |
| Requesting lab tests | 3.49 | 3.5 | 3.48 |
| Prescribing | 3.47 | 3.36 | 3.57 |
| Bridge-resin retained | 3.29 | 3.28 | 3.3 |
| Dental trauma | 3.26 | 3.04 | 3.48 |
| Children in pain | 3.25 | 3.11 | 3.39 |
| RCT molar | 3.25 | 3.37 | 3.13 |
| Bridge-conventional | 3 | 3.25 | 2.74 |
| Dealing with medical emergencies | 2.93 | 2.64 | 3.22 |
| Design/fit/adjust orthodontic appliances | 2.88 | 2.75 | 3.04 |
| Simple surgical procedures | 2.58 | 2.33 | 2.82 |
| Surgery involving flap, sutures | 2.28 | 2.12 | 2.43 |

able to 'design/fit/adjustment of orthodontic appliances' (2.88).

Table 1 also compares procedures ranked highest in overall mean confidence for male and female students. In general, the perceived confidence of male students was greater than female students. The simpler tasks such as performing a 'simple scale', 'fissure sealant', 'local anaesthetic' and 'anterior composite restorations' had a similar score for males and female students. However, as the procedures became more technically challenging, consistent differences between the genders emerged. Of the procedures ranked in the top four, male students had a greater mean confidence score. This pattern was repeated for the majority of procedures, with male students having a higher mean confidence score overall, with the exception of forming a 'preventative education plan', treating 'children (routine)', 'orthodontic assessment', 'requesting lab tests', 'RCT molar' and formation of a 'conventional bridge'.

A surgical extraction 'involving a flap and sutures' had the lowest mean confidence score for both males and female students, 2.43 and 2.12 respectively. The three procedures which ranked lowest in mean confidence for female students were 'surgery involving flap, sutures' (2.12), 'simple surgical procedures'(2.33) and 'impression taking' (2.50). The three procedures which ranked lowest in mean confidence for male students were 'surgery involving flap, sutures' (2.43) 'bridge-conventional' (2.74) and 'simple surgical procedures' (2.82).

## Discussion

The results obtained from this questionnaire-based project are an indicative personal view of dental undergraduates' confidence in undertaking clinical procedures and not their competence. The questionnaires were distributed before the beginning of a lecture and collected at the end in a box to ensure anonymity. Students were given the choice on whether they wished to take part or not. This method of distributing the questionnaires was chosen because it is one of the few ways the final year students are present in one place at the same time due to clinic timetables and outreach placements in Cardiff. A few students decided not to take part. A response rate of 71% may have resulted in compromised 'confidence' data, but this was still considered an adequate response rate.

It is important to note that competence and the perception of competence (confidence) are different.[15] An individual may have the necessary skills (competence), but because of context and their internal perception of their ability, may not have the self-belief (confidence) in their ability to undertake particular tasks. Level of confidence has implications for practice. Under-confidence could make a graduate over-reliant on trainers and so slow development. Conversely, over-confident individuals may risk patient safety by attempting tasks beyond their competence. What is desirable is accurate self-assessment of competent and associated confidence.

In an attempt to evaluate overall general confidence, student responses to a series of statements were collected and presented in Figure 1. It was clear from the results that there were some students who felt unprepared, and this is of concern. It was also clear that some students relied on supervisors and became anxious if they were not 'helping enough'. The difference between male and female students was evident here. The question raised is whether perceived need for assistance is well-judged or whether there is over-reliance on supervisors. The transition from supervised to unsupervised practice is a difficult but important one, which is essential for independent practice. The evidence here suggests that female students may find this transition more difficult, so may require more encouragement to make this step progressively as the course nears its end. An alternative interpretation, of course, is that male students are over-confident and lack the insight to know when they should seek assistance. The implication then is to encourage greater caution so as to ensure patient safety.

In a study of medical pre-registration house officers, Stewart *et al.*[16] highlighted the role of confidence and how it influenced decision making processes, dictating what clinical procedures they would undertake. They proposed that house officers self-assessed the 'risk' of causing harm, and this determined their confidence as to whether to undertake a procedure. When confident (assessed as low harm risk) they would proceed to undertake a task even if initially unsuccessful. When looking at house officers at the end of their pre-registration year they felt experience had made them more independent in their practice. The suggestion is that experience improves self-assessed confidence, or vice versa, that confidence enhances experience.

Figure 2 illustrates students' confidence in relation to two fundamental communication skills for patient interaction. Perceived ability was relatively high for these elements of communication, and highest for female students. However, again when asked to comment on their ability to carry out treatment without supervision, female students felt less confident than their male colleagues.

