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Review and mapping of basic dental training in EU member states: Final Report

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Executive Summary

Introduction

In the United Kingdom, the General Dental Council regulates dental professionals and dental education that leads to registration as a dentist, with the setting of standards and quality assurance of dental education being a statutory function of the organisation. Dental schools must educate their students to meet the outcomes set out in the General Dental Council's *Preparing for Practice: Dental Learning Outcomes for the Dental Team,* and their dental programmes are quality assured against standards published in *Standards for Education.* However, the regulator also registers and regulates dentists who have trained in other countries and then come to the UK to work. It is therefore important for the General Dental Council, and other key stakeholders in dental education, postgraduate training and employment, to understand the nature, scope, and expected outcomes of non-UK training programmes. The extent to which these are comparable or not to UK undergraduate programmes and associated expectations may have implications for patient safety.

Aims and objectives

The aim of this project was to identify and map standards for dental qualifications in EU member states to the UK standards set out in *Preparing for Practice.*

The project was designed to fulfil three objectives:

- To compare EU member states' dental curricula against the UK learning outcomes for dentists, as set out in the GDC's *Preparing for Practice: Dental Learning Outcomes for the Dental Team* and to identify whether gaps exist at domain level.
- To identify the point in each EU member state's programme of dental education that clinical experience with patients commences and to establish the extent of such clinical experience.
- To explore EU member states' systems for quality assuring basic dental training and the visibility of these systems.

Study design and methods

The research used three complementary methods to identify information.

- A literature review
- Searches of relevant organisational websites
- A fact-finding questionnaire

Once information was identified and collated, examples of standards and curricula were mapped to the domains of *Preparing for Practice.*

Literature review

Database searches were carried out in October 2019 to identify papers relating to the following four aspects: EU member states; dental education; curricula; and regulation, quality assurance or learning outcomes. Results were de-duplicated into a single set of results, which were then screened twice against detailed inclusion and exclusion criteria, first screening against titles and abstracts then screening initially included items using the papers' full texts. Ultimately, 76 papers were included for review. Relevant data were extracted and synthesised.

Website searches

Relevant websites in each EU member state were reviewed using a hierarchical approach. First, websites of national dental authorities (i.e. regulators, ministries of health, or professional associations) were reviewed, then if more information was needed, the websites of selected individual dental education providers were searched. A spreadsheet was used to extract and collate relevant information for each country. Significant documents identified during the searches were downloaded and saved, including examples of curricula or graduate outcomes.

Fact-finding questionnaire

A short questionnaire, designed to collect factual information about dental education systems and their quality assurance in EU member states, was developed. The questionnaire was distributed between December 2019 and January 2020, to organisations responsible for dental regulation and also to dental school representatives. Responses to the questionnaire were received from ten EU member states, with twelve responses in total.

Mapping to 'Preparing for Practice'

Example of curricula or graduate outcomes, whether produced at national level or, where no national information could be found, by an individual dental school were mapped against the domains and elements of *Preparing for Practice*. Two senior clinical educators, one of whom is also an experienced dentist, carried out the mapping exercise.

Findings

Literature review

Papers ranged from those with an international (n=6) or Europe-wide (n=36) scope, to those covering individual countries. Most of the included papers were commentaries or editorials (n=53), and many focused on describing the development of curricula or competences. There were 21 research papers, most of which reported survey findings and focused on faculty views on curriculum development or setting competences. There was a lack of rigorous evaluative research.

The literature provided background on the historical development of dental education in Europe. Two major traditions, the stomatological and odontological models have been pursued at different times in different countries, with the former having trained students first as medics who then specialise in stomatology or oral medicine, while the odontological model treats dentistry as a distinct discipline. Stomatology had been prevalent in many Central and Eastern European countries though it has now been largely superseded by the odontological model, in part because of changes necessitated in some countries as part of their accession to the European Union.

The literature points to European Union initiatives focused on educational harmonisation, included the Bologna declaration and subsequent process, and the 2005 Professional Qualifications Directive 2005/36/EC, as major drivers in the development of proposals for curriculum development. Alongside political initiatives, academics and other stakeholders sought to strengthen European collaboration in dental education through the DentEd projects, which culminated with the production of the Association for Dental Education in Europe's (ADEE) *Profile and Competences for the Graduating European Dentist*. Subsequently, many special interest groups working in particular fields of dentistry or dental education have produced curricula or graduate outcomes for their areas of interest, often drawing on the ADEE *Profile and Competences* document. These proposals were the subject of many of the papers included in the review, but there was little information about the extent to which they have been implemented.

A number of key issues were identified from the literature in relation to the extent of dental students' clinical experience with patients, which evidently varies in scope and type of activity. There was some debate over whether this clinical experience should be measured numerically, i.e. by number of cases treated, or by using competences to measure quality. The challenges for dental schools of providing clinical experience for students also arose, especially in relation to achieving a suitable flow and mix of patients.

Website reviews

In the main report, the findings from the website searches have been developed into a short summary for each country, outlining the information retrieved about the provision of dental education, the extent of students clinical experience, quality assurance arrangements, and whether any graduate outcomes or curricula were identified. Overall, the extent of the information that was publicly available online varied considerably between countries.

Questionnaire

Responses were received from national bodies in Belgium, Denmark, Finland, France, Ireland, Spain and Sweden. Responses were also received from universities in Luxembourg, Finland, Portugal, Slovenia, and Spain. All these countries have a national dental register managed by a dental council or a government body. National competences in some form were reported by Belgium, Denmark, Finland, France, Ireland, Spain and Sweden.

The questionnaire responses showed that the extent of clinical experience with patients that dental students are exposed to during their basic dental training varies, and also highlighted the importance of additional vocational training as a prerequisite for full registration or licensing in some countries.

Quality assurance arrangements for dental education also varied between responding countries. In Ireland, dental education is accredited by the Dental Council of Ireland. In most other responding countries, dental education is quality assured by a quality assurance body for higher education.

Mapping to 'Preparing for Practice'

We identified and mapped to the domains of '*Preparing for Practice*' national level curricula or outcomes for seven countries (Belgium, Finland, France, Germany, Ireland, Spain and Sweden). Other countries were mapped to the curricula or outcomes in use at a single dental school, as an example of provision, except for six countries where no information suitable for mapping was identified (Cyprus, Estonia, Hungary, Latvia, Netherlands and Romania). Luxembourg has no dental schools.

Most countries, where information was available, showed good evidence that their graduating standards included 'demonstrating effective clinical decision-making' and 'applying an evidence-based approach to learning, practice, clinical judgment and decision making and utilise critical thinking and problem solving skills.' However, less than half could be mapped to 'making the high quality long term care of patients the first concern', 'describe the principles of good research' and 'recognise the importance of lifelong learning.' Only five countries had information that could be mapped to the GDC's 'accurately assess their own capabilities and limitations' outcome.

We identified seven countries (Croatia, Czech Republic, Germany, Greece, Ireland, Slovakia, Spain) where all the clinical skills related to individual clinical care in the GDC's *Preparing for Practice* were included as graduating outcome standards. Of these, Germany, Ireland, and Spain were mapped at national level. Overall, the domains of 'communication' and 'professionalism' were well

represented, but there was less evidence for the elements of 'teamwork' and 'development of self and others'. The 'management and leadership' domain was less well represented in the outcomes and curricula mapped.

Discussion and conclusion

The findings from this mapping exercise offer insights into the development of basic dental training in Europe, the broad range of proposals for harmonisation and the scarcity of evidence for how far these aspirations have been achieved. The key findings point to the continued variation between and within countries in the provision of dental education, and the differences between countries in how dental education is quality assured. We were able to identify national level graduate outcomes in several countries, but by no means all. The extent to which the outcomes available for mapping against *Preparing for Practice,* whether at national or institutional level, could be considered comparable to the expectations set out in that document also varied significantly.

