


The teaching and assessment of local anaesthesia in UK dental schools

Charlotte Richards¹  | Anna Dargue² | Petros Mylonas¹ | Dominic Morris¹ | Charlotte Emanuel¹

¹School of Dentistry, Cardiff University, Cardiff, UK

²Bristol Dental School, Bristol, UK

Correspondence

Charlotte Richards, School of Dentistry, Cardiff University, Heath Park, Cardiff CF14 4XY, UK.

Email: richardsc34@cardiff.ac.uk

Present address

Dominic Morris, Cefn Coed Dental Practice, Merthyr Tydfil, UK

Abstract

Introduction: Local anaesthesia (LA) is fundamental to successful dental treatment. Graduating hygienists, therapist and dentists should be confident and proficient in delivering LA. There is one previously published article reviewing LA teaching in United Kingdom (UK) dental schools in 2016, and at this time 10 out of 14 schools allowed peer-to-peer administration. The method of teaching LA administration has become an area of debate in terms of legality and morality given the potential complications and issues with valid consent. The aim of the study was to explore current teaching practices and assessment of LA in UK dental schools.

Materials and Methods: Two national surveys (2020 and 2023) were sent out via the ABAOMS Education Committee to all 16 dental schools in the United Kingdom with dental and/or hygiene and therapy programmes.

Results: There was a 100% response rate from all schools. There has been a significant shift from peer-to-peer administration of local anaesthesia, with only 4 schools now allowing peer-to-peer administration. The majority of schools use simulation methods to deliver the teaching, including LA models, cadavers and 'cap-on' simulation with a peer. When comparing the timing of teaching between 2020 and 2023, BDS students now administer their first LA injection to a patient later in the programme, and there has been a reduction in intra-professional teaching.

Conclusion: Due to the large shift away from practicing LA on peers, there is a need for further development of simulation methods given the drawbacks with current models and the limited development of haptic technology in relation to LA.

KEYWORDS

assessment, local anaesthesia, simulation, teaching methods

1 | INTRODUCTION

Graduating dental professionals should be confident and proficient in delivering local anaesthesia (LA) for successful pain-free

dentistry. In the United Kingdom (UK), the only learning outcome specified by the General Dental Council (GDC) relating to LA states that qualifying dentists must be able to 'safely and appropriately prescribe and administer medicines and therapeutic agents'.¹

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For dental therapists and hygienists, the GDC specifies they must be able to 'manage patient pain through the appropriate use of analgesia'.¹ The vagueness of these learning outcomes is potentially unhelpful to educators. A more detailed curriculum published by the Association for Dental Education in Europe (ADEE) provides a more explicit and clear directive to educators, advising that on graduation a European dentist must be able to 'administer infiltration and block local anaesthesia in the oral cavity for restorative and surgical procedures, and manage potential complications'.² A systematic review published 5 years ago assessed the evidence for educational techniques for teaching LA administration in the United States.³ They found a lack of literature evaluating teaching methods in their dental schools. So, what is being taught and with what methods in dental schools?

A survey of LA education in European dental schools was carried out in 2006.⁴ Although the response rate was only 18.4%, 35% of all UK dental schools were involved. The survey found a wide variation in the timing, methods of teaching, curriculum and assessment of LA. Most schools used peer-to-peer injection techniques, with several schools planning to change their methods with the introduction of training models.

There is one previously published article reviewing LA teaching in UK dental schools in 2016, with an 87% response rate.⁵ This paper focused on maximum dosages and drugs taught in specific scenarios as well as teaching methods with minimal exploration of assessment. At this time, 72% of schools were utilising peer-to-peer administration of LA to teach the clinical skill for the first time.

Given there is no prescriptive curriculum for LA education in the United Kingdom and no direct learning outcome(s) from the GDC, UK dental schools are free to modify teaching and assessment methods of this fundamental skill. This paper presents the results of two surveys investigating the pedagogy and assessment of local anaesthesia across the 16 undergraduate dental institutions in the United Kingdom, from 2020 to 2023.

There has been a growing discussion in the literature that administration of LA to fellow students with no clinical benefit and potential risk of harm for the purposes of practical skill development may be inappropriate, and these legal, moral and ethical issues were reported in the United States as early as 2009.⁶ Although this paper was published some time before the 2016 UK review of teaching practices, we know it takes time for evidence to change practice. It is our hypothesis that there will be a reduction in peer-to-peer administration of LA for teaching purposes across UK dental schools.

