

# **Curriculum content and assessment of pre-clinical dental skills: A survey of undergraduate dental education in Europe.**

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## **Introduction**

Since 1981 the qualifications for various Health Care Professionals across the European Union have enjoyed mutual recognition in accordance with the EU Directive 81/1057/EEC(1). Whilst the directive includes dental practitioners, it is recognised that significant variation exists in curriculum structure, content and scope of practice across different institutions (2-4).

Dental regulatory bodies are insisting that institutions demonstrate their students' fitness to practise in order to ensure patient safety(5). However, the wide variety of teaching, learning and assessment practices, both in relation to content and style, represent one of the main obstacles in the standardisation and quality assurance of dental education. Although research has been carried out that scopes specific areas of dental education, such as oral surgery (2,4), more details on how pre-clinical dental skills are taught across Europe is required. It is known that wide variation exists in current skills-teaching practice, and this was recognised by the Association for Dental Education in Europe (ADEE) in the formation of Taskforces with the remit of refining and harmonising the delivery, structure and quality of dental undergraduate education(6). To assist this process, ADEE's pan-European Pre-clinical Skills Special Interest Group met to formally evaluate current practice. The aim of this paper is to inform on pan-European practice in relation to curriculum content, teaching and learning strategies, and assessment of pre-clinical dental skills.

## **Method**

This study received favourable ethical approval from Newcastle University Ethics Committee (Reference 226373, 18/08/2014). A request to complete the online questionnaire, in English, was sent electronically to skills leads at all ADEE member schools across Europe. The questionnaire collected information in relation to:

- Institution and country
- Regulatory requirements to demonstrate student safety prior to patient treatment
- Details of specific pre-clinical skills courses
  - Timing
  - Content
  - Duration
  - Assessment
- Learning materials
- Teaching staff

The questionnaire had been originally piloted at the Special Interest Group in Szeged, Hungary, through "think-aloud" testing (7), using the curriculum at a UK University as a guide. The questionnaire then underwent further critical appraisal in terms of face and content validity by a small working group from across Europe, including representation from

the European Dental Students' Association. Modifications to clarity of the English and understanding of the format was made after feedback from the initial testing. The definitive questionnaire was hosted by Newcastle University's online 'Form Service', and employed conditional entries, whereby participants were unable to submit without completing all of the necessary information. The questionnaire items are listed in Appendix A. The link remained active for 9 months in order to maximise the response rate. A reminder email was sent one month prior to closure of the questionnaire. All responses were transferred to Excel in order to analyse the data and formulate descriptive statistics.

## **Results**

The survey was completed by 48 institutions, belonging to 32 different countries (Figure 1). This represents 64% of the European countries, and a significant proportion of the ADEE institutional membership.

It was found that in 7 countries (n=8, 22%), there was *no requirement* to demonstrate student operative safety prior to patient treatment. Most institutions (88%, n=42) reported running dedicated skills courses for pre-clinical skills, and the same number (n=42, 88%) reported that they formally test students before they begin patient treatment. There was variation in delivery of pre-clinical skills teaching, although it was most common for institutions (35%, n=17) to teach some clinical skills within the first year (Table 1).

### Teaching and assessment of core clinical skills prior to patient treatment

Table 2 outlines the frequency by which core clinical skills were reportedly taught. Cross-infection control was the most frequent core clinical skill, with 94% (n=45) of institutions actively teaching it prior to patient treatment. Communication skills (69%, n=33) and working as a team (58%, n=28) were taught noticeably less frequently. Reflective practice was the least frequently taught core clinical skill (48%, n=23).

Table 3 outlines the frequency by which core clinical skills were reportedly assessed. Clinical examination skills and Cross-infection control were the most frequently assessed core clinical skill (73% n=35, 71% n=34 respectively). Communication skills, working as a team posture and reflective practice were all assessed by less than half of the institutions surveyed. 6 institutions (13%) reported not assessing *any* core clinical skills prior to patient treatment. The reported relationship between the number of core skills taught and the number of core skills assessed is represented in Figure 2.