This research has demonstrated that considerable challenges remain in making comparisons about the basic dental training provided in European countries, including in some instances a lack of visible information about the processes and standards in place.

Introduction

In the United Kingdom, the General Dental Council (GDC) works as the regulatory body for dentists and dental care professionals to protect, promote and maintain the health and safety of those receiving dental care. One of the GDC's major areas of activity is in setting education standards and quality assuring dental education leading to registration as a dental professional in the UK. As such the organisation has a strong and involved relationship with UK higher education institutions who train dental students in line with outcomes set out by the GDC in *Preparing for Practice: Dental Learning Outcomes for the Dental Team.*[1] Institutions running programmes that lead to a registrable qualification must be able, if requested to do so by the GDC, to demonstrate that each student has successfully achieved each outcome. UK-trained dentists can therefore be confirmed as having acquired the full range of knowledge, skills, and behaviours that a fully registered dental professional must demonstrate as a 'safe beginner', across the four domains of professionalism, communication, clinical, and management and leadership. Accredited programmes are quality assured for content delivery against a complementary set of education standards published in the GDC's '*Standards for Education*'.[2]

However, the GDC also needs to regulate dentists who have trained outside the UK and who come to this country to work. While standards for dental training outside the UK are beyond the jurisdiction of the UK, the nature, scope and expected outcomes of non-UK training programmes are important for the GDC and other stakeholders in dental education, postgraduate training and employment, to understand. The extent to which these non-UK training programmes are comparable, or not, to UK undergraduate dental programmes may have consequences for patient safety when dentists educated through under other countries' training schemes practise in the UK.

The GDC must protect patients while at the same time complying with international laws and conventions designed to protect the rights of workers, and recognising the need for and value of international recruitment to the health professions. Dental education and practice are global endeavours with dental students and practising dentists currently able to move freely across national borders within the European Economic Area. This freedom of movement offers potential benefits for individuals and for the provision of health services, but also poses a regulatory challenge of assuring that each and every dentist entering the UK to work is appropriately trained to practise in the UK. The UK's recent exit from the European Union (EU) has perhaps brought an added focus on how those working in statutorily regulated health professions are regulated across borders, and how these processes will work in future. While negotiations on the UK's future relationship with the EU continue during the transition period, there is as yet no clarity on what exact arrangements or

accords will operate in this sphere in the long-term. However, it is evident that dentists and other health professionals trained outside the UK will continue to enter the UK to work, and it therefore remains important to consider the extent to which dental training is comparable between countries. This research therefore set out to investigate graduate outcomes and standards defined in dental curricula for EU member states and the processes used to quality assure how higher education institutions, including private dental schools, achieve these standards in their graduates.

Aims and objectives

The primary aim of this work was to map standards for dental qualifications in EU member states against the UK standards maintained by the GDC.

Objectives

- To compare EU member states' dental curricula against the UK learning outcomes for dentists, as set out in the GDC's *Preparing for Practice: Dental Learning Outcomes for the Dental Team*[1] and to identify whether gaps exist at domain level.
- To identify the point in each EU member state's programme of dental education that clinical experience with patients commences and to establish the extent of such clinical experience.
- To explore EU member states' systems for quality assuring basic dental training and the visibility of these systems.

In order to meet these objectives, the research was designed to address the following eight research questions:

Research questions

1. What are the curricula for basic dental training in EU member states and how do they compare to the UK curriculum (P4P) at domain and element level?
2. At what stage of training do trainee dentists in EU member states start clinical experience with patients?
3. What is the extent of clinical experience with patients included in basic dental training in EU member states?
4. What systems for quality assuring basic dental training exist in EU member states?
5. Which organisations are responsible for quality assuring basic dental training?
6. How visible and transparent are quality assurance systems for basic dental training in EU member states?
7. Are published standards for assessing or quality assuring dental education used?
8. What is the role and status of private dental education providers in EU member states, and are they subject to the same or equivalent quality assurance processes as public providers?

Study design and methods

To address the research questions, we used three complementary methods to identify relevant information. We conducted a literature review to identify published materials on graduate outcomes in dentistry in Europe. We also reviewed the websites of key organisations with responsibility for dental regulation and education in each EU member state. Finally, we collected information on dental education and regulation directly from relevant organisations across Europe using a questionnaire. Then, once relevant information, had been identified, we mapped examples of curricula and graduate outcomes retrieved during our searches to the domains and elements of *Preparing for Practice: Dental Learning Outcomes for the Dental Team*[1] in order to establish the extent of comparability to these standards.

Further detailed information about each of these methods is provided below.

Literature Review

A literature review was undertaken in order to find papers which discussed or compared at a national level, the learning outcomes, quality assurance or regulation of dental education across the EU. In order to structure the literature search, the SPICE question framing device was used (Booth, 2018). SPICE is used for qualitative evidence synthesis and the mnemonic stands for Setting/Perspective; Intervention; [Comparison]; Evaluation. For the purpose of the literature search, the following four concepts were translated into the SPICE structure:

Setting: EU member states
Perspective: Dental Education
Intervention: Curricula
Evaluation: Regulation; quality assurance; learning outcomes

The search terms for each concept contained both title/abstract terms as well as subject headings where available for the database. An initial scoping search was conducted in Scopus (being the largest database) and a number of highly relevant "sentinel papers" were identified. These were used to develop the search strategy which was then tested on the databases to ensure that the sentinel papers were included in the results. The literature searches were developed and undertaken by an information specialist (LB).

The following databases were searched on the 24th October 2019: Embase [Ovid]; Medline [Ovid]; Scopus; CINAHL; AMED and PsycINFO. The search strategies are reported in Appendix A. Table 1 shows the number of results found in each database. No filters (study or language) were applied. A date parameter was applied to limit the results to the last twenty years: 2000 to 2020.

Table 1: Results per database searched 24.10.2019

Database	Results returned
Embase	441
Medline	422
CINAHL	351
AMED	2
PsycINFO	84
Scopus	580
Total number of results	**1,880**
Total after deduplication	**1,225**

The results from the individual database searches were downloaded into EndNote and deduplicated into a single set of results. These were uploaded into Rayyan, a web-based system which facilitates double blind screening of results.[3] Two reviewers (MB & DZ) independently screened the titles and abstracts of the results and resolved disagreements through discussion. The full texts of the references included at the title/abstract screening stage were obtained and the same reviewers divided these equally and screened the full texts, double-screening a ten percent sample for calibration purposes. Table 2 details the inclusion and exclusion criteria used to inform screening decisions.

Table 2: Inclusion and exclusion criteria used for screening

Inclusion criteria

Any paper which discusses, or study which measures:

- Content or structure of undergraduate dental curricula at a national level within any EU member state (including comparison or description of the domains, stage of clinical experience etc)
- Content or structure of undergraduate dental curricula within an institution within any EU member state and which also discusses how this relates to the national / regulatory framework governing that institution
- Quality assurance of undergraduate dental curricula at a national level within the EU
- Quality assurance of undergraduate dental curricula within an institution within the EU and which also discusses how this relates to the national / regulatory framework governing that institution
- Adherence of undergraduate dental curricula to national frameworks or EU regulations (including how this is assessed)
- Attempts to harmonise undergraduate dental curricula across EU member states
- Attempts to harmonise undergraduate dental curricula within individual EU member states and which also discusses how this relates to the national / regulatory framework governing that country
- Role of dental education regulators at national level within the EU
- Role of private dental education within any EU member state

Papers may be written in any language

Papers must be related to undergraduate dental education

Papers must be dated 2010 to current

Exclusion criteria

Any paper which reports:

- Views of dental students or graduate dentists on the curricula or their competence (unless cross EU country comparisons are made, and the discussion relates to the national / regulatory frameworks)
- Evaluation of an educational intervention or curricula or teaching or learning activities delivered within an institution
- Quality assurance methods or curriculum mapping within an institution

- Postgraduate, Continuing Professional Development or speciality training

Following the screening process, 76 papers were included for review. Figure 1 shows a PRISMA flowchart (Moher, 2009) detailing how the final number of included studies was achieved.