The study aims to establish the current practices of teaching and assessment of LA in the United Kingdom and aim to provide further evidence to help develop a unified curriculum for this important skill.

2 | METHOD

Two similar qualitative and quantitative peer-reviewed surveys were conducted in 2020 and 2023. UK dental schools with undergraduate Bachelor of Dental Surgery and/or hygiene and therapy programmes

were surveyed. An online survey (available upon request) was constructed on the JISC Online Survey platform, and the survey link was distributed via the Academic British Association of Oral and Maxillofacial Surgery (ABAOMS) education committee. The representative from each of the 16 dental schools was asked to identify the staff who lead the teaching of local anaesthesia, as this was deemed the most appropriate person to complete the survey.

Ethical approval for survey one was obtained from Cardiff University Dental School Research Ethics Committee in January 2020, with responses obtained from February to March 2020 just prior to the COVID-19 pandemic. This survey contained 19 questions with both multiple choice and free text responses.

Ethical approval for survey two was obtained from Cardiff University Dental School Research Ethics Committee in March 2023 and the survey was open for completion from April to June 2023. The survey contained 24 questions of both multiple choice and free text responses. Additional questions were related to hygiene and therapy programmes and procedure-specific local anaesthetic techniques.

3 | RESULTS

A 100% response rate (16 of 16) for survey completion was achieved for both the 2020 and 2023 surveys. Where available, results from both the 2020 and 2023 surveys will be presented together. Additional questions were included in the 2023 survey, and these will be presented without comparator data.

3.1 | Teaching

Question 1: In which year do dental students first learn about the anatomy and pharmacology of local anaesthesia (as opposed to the practical elements)?

Question 2: In which year do dental students first learn about the practical aspects of delivering local anaesthesia? (Table 1)

Question 3: How is local anaesthesia teaching delivered (both practical and pharmacology)? (Table 2)

Question 4: In which year of study do the majority of BDS students deliver their first ever local anaesthetic injection on live patients (regardless of technique used)?

TABLE 1 Summary of results questions 1 and 2, 2020 and 2023 data.

	Year 1	Year 2	Year 3
Anatomy and Pharmacology taught			
2020 survey	n/a	n/a	n/a
2023 survey	31%	56%	13%
Practical LA skills taught			
2020 survey	12%	88%	0%
2023 survey	19%	62%	19%

TABLE 2 Summary of results question 3, 2020 and 2023 data.

	Lectures	Small Group Teaching	E-learning	Symposium format	Teaching Block	BDS Students only	BDS and DH&T (Interprofessional)
2020 survey	81%	81%	56%	44%	38%	25%	75%
2023 survey	94%	94%	56%	50%	31%	56%	44%

TABLE 3 Summary of results questions 4 and 5, 2020 and 2023 data.

	Year 1	Year 2	Year 3
BDS first injection			
2020 survey	13%	81%	6%
2023 survey	0%	31%	69%
BSc first injection (13 schools)			
2020 survey	n/a	n/a	n/a
2023 survey	15%	85%	0%

Question 5: In which year of study do the majority of dental hygiene and/or therapy students deliver their first ever local anaesthetic injection on live patients (regardless of technique used)? (Table 3)

Question 6: Which speciality/department is the lead for teaching local anaesthesia? (Table 4)

Question 7: When students are about to deliver their first ever local anaesthetic injection to whom or what do they deliver the injection? (Table 5)

Question 8: If students are not used for the purpose of practicing LA techniques on each other, please state why?

2020: Comments have been divided into themes.

One response in 2020 discussed the issue of the lack of valid consent because of coercion due to students having to receive an injection to be able to administer one themselves.

'Students unable to give unbiased consent to receive an injection (issues of dependence).'

Most comments (five) in 2020 were in relation to adverse events and potential medicolegal issues, such as for insurance purposes, the administration of a prescription-only medicine for no therapeutic indication and the potential for a reaction or allergy.

'In case of allergy (albeit unlikely).'

'Concern was raised over the fact we were injecting a POM for no clinical purpose and should someone have a reaction to this we would be indefensible.'