The list in Table 1 represents the types of procedures carried out at an undergraduate level as well as in the DF year. The list was certainly not exhaustive, but was minimised to reduce the completion time of the questionnaire and to maximise the potential response rate. Looking at individual clinical skills the findings of this study largely correlate with findings of other similar work,[11,17,18] in that respondents were more likely to recognise the need for assistance with more challenging procedures such as molar endodontics, surgical extractions, conventional bridge procedures and orthodontic appliance design and construction; confidence was high for simple periodontal treatment, routine extractions and oral hygiene instruction. A recent study of foundation trainers in England and Northern Ireland found that nearly 40% of trainers felt that new graduates were unable to undertake a surgical extraction on their own, and a further 30% felt that the new graduate would need advice before attempting the procedure.[19] Macluskey *et al.*[17] comment that it is well reported that forceps exodontia and surgical extractions have a great discrepancy in confidence, emphasised by a survey that records the number of surgical extractions undertaken by UK dental undergraduates as low. The authors suggested that the lack of confidence in this procedure may be the result of limited experience (few cases) and lack of staffing due to the amount of supervision required for this procedure. It may be useful in further studies to investigate which part of the surgical extraction process may be associated with low confidence, whether it be raising a flap, removal of bone, or tooth sectioning. The use of simulation may help to develop some confidence in this area. Further investigation comparing those students with the most experience at undergraduate level with those with the least would be of interest. This may confirm the work of Stewart *et al.*[16] on medical house officers suggesting increased experience would increase confidence.

Amongst the results for exodontia, some discrepancy may have arisen due to the wording of the questionnaire. For example, mean confidence for 'simple exodontia' and 'extraction

of buried roots' was fairly high at 4.47 and 3.74 respectively, whereas 'simple surgical procedures' and 'surgery involving flaps, sutures' scored the lowest out of all the procedures with a score of 2.58 and 2.28. It may be argued that there is no difference between 'extraction of buried roots' and a 'simple surgical procedure' and that the respondents were confused by the question, expecting that 'extraction of buried roots' simply meant extraction of roots, whether they be visible or not. For future studies it may be worth changing the statement so that it is clearer, for example, 'extraction of visible roots' and 'extraction of buried roots involving a simple surgical procedure'. The assumption here is that this was implied in the question.

Restorative procedures, in general, were relatively high scoring, which may be linked to the amount of time spent in restorative clinics as an undergraduate. This correlates with other studies, where graduates felt well prepared in many areas of restorative dentistry.[20,21] Ninety-nine percent (N = 157) of participants in the study by Yiu *et al.*[21] felt well prepared to restore teeth with an amalgam restoration and 96% (n = 157) with resin composite restorations. This resonates with results from the present study which demonstrates that respondents had a high overall confidence score of 4.89 in placing composite restorations and 4.71 in placing amalgam. When comparing these results it appears that newer graduates had greater confidence in placing composites as opposed to amalgam. This may well reflect modern teaching methods which have increasingly favoured composite over amalgam due to conservation of tooth tissue and concerns over the use of amalgam. Furthermore, Yiu *et al.*[21] also report that 99% (N = 157) had felt prepared in placing crowns yet 28% (N = 44) felt poorly prepared for multi-rooted endodontics, as is reflected in the present results (Crowns: 3.86, RCT molar: 3.25). Many other studies indicate that dental graduates' in the UK have the lowest confidence in carrying out molar endodontics.[4,22] The GDC's '*The first five years*' states that 'dental students on graduation must be competent in 'endodontic treatments of single and multi-rooted teeth.'[23] While the latest GDC guidance in '*Preparing for practice*' states that a new graduate should 'manage the health of the dental pulp and periapical tissues.'[1] There is clearly significant room for interpretation by the education provider in the latest guidance suggesting that the experience of multi-rooted endodontics by students may reduce under this direction. Currently many undergraduates and their trainers express that they are not comfortable in performing any endodontic treatment on anything other than single-rooted teeth.[22] This is at a time of increased demand by patients for endodontics instead of extraction. Time constraints within the undergraduate curriculum mean that extensive experience and expertise in complicated technical skills such as molar endodontics may not be possible and that this may be a skill that needs to be developed over time. New graduates and trainers should realise that skill building and development is required in this transition to independent practice which aligns to the current GDC guidance describing the new graduate as a 'safe beginner' working as part of the dental team.[1]

In the study 'fixed prosthodontics' was the restorative procedure that scored lowest in mean confidence. Youngson *et al.*,[24] stated that a considerable number of dental schools do not expect their undergraduates to have performed a great number of cases involving bridgework or endodontic procedures. In view of this, the authors observed that it is unlikely that many undergraduates will be competent in these clinical areas on graduation. The present study assessed confidence and not competence. As highlighted earlier a lack of confidence in this area could be explained by the limited exposure to extensive clinical experience and although experience gained in the simulated environment may help, it is limited in its scope. A pertinent question is whether the undergraduate curriculum should concentrate on the 'basic building blocks' of skills. However, is there common agreement on these blocks? If this is the case, this would mean students would be taught skills relating to the provision of crowns and leave the further skills required for bridgework to be developed post-graduation. Similar strategies may also be needed for other complicated skills such as multi-rooted endodontics and surgical extractions. Strategies are also needed to develop insight into own abilities, perhaps by enhancing the confidence in abilities amongst female students and addressing over-confidence amongst males.