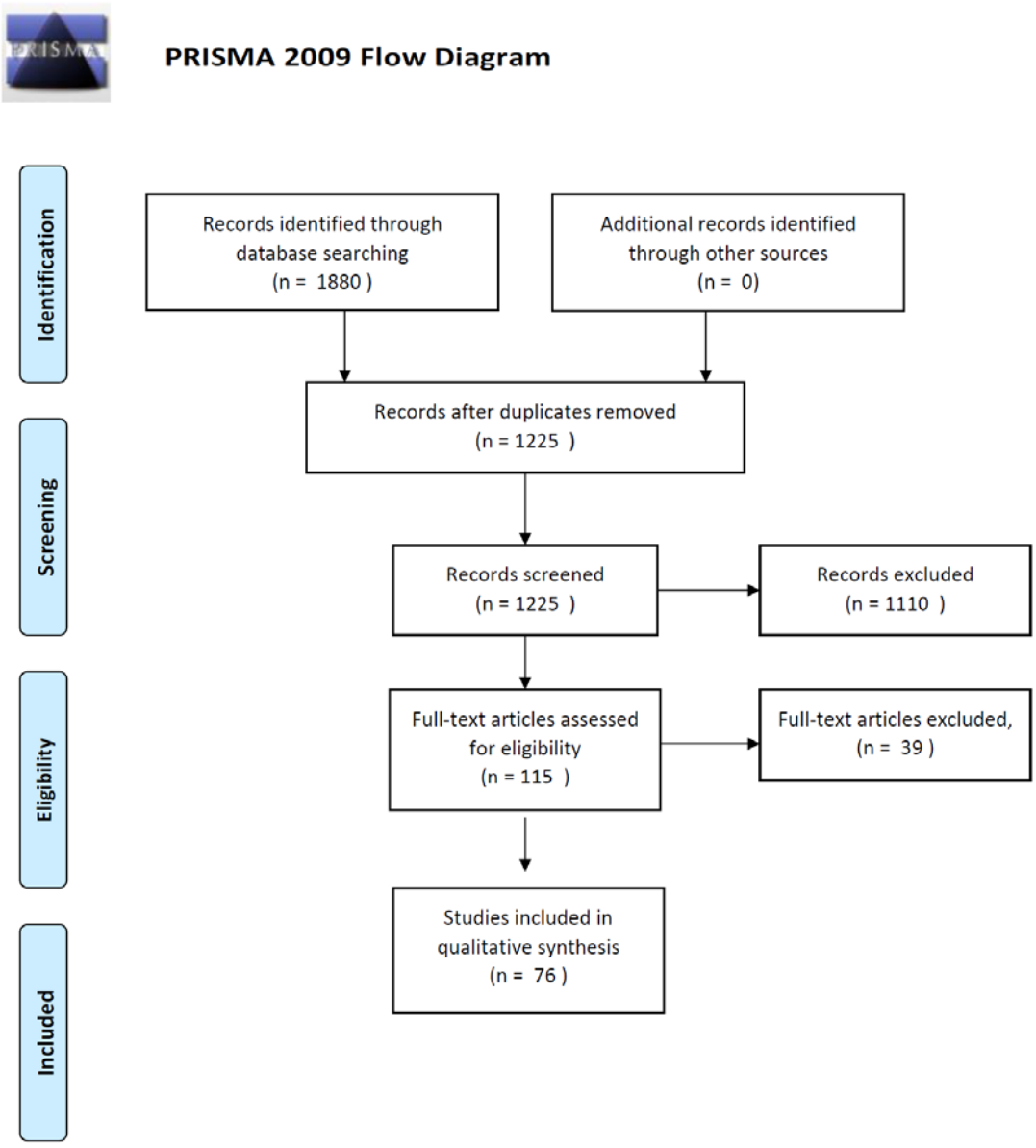


Figure 1: PRISMA diagram

A data extraction spreadsheet was created to capture information related to the review research questions and to enable comparison of countries. We collected categorical information about the

included papers (the country or countries focused on; the type of paper and study methods; the area of dentistry covered; and whether regulatory arrangements were mentioned) and also extracted information relating to each research question.

Website searches

Information produced by specific, identified organisations in each of the EU member states was reviewed. The organisations sought for each country included independent regulatory authorities, such as the GDC, professional associations, ministries of health or education, and providers of basic dental training. The organisations were identified through a number of online sources such as the EU Manual of Dental Practice,[4] the Federation of European Dental Competent Authorities and Regulators (FEDCAR) list of members,[5] and the GDC list of competent authorities.[6] An Excel spreadsheet was created to collate information about each country against each of the research questions as answered by the organisational websites. A hierarchical approach to the website searches was taken, so that competent authority and regulator websites were reviewed first, followed by ministry websites, and finally dental education provider websites until an answer was found for each of the research questions. We also followed up on links to additional organisations as these arose during the searches.

Against each country, the following information was sought:

- National professional competences
- Domains of curricula
- Extent and timing of patient contact throughout training
- Quality assurance / regulation of dental education
- Published standards of dental education
- The extent of private provision of basic dental education

Where information was provided in the language of the host country, online translation or within team language proficiencies enabled the extraction of relevant information. All URLs were recorded, and useful documents were saved.

Information that related to professional competences, domains of curricula, or standards of dental education were mapped against the GDC Preparing for Practice framework (GDC, 2015), as described further below.

Questionnaire

We developed a short questionnaire designed to collect factual information, and additional relevant documents, about basic dental training and its quality assurance in EU member states. The questionnaire (Appendix B) was distributed by email. A first wave of questionnaires was distributed in December 2019 to organisations with responsibility for regulating dental education or dental practice in EU member states, identified through the website searches, and from the FEDCAR website. A second wave of questionnaires were distributed in January 2020 via FEDCAR and the Association for Dental Education in Europe (ADEE), to organisations including regulators and dental schools. We received responses to the questionnaire from organisations in 10 EU member states, with 12 responses in total.

Ethical approval

This study was deemed not to require ethical review by the Chair of the University of Plymouth Faculty of Health: Medicine, Dentistry and Human Sciences Research Ethics and Integrity Committee.

Synthesis and mapping to *Preparing for Practice*

Once relevant information had been collected via the literature review, the website searches, and the questionnaire, we brought the information together in a number of ways. The literature review provided useful background information about the development of dental education in Europe, moves towards harmonisation, and the challenges that this has presented. We used information from the website searches to create short summaries of the arrangements for regulating and quality assuring basic dental training in each EU member state, and these were verified where possible by information received in response to the questionnaire. Finally, where national level graduate outcomes or a national level curriculum for basic dental education had been identified, we mapped these to the domains and elements in *Preparing for Practice.* Where no national level outcomes were identified in a country, we sought to map the outcomes or curriculum of a single dental school as an illustrative example of provision in that country, but with the caveat that this cannot be considered as necessarily representative of the country's provision as a whole.

The mapping process was carried out using a spreadsheet into which the domains and elements from *Preparing for Practice* had been extracted. Five overarching outcomes were mapped against, along with each of the four domains (clinical, professionalism, management and leadership, and communication) and their subheadings. Given its very UK-specific meaning, and the fact that being registered or a regulated professional does not necessarily carry the same or even an equivalent meaning in other countries, we did not map against the domain of *Preparing for Practice* that centres on whether graduates recognise the role and responsibility of being a GDC registrant.