'University protocol—insurance reason.'

'We received information that other schools have been advised to stop this.'

'Unethical to give a drug for non-therapeutic purpose.'

TABLE 4 Summary of results question 6, 2020 and 2023 data.

	Multidisciplinary teaching team	Oral Surgery	Restorative
2020 survey	56%	38%	6%
2023 survey	31%	56%	13%

2023: There were more comments in both the consent and medicolegal issues theme in 2023, and one participant commented that alternative teaching tools were available: *'The technique can be taught as well, if not better, on phantom head'*.

Comments including *'ethical issues with consent'* and the issues of *'coercion if [they] want to practice on another colleague'* were received in 2023, with two comments specifically mentioning *'student anxiety of injections'* and their *'refusal to receive LA themselves'*, but that students *'still wanted to give it.... because this was progressional towards being authorised to administer LA'*. There were eight comments (Figure 1) in relation to medicolegal concerns and the risk of potentially adverse outcomes such as needle sticks and the risk of nerve injury.

Question 9: What anaesthetic delivery systems do you clinically teach to undergraduates (across all departments)? (Table 6)

Question 10: Are inferior dental blocks taught routinely in the school for extraction of mandibular teeth?

2020: No data.

2023: 100% of schools report yes. Row 2, Table 7.

Question 11: Are inferior dental blocks taught routinely in the school for restoration of mandibular teeth?

2020: No data.

2023: 11 schools (69%) report yes, with five schools (31%) reporting no. Row 3, Table 7.

Question 12: Are inferior dental blocks taught routinely in the school for non-surgical periodontal treatment of mandibular teeth?

2020: No data.

2023: Ten schools (62%) report yes, with six schools (38%) reporting no. Row 4, Table 7.

Question 13: For the following common dental procedures, please indicate the anaesthetic technique(s) recommended to the student (Tables 8 and 9).

Assessment.

Question 14: How are the theoretical components of local anaesthesia assessed during the programme?

2020: No data.

2023: Figure 2.

Question 15: How are the practical components of local anaesthesia assessed during the programme? Please tick all that apply.

TABLE 5 Summary of question 7 results. Note 2023 data adds to more than 100% because three schools utilise anatomical models alongside administration to a student colleague.

	Student colleagues IANB and infiltration	Student Colleagues Infiltration only	Patients only	Anatomical Models	Cadavers
2020 survey data	44%	—	19%	31%	6%
2023 survey data	12.5%	12.5%	6%	75%	35%

- *'Not done for many years due to concerns about risks involved (needle sticks /potential complications)'*
- *'Decision made to no longer allow students to inject each other as no clinical benefit, risk of harm with IDBs'*
- *'Stopped due to risk of adverse reactions for no clinical need'*
- *'Prohibited ...by the university... medicolegal - in the event of IAN or LN injury'*
- *'Not permitted due to unnecessary delivery of a drug'*
- *'A discussion was held with our indemnifiers who advised that we cannot defend students receiving LA without a therapeutic reason'*
- *'prescription only medicine given for no clinical benefit, school made a decision to move away from student to student administration in 2022'*
- *'A decision to stop letting students treat each other was made a few years ago following negative feedback from the GDC on the practice.'*

FIGURE 1 Comments from 2023 survey results in relation to medicolegal issues as to why schools no longer allow peer-to-peer administration.

TABLE 6 Summary of question 9 results, 2020 and 2023 data.

	Safety syringes	Traditional Syringe	Peri press	Wand system
2020 survey data	94%	18%	38%	18%
2023 survey data	100%	0% (12% of schools reported making their students 'aware of the system')	25%	18%

2020: No data.

2023: Figure 3.

Question 16: Is there any specific criteria regarding mandated supervision of students giving LA to patients?

2020: No data.

2023: Figure 4.

4 | DISCUSSION

4.1 | Use of peers

The administration of LA to fellow student colleagues has been the most common method of teaching LA for decades, even seen as part of the tradition of dental school and considered by both staff and students as a 'rite of passage'. Using a fellow student colleague

has obvious advantages with the texture and behaviour of soft tissues that cannot be replicated by anatomical models or formalin fixed cadavers, as well as allowing the development of behavioural management techniques. A study in Australia of peer LA administration between 42 second year students found the experience of receiving an injection and the sensation of 'feeling numb' helped the dental students to understand and explain how their patient would feel during the procedure and increased their empathy with their patients.⁷ Many students will have limited experience of receiving dental treatment due to improving oral health; therefore, it is perceived that students experiencing an injection could be beneficial.