### Assessment of operative clinical skills prior to patient treatment

Table 4 outlines the frequency by which operative clinical skills were reportedly assessed. All institutions reported assessing the following prior to patient treatment:

- Anterior approximal preparations
- Caries management
- Composite restorations
- Occlusal preparations
- Posterior approximal preparations

- Pulp access
- Root canal negotiation, access and obturation

Less than half of the institutions assessed veneer (33%, n=14) and resin-retained bridge (36%, n=15) preparations prior to patient treatment. 6 institutions (13%) reported not assessing *any* operative clinical skills prior to patient treatment. 69% (n=33) of institutions assessed continually throughout the course. 8% (n=4) assessed towards the end, and the same number (n=4) assessed only once. Over 25% of respondents stated that the method of assessment depended on the particular clinical skill – and it was common for the complexity of the assessments to increase as the course progressed.

### Progression

Of those institutions assessing students prior to patient treatment (n=42), one institution reported that their students were able to repeat assessments indefinitely until competence is displayed, whilst the majority offer a maximum number of attempts before a student is deemed to have failed the course. 88% (n=37) stated that all students must sit the same assessment(s). The remainder (n=5, 12%) described a process of adaptive assessment, whereby their students were able to progress without formal assessment if they show a degree of consistent and safe performance throughout the course.

### Inter-professional education and modes of delivery

42% (n=20) of institutions also taught students from other dental health care programmes their pre-clinical skills concurrently. There was a reasonably equitable mix of delivery methods across all institutions, with 38% (n=18) reporting delivery wholly by academic members of staff, 31% (n=15) reporting the programme being *led* by academics, and 27% (n=13) reporting a true mix of shared delivery between academics and other employed staff. Two institutions reported that their skills programmes were delivered entirely by visiting dental practitioners from primary care. Only 5 institutions (10%) were able to recommend a suitable text book for their pre-clinical skills course. 2 institutions (4%) stated that they had produced in-house manuals as a substitute.

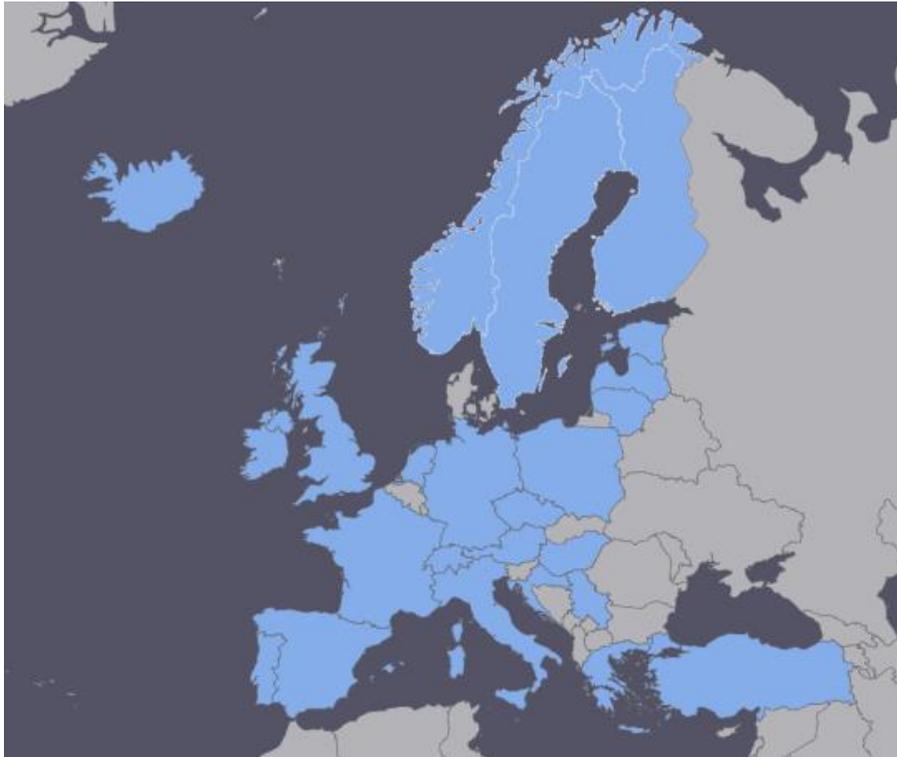


Figure 1 – Infographic detailing European countries that responded to the questionnaire