Two clinical senior educator members of the research team (TG and SH), one also an experienced dentist (SH), performed the mapping exercise. Using an expert knowledge of dentistry and the learning outcomes, mapping was completed at national or local institution level, depending on data source. Generalisation and extrapolation from local to national level and vice versa was not assumed, and each data source was identified against the completed mapping exercise.

Findings

We present the findings of the research in sequence, with information presented separately by source first, followed by the results of the mapping exercise.

The literature review offers background on the development of dental education in Europe, and key issues including different educational traditions, moves towards European harmonisation, and the challenges that this movement has created. The literature review also highlights some key gaps in the evidence base.

Against this background information, we then present summaries of the information that could be identified about dental education provision, regulation and quality assurance in each EU member state, before also presenting the information gathered via the questionnaires.

We then present the results of the mapping exercise in tabular form, offering a clear visual presentation of the extent to which graduate outcomes or curricula in EU member states can be mapped to *Preparing for Practice.*

Literature review findings

Overview

The geographic focus of the included papers ranged from those that were international in scope (n=6), those focusing on pan-European activities (n=36), some that offered comparisons across two or three countries (UK and Ireland, n=5; Scandinavian countries, n=2; Poland, Sweden and UK, n=1; France and Sweden, n=1), and two that compared Germany to the EU more broadly. Other papers focused on single countries (Netherlands, n=2; Germany, n=3; Spain, n=2). The most common country was the UK, which was the sole focus of 16 papers, of which two focused specifically on Scotland.

Most of the included papers could best be categorised as commentaries or editorials (n=53), largely focusing on describing or discussing the development of curricula or competences. There were two literature review papers. Twenty-one papers could be classed as research papers, reporting data of some kind. These included a range of methods, of which the most frequently occurring were surveys (n=18), there was one Delphi study, one qualitative study, and one paper that reported faculty visits. These research papers primarily reported views from faculty on curriculum development or on setting competences. There was no research reporting rigorous evaluation of curriculum implementation for example.

In terms of subject matter, the included papers addressed dental education or undergraduate curricula or competences generally (n=26), or focused on particular educational issues in basic dental training (assessment, n=2; the transferability of qualifications, n=2; priority setting in dental education, n=1; the preclinical curriculum stage, n=1; GDC learning outcomes in the undergraduate curriculum, n=1; and quality assurance of dental education, n=1).

Other included papers focused more narrowly on the development of curricula or competences in particular subfields of dentistry, including implant dentistry (n=6), prosthodontics (n=4), cariology (n=3), periodontology (n=3), special care dentistry (n=3), endodontics (n=3), orthodontics (n=2), clinical medical sciences in dentistry (n=1), oral anatomy, histology and embryology (n=1), oral medicine (n=1), oral pathology (n=1), oral pathology and oral medicine (n=2), oral surgery (n=2), orofacial pain and temporomandibular joint disorders (n=1), paediatric dentistry (n=1), restorative dentistry (n=1). Other topics covered by included papers focused on specific skills or areas of dental education including professionalism (n=2), critical appraisal skills (n=1), patient-centred care (n=1) and dentistry in society (n=1). Finally, two papers centred on the distinction between the stomatological and odontological traditions in European dental education.

Fifty-one of the included papers made some reference to a regulatory body or to regulatory or legislative arrangements around basic dental training, although these mentions were often brief and included in background sections, with regulation rarely the major focus.

Curricula for basic dental training in Europe

Background to basic dental education in Europe

Historically there have been two major traditions in the provision of basic dental training in Europe, stomatological and odontological. In the former, students trained first as medics then later specialised in stomatology, or oral medicine, whilst the latter model sees students trained from the outset to be dentists, with dentistry positioned as a distinct and separate discipline to medicine.[7-9] The odontological model has been described as typical of Northern and Western Europe, and as similar to dental education in North America, with the stomatological model more prevalent in Central and Eastern Europe.[7,8] The stomatological model was also strong in countries such as Spain, Portugal and Italy prior to their accession to the European Community.[8] The EC's Dental Directives were based upon the odontological model and so member countries that had previously operated according to the stomatological tradition were required to reorganise their provision of dental education.[8,9] Scott notes that the oldest independent dental schools in Italy did not predate 1978,

that odontological education provision began in Austria in 1998, and that in Spain the conversion to odontology was not completed until 2001.[8,9]

The differences between these educational traditions has been important in discussions around the harmonisation of European dental education. For example, the very limited practical clinical training in dentistry that students received under the stomatological model has been identified as a particular cause for concern, particularly during the early 2000s as several Eastern and Central European countries were working towards accession to the European Union.[8] However, conversely it has also been noted as being important for dental education provided in the odontological model to ensure that students acquire sufficient basic science knowledge alongside their practical skills.[8,9]

Bologna declaration and process

Accession to the European Community and latterly the European Union, has evidently been a major driver for countries switching to an odontological model of dental education. Shanley (2002) recounts the history of early EC/EU directives on dental education, including the 1978 Dental Directive, but states that there were questions over whether this had any genuine impact on ensuring comparable standards in dental education across EU countries.[10]

In the early 2000s, the EU focused more on efforts to harmonise higher education systems, with significant implications for basic dental training. In particular, the Bologna declaration (fully, the Joint Declaration of the European Ministers of Education, convened at Bologna in 1999) saw EU member states agree to pursue a system of higher education based on comparability between countries. The European Credit Transfer System (ECTS) was developed to support comparability and transferability of qualifications. Within the included literature, the aims of the Bologna process which followed this declaration were reported as being to improve standards of higher education and to make Europe an attractive destination for international students, to whom transferable qualifications would appeal.[11-13] The declaration was seen as being intended to stimulate cohesion across European higher education systems while also allowing diversity.[12]

The Bologna declaration described cycles of higher education, envisaged as three years of undergraduate studies followed by postgraduate studies to masters or doctoral levels. However, the European Union recognised that this length of undergraduate studies would not be appropriate for several clinical professions. A further EU Directive (the Professional Qualifications Directive; 2005/36/EC), which came into force in 2007, set out that undergraduate dental training should be equivalent to the three years of undergraduate studies plus two years Masters studies envisaged for general higher education courses under the Bologna process. This Directive therefore established

that basic dental training should last for at least five years of full-time education, including both theoretical and practical clinical components, and should be provided by a University or Institute of Higher Education.[14]

DentED & ADEE projects

Alongside political efforts to drive educational harmonisation in Europe, academics and other stakeholders were also concurrently seeking to work more closely together with their counterparts across Europe. In dental education, these efforts centred on the 'DentEd' projects.

In a series of papers, Plasschaert[13-15] describes the development of efforts to harmonise European undergraduate dental curricula. Between 1997 and 2000, the EU funded a Thematic Network Project (TNP) called DentEd which created a network of dental schools and other parties interested in promoting high standards in dental education.[13] The aims of DentEd were to promote higher standards in undergraduate dental education in European Union countries, and those countries about to accede to the EU, and to enable the sharing of resources and pedagogical knowledge as a means to bring about improvement and harmonisation, as legislation mandating change was seen as unlikely.[10] A second TNP called DentEd Evolves spanned 2000-2003, and produced a document called 'Development of Professional Competences.'[13] In 2005, the DentEd projects produced a document with a modular structure in line with the ECTS system.[14]

For DentEd III, the Association for Dental Education in Europe (ADEE) took on the responsibility of continuing efforts towards harmonisation, culminating in the *Profile and Competences of the European Dentist* produced in 2005.[13] In reporting this, Plasschaert notes that ADEE was 'keen to preserve diversity in order to give Universities and learners real choice in their dental education' but that this choice should happen within an agreed framework in order to achieve cohesion in dental education across Europe.[14]