The results of our survey confirm our hypothesis that there has been a considerable reduction in schools permitting LA practice on a peer. This shows consistency with other published studies across the world. In 2009, Rosenberg et al. found 98% of US dental schools used peers for administration of a first injection; this is very similar to the

TABLE 7 Responses to questions 10, 11 and 12. ✓ denotes yes, X denotes no. Extraction (XLA), restoration (Fill) and professional mechanical plaque removal (PMPR).

Procedure	School 1	School 2	School 3	School 4	School 5	School 6	School 7	School 8	School 9	School 10	School 11	School 12	School 13	School 14	School 15	School 16
XLA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fill	X	✓	✓	✓	✓	✓	✓	X	✓	✓	X	✓	X	✓	✓	X
PMPR	✓	✓	✓	X	✓	X	✓	X	✓	✓	X	✓	X	✓	✓	X

TABLE 8 Recommended injection techniques for varying clinical procedures (2020).

	Maxillary posterior direct restoration	Maxillary anterior direct restoration	Mandibular posterior direct restoration	Mandibular anterior direct restoration	Maxillary posterior extraction	Maxillary anterior extraction	Mandibular posterior extraction	Mandibular anterior extraction
Buccal Infiltration (maxillary)	16	16	X	X	16	16	X	X
Buccal Infiltration (mandibular)	X	X	6	11	X	X	9	5
Inferior Alveolar Nerve Block	X	X	13	3	X	X	5	16
Mental Block	X	X	0	9	X	X	12	3
Long Buccal Nerve Block	X	X	1	0	X	X	2	14
Infraorbital Block	0	0	X	X	1	X	X	X
Palatal Infiltration	3	3	X	X	14	15	X	X
Lingual Infiltration	X	X	1	3	X	X	9	4
Intra-pulpal	1	1	1	1	2	2	2	2
Intra-ligamental	1	1	1	1	4	4	4	4

TABLE 9 Recommended injection techniques for varying clinical procedures (2023).

	Maxillary posterior direct restoration	Maxillary anterior direct restoration	Mandibular posterior direct restoration	Mandibular anterior direct restoration	Maxillary anterior extraction	Maxillary posterior extraction	Mandibular anterior extraction	Mandibular posterior extraction
Buccal Infiltration (maxillary)	16	16	X	X	15	15	X	X
Buccal Infiltration (mandibular)	X	X	14	11	X	X	12	7
Inferior Alveolar Nerve Block	X	X	13	2	X	X	3	16
Mental Block	X	X	0	5	X	X	8	1
Long Buccal Nerve Block	X	X	1	0	X	X	0	13
Posterior Superior Alveolar Nerve Block	1	0	X	X	0	4	X	X
Infraorbital Block	0	0	0	0	0	0	0	0
Palatal Infiltration	4	4	X	X	16	16	X	X
Lingual Infiltration	X	X	2	4	X	X	14	4
Intra-pulpal	1	1	1	1	4	4	4	4
Intra-ligamental	0	0	0	0	5	5	5	5

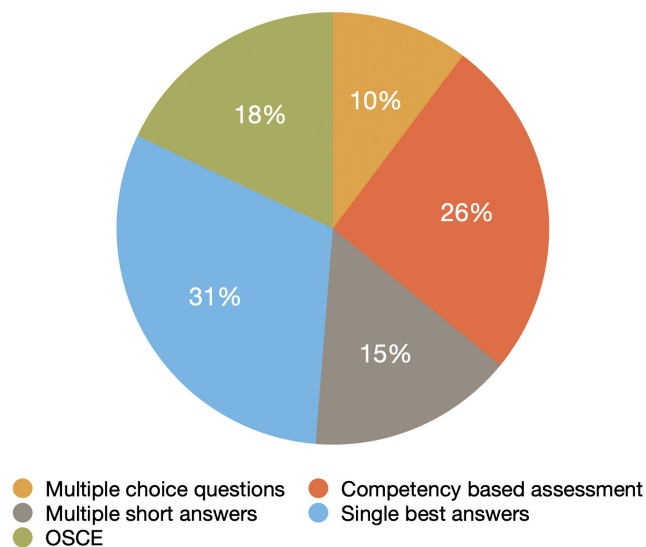


FIGURE 2 2023 responses to question 14. Numbers indicate the number of schools.