When the confidence levels of males and female students were compared, male students appeared more confident overall although statistical analysis of this was not undertaken. Gender differences in reported confidence have also been noted in the medical field. Female medical students consistently report lower confidence in their competences than male students.[25] Furthermore there is evidence to suggest that the disparity between male and female students' perceived confidence levels increases as their UG education progresses.[26]

Although males were more confident overall, the order in which procedures were ranked was almost identical. There was, however, a slight disparity in the confidence of treating children with both male and female students reporting very low confidence in treating children with pain; however, female students were more confident in routine treatment of children (4.64 compared to 3.82 of males). This may suggest that females are more comfortable with children for routine treatment, as was evident in a study by Turner *et al.*[27] where twice the number of female medical graduates than male medical graduates chose a long-term option in paediatrics. Gender differences in communication style have been widely reported, with female practitioners tending to relate to their patient's emotions and feelings more than their male counterparts.[28] This may account for the gender-related variance in sub-specialities, such as paediatrics.[29]

Macluskey *et al.*[17] reported a perceived gender difference within their sample also, with men reporting greater confidence in all aspects of exodontia. The study found that female students were either less confident overall due to their personality makeup, as reported by Blanch *et al.*,[25] or as a reflection of a true reduction in female students' exposure to these procedures. It is most likely that males scored more highly in confidence as a reflection of the complex association between gender and perceived confidence. In the study by Bartlett *et al.*,[12] they observed that there was a statistically significant difference observed between the confidence of male and female trainees, with male trainees reporting higher confidence in making crowns, simple bridges, endodontics and surgical extractions. In the present study the female student reported higher confidence in procedures relating to children and orthodontics but also bridgework and molar endodontics.

In general, observing the results, it seems that routine care scored the greatest in overall mean confidence. For example, at the top of the list, 'simple scale', 'placing fissure sealants' and 'administering local anaesthetic' scored highly, whereas procedures where undergraduates were less likely to have had as much exposure to, namely, 'design/fit/adjustment of orthodontic appliances', 'dealing with medical

emergencies' and 'formation of a conventional bridge' all scored very low and were towards the end of the table for overall mean confidence.

It has been reported that insufficient clinical experience has led to decreased confidence in undergraduates. However, increasing clinical experience is difficult with restraints such as increased student numbers, limited access to patients for every procedure and an ever increasing list of clinical and other skills deemed 'necessary' within the undergraduate curriculum. The GDC guidance documents have also increased the demands on already limited time. Some of the skills thought necessary by teaching staff and indeed by postgraduate trainers may be because of historical trends and do not reflect modern practice nor developments in disease management. A closer working relationship is required between undergraduate schools and foundation trainers to further identify core skills of a new graduate along with realistic approaches to their contribution to the continuum of education. This work has been ongoing in parallel through our studies on foundation trainers' expectations and experiences of new graduates in Wales and in England and Northern Ireland, and has influenced the curriculum in the School of Dentistry in Cardiff and in other Schools.[19] On graduation, learners are not the same and their future educational development needs will vary. Some of the skills learnt as an undergraduate will need consolidation; perception of competence may be low, therefore requiring more assistance. The transition to FT can be difficult and many schools in the UK have introduced outreach teaching in a variety of environments to improve this transition.[13] However, there still appears to be a divide between undergraduate training and FT, rather than a continuum.

## Conclusion

Final year students at Cardiff School of Dentistry were most confident in procedures that they had most clinical experience and practise in, such as a 'simple scale and polish', 'placement of fissure sealants' and 'administration of local anaesthetic'. Procedures which were the more complex and least practised scored the lowest in overall mean confidence such as 'surgical extractions', 'design and adjustment of orthodontic appliances', 'dealing with medical emergencies', restorative procedures of 'making a conventional bridge' and 'molar endodontics'. Given an apparent relationship between experience and confidence, a greater amount of clinical time should be dedicated so that students have more experience and exposure in what they feel least confident in undertaking. On graduation, new dentists need the skill to be able to target their 'weak' areas through training by using portfolios, reflection and personal development plans. In the first year this process will be regulated within foundation training.

Education providers need to be aware of the potential gender differences in self-perceived confidence levels and need for assistance. There is a complex relationship between clinical experience, competence and student self-perceived confidence. This work sheds light on this relationship, raises implications for the undergraduate curriculum and poses questions for further research.

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