A 2011 paper on curriculum structure, content, learning and assessment in European undergraduate dental education usefully reviews developments in the DentEd project.[16] This paper states that encouraging convergence in undergraduate education was one of the DentEd project's key aims and that ADEE sought to continue in this vein.[16] The authors write that this convergence allows mutual recognition of ECTS and qualifications, and 'most importantly ensures that patients receive appropriate standards of oral health care across the EU.'[16]

DentEd III ran until 2007,[17] and the *Profile and Competences* document was approved by the ADEE General Assembly, following review and consultation, and thus accepted by European dental schools

as leading guidance on the undergraduate curriculum.[13] The aim was that this document would play a central role in harmonizing European dental education while also retaining recognition of 'national and regional socioeconomic and cultural differences.'[13] The ADEE proposed programme would be five years and worth 300 ECTS, and ADEE envisaged all schools adhering to the profile, the seven domains and major competences, but also being able to vary and adjust supporting competences according to their own preferences,[14] and considering the details of the structure and design of their own individual curricula.[18] The *Profile and Competences for the European Dentist* was further updated as *The Graduating European Dentist* in 2017, and described in a series of papers,[19-22] though further implications from this update are not yet evident in the literature. The *Profile and Competences for the European Dentist* became an important document in discussions about developing dental undergraduate curricula, however it has been noted that there has been a lack of published data on the extent to which these proposed competences have actually been implemented and are being achieved by undergraduate dental students.[23]

Proposals for curricula or competences developed by special interest groups

The Bologna process, 2005 EU Directive, and the *Profile and Competences for the European Dentist* prompted a significant body of literature featuring proposals for curricula in particular subfields and specialties of dentistry, intended either to be used across Europe or seeking to translate European initiatives for individual countries, and often developed by special interest groups or societies. These have included, for example, curriculum guidelines for orofacial pain and temporomandibular disorders, reported by a special interest committee in 2001.[24] Many of these papers include detailed *proposals* for graduate outcomes and competences and/or curriculum design in particular fields but we have not attempted to reproduce this voluminous body of information within this review.

There were several papers that reported proposed curricula with a particular UK focus or source. A 2004 paper offers learning outcomes for paediatric dentistry at undergraduate level developed by the British Society for Paediatric Dentistry, with reference to the GDC's *The First Five Years* guidance, QAA guidance and the DentEd project.[25] Similarly, another 2004 paper sets out proposals for a minimum curriculum in oral pathology, focusing on the UK and referencing the second edition of the GDC's *The First Five Years* and the high level curriculum guidance at European level from the DentEd project.[26] This paper suggested that, in future, EU guidance would shape UK curriculum development but that, at the point of publication, UK oral pathologists had made little contribution to the DentEd project and also that there was considerable diversity between European countries in the delivery of pathology and oral medicine education.[26] The authors also suggested that the imminent accession to

the EU of a number of additional countries would bring greater diversity before any harmonisation was achieved.[26]

Many of the papers proposing curriculum developments in the UK, or UK and Ireland, refer to the regulatory frameworks in those countries. A 2003 paper on dental education in the UK emphasises the importance of the GDC's *The First Five Years* document in offering a blueprint for dental education and shifting the focus of dental training to learning outcomes that encompass 'the wider needs of the dental professional'.[27] A 2007 paper discusses requirements for implant dentistry in undergraduate education in the UK and Ireland, and notes the importance of regulatory guidelines provided by the GDC and the Dental Council of Ireland.[28] This paper identifies a move away from numeric assessment of experience (i.e. how many cases students have treated) to competence based assessments utilising judgements on the quality of their work.[28]

The Association of British Academic Oral and Maxillofacial Surgeons (ABAOMS) sought to develop a 'definitive UK curriculum' for undergraduate education in this area.[29] This paper refers to the DentEd III/ADEE *Profile and Competences for the European Dentist* and recognises that document as an important development in dental education.[29] The curriculum proposed in this paper (2008) compliments the minimum requirements set out in the GDC's *The First Five Years* document, and the details of the proposed curriculum are set out in the paper.[29] The paper notes variation between dental schools as an issue and suggests that the proposed curriculum may need to be amended if it were to be developed for use across Europe.[29]

A 2017 paper focuses on ethics teaching in UK undergraduate dental education, noting that the subject has become increasingly highlighted as an important facet of professionalism, though suggesting this might have negative implications for ethics being taught as a distinct subject.[30] The authors suggest that in this field, the impact of regulatory curriculum guidance from the GDC, referencing both *The First Five Years* and *Preparing for Practice,* may drive a focus on a regulatory definition of professionalism and professional behaviours that does not provide clarity on the difference between ethical matters and wider aspects of professionalism.[30]

In 2011,[31] representatives from 17 dental schools in the UK and Ireland developed consensus outcomes for the teaching of human diseases and illnesses relevant to dental care, and proposed a set of outcomes compatible with the ADEE *Profile and Competences for the European Dentist.*[31] Similarly, in a 2018 paper[32] representatives from 18 dental schools in the UK and Ireland developed a consensus curriculum for undergraduate dental education in oral medicine with proposed graduate outcomes.[32]

Other papers sought to develop European curricula in a broad range of areas of dentistry. A 2001 paper proposed curriculum guidelines for endodontology in Europe, with the paper presenting a list of competences that graduating students would be expected to achieve, though these were not separated into domains or accompanied by supporting competences.[33] There is no information provided about implementation, though the authors recognise that in many dental schools there is limited time given to endodontology. A 2009 paper offered suggested outcomes for graduates in implant dentistry, again with reference to the EU 2005 directive, the DentEd project and ADEE.[34] These proposals come from a workshop organised by ADEE.[34] In 2011, three papers reported on a project to develop and agreed cariology curriculum undertaken by the European Organisation for Caries Research (ORCA) and ADEE Cariology Curriculum Group[35 36] These papers include discussion of a shift in dentistry towards public health and disease prevention rather than, as historically, a primary focus being on restorative dentistry.[37]

Two papers set out proposals for a European periodontal curriculum referencing the *ADEE Profile and Competences for the European Dentist* and the Bologna process.[38] This paper points to the importance of incorporating scientific and technological advances into healthcare education, including in periodontology where new diagnostic and therapeutic approaches had been developed.[38 39] A 2017 paper outlines the areas of competence and learning outcomes of *The Graduating European Dentist* that specifically relate to professionalism, and proposes further detailed graduate learning outcomes relating to professionalism.[40] A 2018 paper proposed a core syllabus for oral anatomy, histology and embryology teaching for undergraduate dental education based on an international Delphi panel.[41]

As well as these UK and Europe-wide bodies of work, we also identified some papers reporting curriculum development proposals in other countries, including a 2001 paper offering a blueprint and objectives for dental undergraduate education in the Netherlands, developed between 1996-2000 in reference to earlier European directives.[42] In that country there needed to be a reduction in course length to five years to align with others.[42] Guidelines for oral pathology and oral medicine dental education in Scandinavian countries published in 2012, offer 'an advisory topic list' but providing no information about how far these have been implemented.[43] Finally, a 2016 paper reported new guidelines and learning objectives for undergraduate dental education in Germany, developed by dental education specialists and stakeholders.[44]

However, while it is evident that there have been a range of efforts to develop curricula and competences for undergraduate dental education across a variety of subject areas, at both European

and national levels, it is less clear how far the resulting proposals have in fact been implemented and with what results.

Implementation of curricula in individual countries or specific areas of dentistry

Some papers did report on the extent of teaching provided within undergraduate dental programmes in particular subfields or specialties of dentistry.