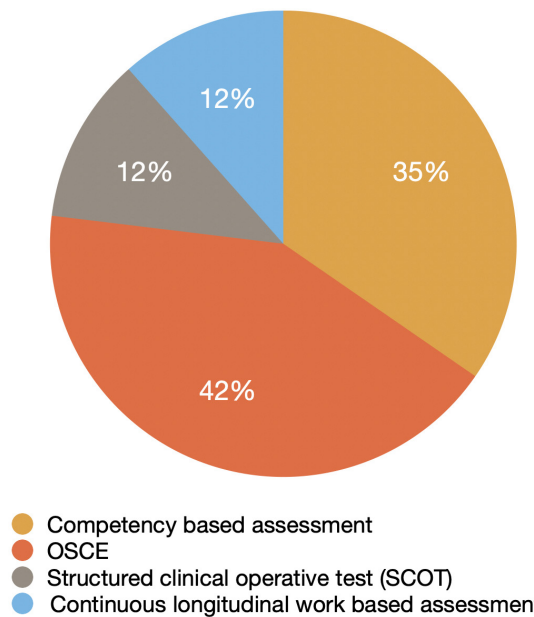


FIGURE 3 2023 responses to question 15. Numbers indicate the number of schools.

findings of a 2008 survey of European dental schools that noted in its detailed findings that for the two UK dental schools included in the survey, 99%–100% of students reported giving their first injection to a fellow student.⁶ A 2016 survey of UK dental schools showed this dropped to 72%, falling further again to 44% in 2020 and 25% in 2023 in our survey.⁵ A survey of European dental students highlighted a geographic difference across Europe, with students in Northern European countries and the US performing their first injection on a peer versus students in Southern Europe giving an injection to a patient.⁸

In our most recent 2023 survey, only two of the four schools using student colleagues for teaching, allowed administration of inferior dental blocks. There appears to be a move away from giving IANB's

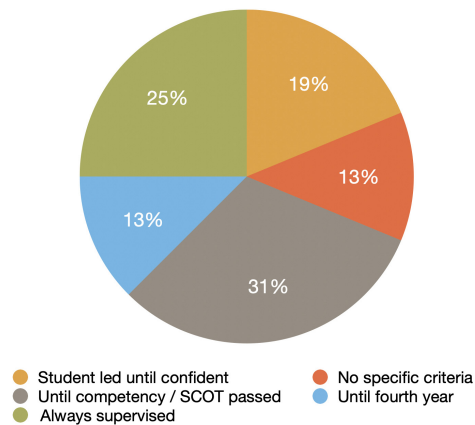


FIGURE 4 2023 responses to question 16. Numbers indicate the number of schools.

from the 2020 survey with two schools now only allowing infiltrations. Three of the four schools using peers utilise anatomical models before practicing on a peer. Similar rationales were given for not allowing student administration in both the 2020 and 2023 surveys, with commonly cited reasons being the risk of complications, the administration of a prescription-only medication with no therapeutic benefit, no indemnity, student anxiety and issues with valid consent. Interestingly, the risk of inferior alveolar nerve injury or lingual nerve injury was only specifically mentioned in the 2023 results, perhaps as more clinicians are discussing this risk with their patients. Other authors concur with these reasons, citing the inability to get indemnification from university insurers,⁹ students being unwilling to participate,¹⁰ and concerns over coercion with the risk of complications.⁶

4.2 | Alternatives to peer-to-peer administration

The majority (75%) of schools are using prosthetic models for their teaching, predominantly the 'NISSIN conduction anaesthesia model [SUG2005-UL-SP]'. The model can be mounted into a phantom head and has 11 contact sensors for anaesthetic block techniques. Needle contact with the sensor completes the circuit, making the user aware via light and/or an alarm sound. There are disadvantages to the prosthetic models, including the contacts for conduction being very precisely placed with difficult angles of approach, as well as the tissues being much harder and firmer than in real life. A mixed-methods study of Australian dental students noted that the synthetic manikin was not realistic enough compared to a real patient and that the lack of experience injecting into human oral tissue was a barrier to their learning.⁹ There is a need for highly realistic simulation, as we know students report a high degree of anxiety surrounding the delivery of LA to patients and their peers.¹¹ No research is available on the efficacy of prosthetic models for dentistry; however, research in the medical field for training nurses with cannulation has suggested that in terms of performance, using models is as effective as practicing on a peer in a randomised trial.¹²