Year 1	35% (n=17)
Year 2	31% (n=15)
Year 3	23% (n=11)
Year 4	8% (n=4)
Year 5	2% (n=1)

Table 1 - Number of institutions teaching clinical skills in each programme year

Cross-infection control	94% (n=45)
Clinical examination skills	88% (n=42)
Hand washing	85% (n=41)
Posture	81% (n=39)
Medical emergencies	81% (n=39)
Preparation of the clinical environment	81% (n=39)
Communication skills	69% (n=33)
Working as a team	58% (n=28)
Reflective practice	48% (n=23)

Table 2- Number of institutions teaching specific core clinical skills

Clinical examination skills	73% (n=35)
Cross-infection control	71% (n=34)
Medical emergencies	58% (n=28)
Preparation of the clinical environment	58% (n=28)
Hand washing	56% (n=27)
Communication skills	46% (n=22)
Working as a team	35% (n=17)
Posture	33% (n=16)

Reflective practice	31% (n=15)
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Table 3- Number of institutions assessing specific core clinical skills

Anterior approximal preparations	88% (n=42)	100%	Of those formally testing
Posterior approximal preparations	88% (n=42)	100%	
Composite restorations	88% (n=42)	100%	
Occlusal preparations	88% (n=42)	100%	
Pulp access	88% (n=42)	100%	
Root canal negotiation, access and obturation	88% (n=42)	100%	
Caries management	88% (n=42)	100%	
Amalgam restorations	75% (n=36)	86%	
Glass ionomer restorations	79% (n=38)	90%	
Extra-coronal preparations	77% (n=37)	88%	
Scaling/root surface instrumentation	73% (n=35)	83%	
Local anaesthetic technique	71% (n=34)	81%	
Provisional/temporary restorations	63% (n=30)	71%	
Suturing	60% (n=29)	69%	
Partial denture preparations	50% (n=24)	57%	
Inlay preparations	46% (n=22)	52%	
Extraction technique	48% (n=23)	55%	
Resin-retained bridge preparations	31% (n=15)	36%	
Veneer preparations	29% (n=14)	33%	

Table 4- Number of institutions assessing specific operative clinical skills

Basic plastic Simulator teeth	100% (n=48)
Natural teeth	85% (n=41)
Advanced Simulator teeth	13% (n=6)
Haptics	23% (n=11)
Advanced and haptics in combination	6% (n=3)

Table 5 - Number of institutions using different types of teeth

Anterior approximal preparations	Operative skills
Posterior approximal preparations	
Composite restorations	
Occlusal preparations	
Pulp access	
Root canal negotiation, access and obturation	
Caries management	
Cross-infection control	Core skills
Clinical examination skills	
Hand washing	
Posture	
Medical emergencies	
Preparation of the clinical environment	