Again, some of these papers focused on provision of dental education in the UK and these typically referenced the importance of the regulatory framework to UK dental curricula, noting that the outcomes and competences set out by the GDC in successive guidance documents have driven curriculum development but also are still interpreted and applied differently between dental schools.[45] [46]

In 2002, it was reported that there was concern amongst orthodontic teaching staff in the UK that some of the expectations in the GDC's *The First Five Years* were unrealistic, especially with regards to the expectations that new graduates would have sufficient competence to formulate orthodontic treatment plans.[47] A 2005 paper on orthodontic education in the UK found wide variation in the form and content of courses between dental schools, with differences in the numbers of hours of clinical teaching students received, the types of patient treatments undertaken, the number of laboratory teaching hours and the content of laboratory courses.[48]

A 2009 paper on oral surgery teaching in the UK mentions the guidelines produced by the DentEd project, and whilst noting that the document represents a positive move towards standardising dental education across Europe, it would be difficult for students in the UK to achieve competences in surgical extractions.[49] Other papers focused on the methods used to deliver teaching in particular subjects. For example, a 2010 paper on the teaching of professional attitudes in the UK found that the methods used were largely traditional, in the form of lectures and seminars,[50] and a 2017 paper reporting survey responses from 12 UK dental schools found that all 12 taught critical appraisal skills, using a variety of methods, including lectures, seminars and web-based teaching.[51]

In several papers, Clark et al addressed the level of competences in implant dentistry and prosthodontics that UK basic dental training would achieve by *The First Five Years*, with new graduates expected to be able to recognise and explain implant treatment options to patients, but not to perform the treatments.[45] In 2002, they reported that undergraduate teaching in prosthodontics in the UK had been 'pared to the bone' with many new graduates lacking the confidence to treat edentulous patients,[52] and in 2010 Clark suggested that there was concern that

GDC requirements in this area of the curriculum, as set out in *The First Five Years* were not being met.[53]

This reduction in curriculum time given to implant dentistry was seen across Europe, as reported in 2009.[54] However, by 2014, another paper on implant dentistry in Europe reported that time given to implant dentistry had increased from 36 hours on average in 2008 to 74 hours, though the competences expected had remained unchanged.[55] Curriculum guidelines for implant dentistry from 2008 had been implemented to varying degrees by dental schools, and barriers to implementation were identified as being the availability of time within the curriculum and limited dental school resources.[55] Another 2014 paper[56] on implant dentistry, following up on consensus guidelines for undergraduate outcomes developed in 2008,[34] reported that the implementation of implant dentistry into curricula had been improved but that very few institutions were reported to have reached the benchmarks reported in 2008.[56] The authors also reported that diversity between dental schools remained, and that the major challenge was therefore not the further development of outcomes, but evaluating the implementation of those already in existence, investigating barriers and seeking ways to support implementation.[56] A 2011 literature review on implant dentistry in undergraduate education compared teaching in UK, Ireland, Europe and the United States, and found that many dental schools had implemented teaching of implant dentistry into their curricula, with lectures commonly used, but that most students received limited tuition in this area, with more in-depth exposure available only to a minority through electives.[57]

A 2011 paper reported findings from a survey on prosthodontic teaching in Spain, focusing on removable partial dentures, found that the average duration of the preclinical teaching in this field was shorter for dental students in public schools than private schools (38hrs vs 60.5hrs).[58] The results also showed that students in public schools made a higher average number of removable partial dentures than those in private schools.[58]

A survey of 48 dental schools across 25 countries in Europe, focusing on teaching of pre-clinical skills, found that the most commonly taught core skills related directly to clinical care, such as infection control and hand washing while skills such as communication and team-working were less commonly taught.[59] A 2009 paper on teaching of root canal treatment reported that there was still inconsistency between dental schools' provision in this field of dentistry despite moves to harmonise dental education across Europe, and despite increased movement of dentists within the EU.[60]

A paper on dental education in the Netherlands reported that new graduates have competences across many dental and medical domains, but that they have 'relatively limited clinical experience.'[61] In Germany, competency-based learning objectives for undergraduate dental education have been

developed, describing the competences that dental students should have acquired by the time that they graduate.[62] A 2018 paper describes the focus of efforts to reform dental education in Germany, with attention centring on five particular areas: 'interdisciplinary subject areas, problem- and symptom-oriented learning, early contact with patients, science and communication training.'[63]

The evidence available in the literature for how far curriculum proposals have been implemented is weak, and provides only piecemeal information about the extent to which various aspects of dentistry are covered. The available information does make clear that there is much variation between individual dental schools, even within countries, highlighting that evaluating provision at a national level is challenging.

Clinical experience with patients

Starting clinical training: when and how?

Just eight of the included papers gave any information on what stage of their education dental students start clinical experience with patients.[16,24,33,41,49,64-66] The information in these papers ranged from survey findings to recommendations or proposals, to broader comments about the desirability of adequate clinical experience.

A recent (2018) paper focusing on the transition to clinical training in dental education,[66] identifies the beginning of clinical experience as a key element in dental training and references the idea of 'the shock of practice' for students, as they take on 'the tasks of a professional healthcare provider' for the first time.[66] The paper highlights the importance of this transition and of clinical experience in students' education, noting that the process of health professional education involves, whatever the curriculum structure, a progression from theory and simulation into clinical practice, and that this requires students to integrate their knowledge of theory and practice and also to apply their acquired skills in real and complex situations, and to take on additional responsibilities.[66]

The nature and timing of the introduction of clinical experience for students in dental curricula was referred to in several papers, with the existence of two major styles of programme structure being identified. The first is a 'traditional' curriculum where preclinical teaching dominates the first years of the programme, with clinical teaching introduced in the latter years of the programme only. The second type of programme sees dental schools integrating clinical teaching throughout most or all stages of their programmes. The decision about what curriculum design to use and therefore at what point students begin to gain clinical experience with patients rests with individual dental

schools. A 2001 paper offering curriculum guidelines for orofacial pain and temporomandibular disorders simply noted that dental schools may either divide their curricula into preclinical and clinical phases, or may seek to balance didactic components and patient care activities throughout their courses.[24] Another paper from the same year focused on endodontology states that it is important that students have adequate preparation and preclinical exercises before clinical experience with patients commences but that it is not seen as necessary that all courses in endodontology should be given prior to students starting to work clinically with patients.[33] A 2006 paper comparing endodontology education at two European dental schools, one in Sweden and one in France, states that the Swedish school used a problem-based learning curriculum and, initial clinical training was limited to endodontic 'procedures' but that endodontic treatments are also practised in a comprehensive clinical care setting in the fifth year of the programme.[65] At the French school, the clinical training was reported as taking place in a comprehensive care setting within a traditional, departmentalised curriculum structure.[65] One paper, from 2009, reported, from a survey of UK dental schools, that students begin forceps exodontia in the third year across all schools from which data were collected; prior to this two schools assessed students' extraction skills using phantom heads at the end of the second year. One school had introduced a new curriculum that would involve students extracting teeth in their second year.[49]

One paper, on general principles of curriculum design, published in 2008, stated that dental schools would need to decide whether or not to adopt the 'contemporary practice of early clinical experience' where students are in contact with patients from early in the programme.[64] A 2011 paper discussing efforts to harmonise dental education in Europe suggested that moves to modularisation should not be a barrier to ensuring early clinical contact with patients.[16] However, whilst increased integration and earlier exposure to clinical experience with patients is perhaps considered more 'contemporary' in comparison to the more traditional preclinical/clinical split model, there have also been recent notes of caution about the possible pitfalls of early clinical experience. In a 2018 paper, focused on the development of a curriculum for oral anatomy, histology, and embryology, the authors noted the importance of a solid foundation in basic sciences prior to starting clinical experience, warning of the 'danger' that 'too early exposure to clinical content […] could compromise learning of basic science' and risk limiting students' development of 'predictive capacities and the ability to construct new knowledge' from a basis of sound disciplinary knowledge.[41]

The question of when and how students make the transition to working clinically with patients remains therefore a matter of active interest within dental education.