Four institutions report using cadavers for teaching, with two institutions using Thiel embalmed cadavers. Thiel embalming is a soft-fix embalming method, and unlike using formalin, tissues remain elastic, colour is preserved and joints are moveable.¹³ This is particularly useful for delivery of an inferior dental block where students can manipulate the temporomandibular joint. For formalin fixed cadavers, practice of an inferior dental block will necessitate a permanently open temporomandibular joint for practice. One of the major benefits of using cadavers is the ability for the student to repeatedly practice insertion until they are confident in feeling and visualising the soft and hard tissue anatomy.

Interestingly, the results show that no UK dental school is using haptic technology for teaching LA. This is likely due to the current limitations where the simulator technology has been developed for drilling of cavities, and so the handpiece ergonomics are ill-matched to that of a lightweight, plunging dental syringe. In addition, an important skill of delivery of LA is the use of the supporting hand and soft tissue retraction, which cannot be well simulated digitally. There is limited literature available on extended reality simulators for LA education; however, these models appear promising. A study using an augmented reality model, which students were able to interact with for LA training, showed better syringe control, improved knowledge of the injection site and a slicker injection technique than those trained on a plastic model.¹⁴ A study with a mixed-reality haptic model, where students use a real syringe that interfaces with a virtual simulation of a 3D mandible to administer an inferior alveolar nerve block (IANB) with realistic sensations compared students using the model before and after peer administration of LA.¹⁵ The authors found that the students who used the model before injecting a peer had greater confidence and better anaesthetic success when performing an IANB.¹⁵ The use of extended reality for education is exciting and one to monitor as the technology develops.

4.3 | Types of syringe

It is very positive that all schools are now using an Ultra Safety Plus (Septodont®) syringe system, a significant increase from 2016, where only 78% of responding schools did.⁵ Safety syringes greatly reduce the risk of needlestick injury for both operator and nurse, as there is no requirement to recap the syringe.¹⁶ The increased use of safety syringes in UK dental schools conforms with European legislation that safety systems should become more common practice within healthcare settings to prevent needlestick injuries.¹⁷

4.4 | Timing of teaching

Our survey results show that most of the theoretical and practical teaching of LA occurs in the second year of study in UK dental schools, and this appears unchanged since Oliver et al.'s 2016 survey.⁵ Interestingly, for dental students, there is then a lag between the teaching and when they give their first injection to a patient, and

this seems to have increased. Despite the perceived benefits of early clinical exposure for dental students,¹⁸ the data suggests that between 2020 and 2023 students gave their first local anaesthetic to patients later in the programme. In 2020, most dental students (81%) gave their first injection in year 2, compared to 31% in 2023. In 2023, most students (69%) gave their first injection in year 3, compared to just one school reporting the first injection in year 3 in 2020. The 2023 findings were more in line with Brand et al.'s 2006 survey of European dental schools that the majority of practical teaching occurred in the second half of year 3.⁴ Given that local anaesthetic is required for most dental procedures, it can be inferred that students appear to be having later clinical exposure than 3 years ago. Given the 2020 survey was before the COVID-19 pandemic, a likely explanation is the ripple effects of reduced clinical activity and patient flow to subsequent years. Data was not captured for hygiene and therapy students in 2020, so this data cannot be compared.

4.5 | Intra-professional education

Intra-professional education (IPE) is defined as when students from two or more healthcare professions are trained together to learn each other's skill set, improve teamwork, create efficiencies and improve health outcomes.¹⁹ There appears to be a reduction in IPE of local anaesthesia between dental students and dental hygiene and/or therapy programmes since 2020, with combined teaching occurring in 75% of schools in 2020, compared to just 44% of schools in 2023 (Table 2). Is this another legacy from COVID-19 where timetables were altered to reduce group sizes and teaching has not reverted to pre-pandemic arrangements?