Table 6 – Proposed taught items within a standardised curriculum

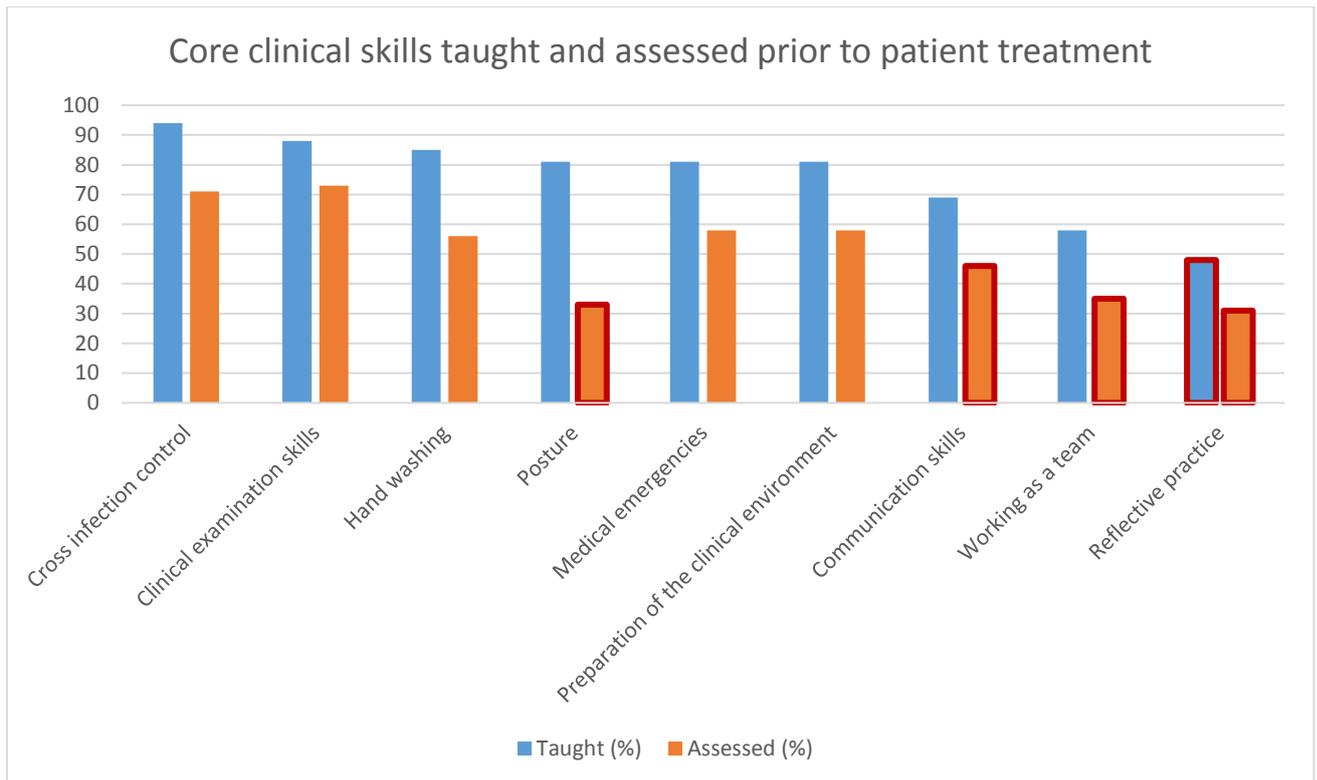


Figure 2 – Proportion (%) of institutions teaching and assessing core clinical skills. The red outlines indicate skills that are assessed by less than half of institutions surveyed.

## Discussion

The results reflect the findings from a selection of schools across Europe, and there is considerable variation in relation to timing, skills taught and assessed, and materials and methods employed. In several countries (n=7) there is no regulatory requirement for dental schools to demonstrate student safety prior to patient treatment. This result serves to highlight the disparity that exists between dental regulators across Europe. In fact, 6 institutions currently allow students to treat patients before being formally tested at all; 2 institutions allow this to happen despite their regulator *requiring* them to do so, and one institution reported that they did not provide any clinical skills *teaching* before patient treatment begins. The value of utilising a simulation environment in order to improve patient safety is well-described (8), and so it is a concern that such discrepancies exist across apparently reciprocal programmes.

### Logistics of teaching & assessment

In terms of teaching core clinical skills prior to patient treatment, the most commonly reported related directly to the clinical working environment – such as cross-infection control, hand washing, dealing with medical emergencies, and preparing the clinical environment. Less commonly reported were skills that indirectly related to patient care, such as communication skills and working as a team. Less than half of institutions reported teaching reflective practice, and the difficulties of successfully doing so are well-documented by Colette Eaton (9).

It is worth noting that there are core and operative clinical skills common to the majority of institutions, and it would therefore seem sensible that these form the basis of a standardised curriculum (Table 6). There are also several core clinical skills that still require introduction and development within a significant number of school curricula. These include communication, team working and reflective practice. The sharing of good practice between institutions is to be commended; whilst this most frequently happens within the remit of special interest groups in ADEE, every opportunity should be sought to engage and share with colleagues from other institutions.

In all cases, the number of assessed skills was lower than the number of taught skills. Whilst there is no real need to assess *all* taught elements, it is of concern that 6 institutions didn't assess any core clinical skills at all. Whilst there may be a perception that core clinical skills are less likely to immediately compromise patient safety, greater efforts are needed to demonstrate that all European students are fit to practice before they start treating patients.