The extent and nature of clinical experience with patients

Eleven of the included papers provided some information about the extent of dental students' clinical experience with patients during their basic dental training.[16,33,44,47,49,53-56,65,66]

Some papers offered descriptions of students' clinical experience with patients in particular fields of dentistry, and also highlighted some of the challenges involved in implementing clinical training with patients. Of these papers, some also focused on single countries. For example a 2002 paper on orthodontic education in UK dental schools, which reported on two surveys conducted in 1994 and 1998, suggested that the amount of time spent by students in active clinical treatment was 25% less in 1998 than it had been in 1994.[47] This paper reports that students were increasingly being involved in fixed appliance treatment but that they were not generally competent in fixed appliance management.[47] As part of their orthodontic education, students were expected to observe the complete treatment of some orthodontic cases though the authors suggest that, within the amount of time given to orthodontic education within the curricula of some schools, this could be difficult to achieve.[47] A 2010 study on UK dental schools' approaches to complete denture teaching in the UK, reported that all schools taught complete denture construction although the number of cases that they required students to treat varied from 1 to 6.[53] A 2009 paper on oral surgery undergraduate teaching and experience in the UK reported findings from a survey of dental schools which found that across 11 schools, the mean target number of extraction that students were expected to achieve during the 'three clinical years' was 51 (SD 31.7) with a range of 20-115, and with the majority of extractions being undertaken in the third and fourth years.[49] However, the paper notes that these figures may not have included extractions undertaken in other departments. Notably, this paper also reports that some schools reported difficulties in providing a reasonable case load of surgical extractions for their students and the authors suggest that such issues may 'affect the school's ability to produce graduates who are confident in their ability to surgically extract a tooth.'[49]

A 2016 paper on practical skills in dental education in Germany reports that both the preclinical and clinical parts of the undergraduate dental curriculum in Germany include practical elements, and that these include simulation exercises, laboratory courses and patient treatment in accordance with the ZÄApprO (German Dental Licensure Act 1955 (Zahnärztliche Approbationsordnung)).[44] However

the paper does not give further details about the nature or extent of undergraduates' direct clinical experience with patients.

A 2006 paper comparing endodontic undergraduate education across two dental schools, one in Sweden and one in France, noted that the institutions initially provided clinical experience in endodontic procedures differently, with students in Sweden practising this in isolation, while at the French school, the procedures were carried out in an integrated care setting from the outset.[65] This paper also notes that time spent on tasks or the number of procedures carried out may not necessarily be indicative of the quality of learning.[65]

Other included papers sought to compare or summarise provision across Europe, either in relation to a specific subfield or looking broadly at undergraduate dental education. For example, a 2009 study reporting findings from a survey of 49 European dental schools from 18 countries, including some non-EU states such as Israel, Switzerland and Turkey, on their implant dentistry education provision found that: in 70% of those schools, students assisted or treated patient with prosthetics; students in 53% of schools assist with surgery; and in 5% of schools, students operate on patients.[54] A later survey on implant dentistry education in Europe, with respondents from 46 institutions from 20 countries, again including some non-EU states, found that the proportion of schools providing students with clinical experience of prosthetic restorations of dental implants had increased to 75%.[55] In 76% of schools, students acquired experience by assisting others, in 73% of schools students treated patients individually under guidance, but one school reported that students only acquired experience in very selected cases.[55] The 2009 and 2014 surveys found that in 23% and 36% of schools respectively, students could undertake elective studies in implant dentistry offering the potential for further clinical experience in this field.[54,55] A 2014 paper on implant dentistry education in Europe states that clinical experience in that area should incorporate diagnosis, treatment planning, surgery, restoration and maintenance, and treatment of complications.[56] The paper states that since 2009, clinical experience in implant prosthetics has increased in undergraduate programmes, and that more dental schools had implemented prosthetic procedures for implant-supported restorations into their programmes.[56] The paper notes that most often, the procedures carried out by students were 'straightforward cases in the non-aesthetic zone.'[56] The paper argues that, while straightforward cases are the appropriate level of difficulty for undergraduates, they should if possible also be exposed to advanced and complex cases to demonstrate different clinical situations.[56] The paper notes that students gain clinical experience in different ways across schools, including treating patients with one to one supervision and chair-side

assistance and observation. It recommends that if direct treatment is not possible, that students should provide chair-side assistance for a range of cases.[56] However, the authors also note that dental schools can face difficulties in offering students clinical experience in implant dentistry, including lack of curriculum time, shortages of trained staff or resources, and insufficient patient flow.[56]

Other papers focused on making recommendations or offering guidelines about the nature and extent of students' clinical experience with patients. A 2001 paper proposing undergraduate curriculum guidelines for endodontology noted that, due to the different approaches taken by schools and their differing resources, it would be problematic to propose an appropriate number of cases that students should treat in the course of their studies.[33] Rather, the authors suggested that a competency-based approach, focusing on students' achievement of the desired quality of care, should be taken rather than focusing solely on quantity, whilst accepting that a minimum number of treatments may be necessary to gain the requisite experience.[33] The paper recommended, based on the views of a specialist committee, that students should be able to treat molar teeth, and should gain experience on 20 teeth including extracted teeth, and that students should have 'adequate' experience of the treatment of endodontic emergencies, including those seen in varied settings including accident and emergency departments.[33]

A 2011 paper on general curriculum structure, content, learning and assessment in European undergraduate dental education highlights that inconsistencies in the extent of clinical experience gained by graduates from different dental schools and across different European countries may create difficulties when dentists migrate to work in other countries.[16] Specifically, the paper points to the requirement in some, but not all, countries for dental graduates to complete an additional year of 'vocational' training after their undergraduate studies.[16] This situation could lead, say the authors, to graduates from countries where no vocational year exists moving to practice in a country where graduates are required to complete additional vocational training – in those circumstances the incoming dentist would be seen as qualified and could not be compelled to undertake the vocational training required of 'homegrown' graduates.[16] This point emphasises that there may be stark differences in dentists' levels of clinical experience with patients as exposure to clinical work may vary between countries both during undergraduate education and in terms of any additional requirements for achieving registration. The paper notes ADEE's desire to move towards harmonizing vocational training in collaboration with national authorities and professional associations.[16]

A 2018 paper focused on the transition to clinical training in dentistry, reporting a survey of 14 dental schools across 12 European countries, found that the majority of responding schools included early contact with patients during the first or second year of studies within their curricula.[66] However, this early patient contact was described as typically being observational and non-invasive, aiding the cognitive and communication aspects of the transition to clinical practice but not developing procedural skills.[66] The 'true' clinical training phase began in the second and third years of the schools' curricula but the authors state that 'the nature of this contact and the differences between schools remain unclear.'[66] The paper also notes the importance of quality and quantitative adequacy of the patients that students are exposed to during their clinical training, and emphasise the desirability of students being exposed to all areas of clinical dentistry.[66]

Although the information found in the included papers on the extent of dental students' clinical experience with patients was limited and somewhat fragmented, a number of key issues emerged. Firstly, there is the question of how the adequacy of clinical experience is best measured or assessed, whether through students' achievement of set numbers of procedures or by the achievement of a standard or competency, or through some combination of a competency-based assessment with a minimum number of procedures also prescribed. Several papers identified that providing students with adequate and appropriate clinical experience with patients can be challenging for dental schools, because of the need for exposure to cases across various subfields, which brings a requirement for a certain level of patient flow and case mix, plus resource challenges including staffing. Overall, and particularly in the studies looking across Europe, there was a lack of clarity about the extent and the nature of students' clinical experience with patients, with the main source of information being periodic surveys of dental schools that produce only partial and superficial data. The potential inconsistency in students' clinical experience depending on which country they studied in was also identified as a potential challenge in relation to migration between countries post-graduation.