4.6 | Procedure-specific LA techniques

All UK dental schools routinely teach the use of IANB's for extraction of teeth. However, there is variation in whether students are taught to use IANB's for restoration and non-surgical periodontal management of mandibular molar teeth, as seen in Table 7, which may highlight the clinical preferences of teaching staff. Tables 8 and 9 show a significant increase of 50% in the teaching of infiltrations for mandibular molar restorations from six (38%) to 14 (88%) schools in 2020 and 2023, respectively, revealing a change in the teaching and practice of LA. It is suggested that this relates to the increasing awareness of the risk of nerve injury with an IANB and the acceptance of successful mandibular anaesthesia with articaine infiltrations and intra-ligamentary techniques.²⁰

4.7 | Assessment of competence and supervision

Most UK dental schools use composite methods of assessment techniques to assess both the theoretical and practical components of their LA teaching. The results are similar to Brand et al.'s

findings that the theory was more commonly assessed by written or oral exams (single best answers, competency assessment, OSCE's), whereas practical skills were assessed mostly by practical or oral examinations (OSCE's, competency assessment).⁴ Schools recognise the requirement for practical assessment of skills and follow Miller's Pyramid of Clinical Competence using OSCE's or competency assessments to ensure the acquired skill of the student was demonstrable.²¹ Objective Structured Clinical Examinations (OSCE) are the most common method of practical assessment and have increased considerably in popularity since the 2016 paper, from 21% to 69% of UK schools in 2023.¹ The use of competency-based assessments appears relatively unchanged, from 56% in 2023 versus 50% in 2016.⁵ Two schools use competency assessments to allow progression onto patient clinics (from the lab setting), and five schools use them to dictate when students can give LA unsupervised. In seven schools, however, there are no specific criteria or assessment for students to administer LA unsupervised. These schools instead use a generic approach of students being supervised 'until fourth year', or until the student 'feels confident'. Schools not using a competency-based approach utilise longitudinal work-based assessment as the alternative for highlighting a lack of satisfactory progress.

5 | CONCLUSION

With the move to more defensive medical and dental practice, it is possible we have moved to a defensive teaching approach due to medicolegal anxieties. In addition, student evaluation of teaching is a more common practice, and therefore their opinion has a more significant position in our teaching practice. Many teachers feel that the loss of practicing clinical skills on a fellow student (cannulation, impressions, LA to name a few) is a big loss to developing these skills. However, within the medical specialities, medical students and allied health professionals have not practiced clinical techniques on fellow colleagues for decades, and we are now seeing this cultural shift in undergraduate dentistry in the United Kingdom. Potentially because dentists have practiced some techniques on each other, dentistry is behind medicine, where virtual reality has been used for some time for surgical training such as in endoscopy and orthopaedic surgery. Specifically, within the field of LA, there is a need for the development of high-fidelity simulation technologies. At present, no UK dental schools are using haptic simulation for teaching LA. However, with technology development, these may prove to be excellent teaching tools and overcome the lack of realism in current models. Time will tell whether these haptic models will be the solution for teaching a fundamental skill to the next generation of dental students.

ACKNOWLEDGEMENTS

The authors would like to thank the members of the education committee of the Academic British Association of Oral and Maxillofacial Surgeons for their contribution to this work.

FUNDING INFORMATION

No funding was received for conducting this study.

CONFLICT OF INTEREST STATEMENT

None of the authors have a conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

Raw data were generated at Cardiff University and stored in a secure location. Derived data supporting the findings of this study are available from the corresponding author [CR] on request.

ETHICAL APPROVAL

Appropriate ethical approval was sought for completion of this study. Ethical approval for survey one was obtained from the Cardiff University Dental School Research Ethics Committee in January 2020 (CU-DSREC-2001a). Ethical approval for survey two was obtained from the Cardiff University Dental School Research Ethics Committee in March 2023 (CU-DSREC-2303a).

ORCID

Charlotte Richards  <https://orcid.org/0000-0002-4624-1155>

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How to cite this article: Richards C, Dargue A, Mylonas P, Morris D, Emanuel C. The teaching and assessment of local anaesthesia in UK dental schools. *Eur J Dent Educ.* 2024;00:1-9. doi:10.1111/eje.13031