### Skills training environments

One fifth of institutions taught students from other dental health care programmes concurrently. This is an interesting concept, and requires further investigation in order to determine whether students from other programmes are simply sharing the skills environment/teaching sessions, whether the students are taught as a unified group, and whether all students are assessed in the same way. The recommendation is made here that, whilst students from different programmes might be assessed differently, there are considerable benefits from all of the students being taught together. A similar action research approach to that reported in this paper, can be extremely useful in defining core

components of allied health education(10). There was a reasonably equitable mix of delivery methods across all institutions, with around 40% reporting delivery wholly by academic members of staff, and just under one third reporting the programme being led by academics but involving visiting dental practitioners. Across institutions there will undoubtedly be considerable financial, educational and political drivers that determine the staff student ratio, and the types of clinical teachers that are assigned to skills teaching. A recent narrative review of practical skills teaching explored the effects of instructor type on skill acquisition and Objectively Structured Clinical Examination (OSCE) performance, showing little difference in outcomes between instructor types. Interestingly, the instructor types included trained peers (11). Further, it seems that it is the frequency and intensity of feedback to the students that has the greatest impact on skills acquisition rather than the instructor type *per se* (12). As such, a team approach to reflective practice after each learning event should be encouraged from an early stage.

In relation to training resources, most institutions were unable to identify an essential text that would be helpful in teaching operative dental clinical techniques for the first time. The remainder identified only two in total (13, 14), with two institutions reporting the use of in-house manuals. Regardless of the source, having clearly stated goals for each exercise, with tangible outcome measures, will more likely lead to learners mastering practical skills (15) and achieving their goals (16). At present, only two sources provide this level of detail accessible to the wider profession (13, 17). Wider collaboration is therefore advocated in order to facilitate wider implementation of a comprehensive curriculum, resulting in improved student confidence and patient safety.

## **Conclusions and recommendations**

- There are existing differences within European pre-clinical dental education.
- Greater efforts are needed to demonstrate that *all* European students are fit to practice before they start treating patients.
- Learning outcomes, teaching activities, and assessment activities of pre-clinical skills should be shared collaboratively
- Reflective practice, peer review and team working should be encouraged from an early stage, and taught and assessed longitudinally throughout the programme.
- Clinical skills teaching should occur early not only to encourage motivation, but also to identify students who may benefit from extra support, or may not be suited to a clinical programme.
- Local and national interventions are required to bring about standardisation

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## **Appendix A – Pre-clinical skills questionnaire questions**

Which institution do you represent?

In which country are you based?

### **The next section considers the teaching of pre-clinical dental skills at your institution**

The UK General Dental Council requires all schools to demonstrate that students are safe to conduct clinical procedures before carrying them out on patients.

Does your country also have this requirement?

Does your school run a dedicated course for the teaching of pre-clinical dental skills?

In what year of the programme are your FIRST clinical skills taught?

Are your students FORMALLY tested before entering the clinics to treat patients?

### **The next section considers developing 'core' clinical skills at your institution**

Which core clinical skills are actively taught BEFORE your students treat patients?

We don't teach any core skills before patient treatment begins

Which core skills are ASSESSED before your students treat patients?

Please list any skills that are formally assessed before your students are allowed access to patients on the treatment clinics

Are any core clinical skills taught EARLIER in the course than the operative skills?

Do you feel that your students would benefit from earlier involvement with any clinical skills?

Which operative clinical skills are ASSESSED before your students have access to the clinics to begin patient treatments?

Generally, how many times are your students formally tested on each exercise?

### **The next section relates to the equipment that you use to teach your tooth-based clinical skills**

What type of teeth do your students work on?

Do you think that there is a need to standardise the teeth that students use?

**This section considers how the teaching is formulated within your institution**

Do you also teach students from other programmes concurrently?

Who provides the actual TEACHING for your clinical dental skills?

Must all students sit a clinical skills stage examination prior to treating patients?

Which text books would you consider to be essential when teaching clinical dental skills?