Quality assurance of basic dental training in Europe

Quality assurance processes for basic dental training were discussed to an extent in the included literature, but not often in great detail or as a major focus of the studies or commentaries. One 2002 paper pointed to the role of the EEC, through its 1978 directive 78/687/EEC and a document produced in 1986 III/D/617/5/86-EN, in seeking to ensure 'high standards across members states'

with the harmonisation agenda being seen as part of an effort to develop a European quality framework.[67] The 2005 EU Directive is mentioned as it provided for freedom of movement and the automatic mutual recognition of qualifications on the basis of 'co-ordinated minimum conditions for education.'[16] A paper from 2003, discussing dental education and the Bologna process, noted that accreditation by an external body to affirm that quality standards are met was not a tradition in most European countries, and pointed to the potential for ENQA to fill this role.[12] Another paper from 2007 also mentions ENQA[68] – written from a UK perspective it notes that UK academics may be surprised that their European counterparts were, at the time, not subject to the same processes of external quality assurance that they experienced.

A 2003 paper reviewing the state of dental education in Europe and the harmonisation agenda, notes that in most European countries the curriculum was determined by the government or a statutory authority, though with varying degrees of central control vs local freedom for individual dental schools.[8] The paper reported that, at that time, in Spain 60% of the curriculum was determined centrally and 40% by dentals schools, while in Italy the flexible element amounted to 20% of the curriculum.[8] In Ireland and the UK, there were regulator inspections to monitor compliance with regulatory standards for education.[8] In the Netherlands, at this point in time, there was a system of five yearly inspections including school visitation as part of the general system for quality assuring higher education.[8] The paper notes that few European countries had any national form of external monitoring for quality assurance, citing the UK, Ireland, the Netherlands and Sweden as the outliers in this regard, and also notes that the practice of appointing external examiners for university examinations operated in the UK and Ireland was 'infrequent' elsewhere.[8] The paper remarks that the DentEd Visitation Program had therefore been a novel experience of external review for many of the European dental schools that participated.[8] A 2008 paper on general principles for curriculum structure and design noted that national regulatory bodies and quality assurance processes are amongst the motivators for change to curricula, and also pointed to the importance of dental schools having their own internal quality assurance processes.[64] However, the latter paper did not offer specific examples or details of any such national quality assurance processes.

As these papers make clear, quality assurance processes featuring external monitoring processes have not traditionally been found in many European countries. Reflecting this, where there was discussion of quality assurance systems in specific countries these were mostly in papers focusing on the UK and Ireland. Several papers discussed the role of the GDC in quality assuring dental

education, plus the additional role of the Quality Assurance Agency for Higher Education in providing benchmark standards for higher education courses generally. Several papers referred to the predecessor to *Preparing for Practice*, the GDC's *The First Five Years* document, with one from 2003 noting that in producing that document the GDC had taken changes in dental practice into account and that it was aligned with the Quality Assurance Agency for Higher Education's work in quality assuring higher education.[45] A 2004 paper on dental pathology education in the UK details the arrangements in place for quality assuring dental education, for which the primary responsibility lies with the GDC under the Dentists Act 1984.[26] This paper also refers to *The First Five Years,* and states that the GDC takes responsibility for ensuring compliance/consistency with EU directives.[26] The paper also describes the role of the QAA, which is responsible for providing benchmark standards for high education across all fields, by describing the nature and characteristics of degree level programmes, award standards and the attributes for new graduates.[26] The paper describes the roles of the two organisations as overlapping, but with the GDC as the primary, and that there is co-ordination/collaboration between the two.[26] Another paper, from 2007, stated that the GDC undertakes review visits to UK dental schools and subsequently sends a report from the visit to the institution.[28] Another 2009 paper notes that in the UK, dental undergraduate curricula align with the frameworks set by the GDC and the QAA, and that both organisations operate visitation programmes to ensure consistently high standards.[49]

A few included papers offered some comment on the impact of quality assurance processes in the UK. In a 2010 paper on trends in complete denture teaching in UK dental education, it was reported that a majority of respondents felt that the quality assurance systems in place, including external examiners, Teaching Quality Assessments and GDC visits, did not necessarily ensure that GDC requirements for competence in their subject area were being met.[53] Conversely, other papers offered a more positive view on the quality assurance arrangements in place. A 2015 paper focused on the implications of the Francis Report for dental education and training in the UK, notes the report's recommendation that education and training must not take place in environments that do not adhere to expected quality and safety standards, but states that this proviso is already explicit in the GDC's *Standards for Education,* against which UK undergraduate dental education is quality assured.[46] A 2018 paper looking at implant dentistry education across the UK and Ireland noted that dental schools must provide the relevant training in this field to meet the requirements set by their regulatory bodies, the GDC and the Dental Council of Ireland.[69]

Information from questionnaire responses

Information received in response to our questionnaire was especially rich and clear, and provided valuable additional insights into national arrangements for the regulation and quality assurance of dental education in a number of EU member states.

Responses were returned from ten countries: Belgium, Denmark, Finland, France, Ireland, Luxembourg, Portugal, Slovenia, Spain and Sweden. Responses were received from national bodies in Belgium, Denmark, Finland, France, Ireland, Spain and Sweden. We also received responses from universities in Finland and Spain. Responses from Luxembourg, Portugal and Slovenia were received from individual universities only.

All of these countries have a national register of dentists, which is managed either by a national dental council or by a governmental body. Completion of a degree in dentistry is an essential pre-requisite for registration in all countries.

In Portugal and Sweden, entry onto the register of dentists enables the dentist to practise. In Belgium, Denmark and Slovenia, the licence to practise independently requires further vocational training in addition to the basic dental training offered in that country. In Belgium, this year must amount to a minimum of 1,500 hours vocational training. In Denmark, 1,440 hours are stipulated. In Finland and France, the basic training incorporates a minimum amount of clinical experience. In Finland, this amounts to the final half year of the 5.5 year course. In France, the number of clinical hours are stipulated in legislation as an essential component of the dental degree, and these must amount to 2,000 hours.

Finland and Ireland have adopted the ADEE competences as their nationally agreed set of professional competences. Belgium, France, Spain and Sweden also have a set of nationally agreed professional competences, and in France, Spain and Sweden, these are prescribed in national legislation. In Denmark, education meets the requirements set by the EU Directive 2005/36/EC. The responses from Luxembourg, Portugal and Slovenia did not provide evidence of a set of national competences.

In all of the responding countries, except Luxembourg, which has no dental school, dental training incorporates clinical experience, but there is variation between countries and between universities within countries as to the point at which this commences. In Belgium and Sweden, clinical

experience can begin in the first year. In Denmark, Finland, France, Ireland, Portugal and Spain, clinical training begins in the 3rd year. In Slovenia, this is starts in the 4th year. There are no dental schools in Luxembourg.

In Ireland, dental education is accredited by the Dental Council. In most other responding countries (Belgium, Denmark, France, Portugal, Slovenia, Spain and Sweden) accreditation or quality assurance of dental education is not undertaken by a dental organisation, but by a national quality assurance agency for higher education.

In Portugal and Spain there are private dental schools that must adhere to the same processes as state run dental schools. In the other responding countries, there are no private dental schools. In France, the only private dental school has closed, but legally, further private entities would be permitted, and they too would have to ascribe to the same standards as state run providers.

Mapping to *Preparing for Practice*

Here, the results of our mapping exercise, in which graduate outcomes or curricula from EU member states were compared to those set out for undergraduate dental education in the UK by the GDC in its *Preparing for Practice*[1] document.

Figure 2 highlights seven countries where national outcomes were identified, 16 countries which were mapped to outcomes of a single dental school / university, and six countries where no information was available; Cyprus, Estonia, Hungary, Latvia, Netherlands and Romania. Germany, Spain and Sweden were mapped at both country level and institution level since country level data from the survey became available after these countries had already been mapped from institutional level data. National level data were generally more evident from countries in Northern or Western Europe (Figure 2).

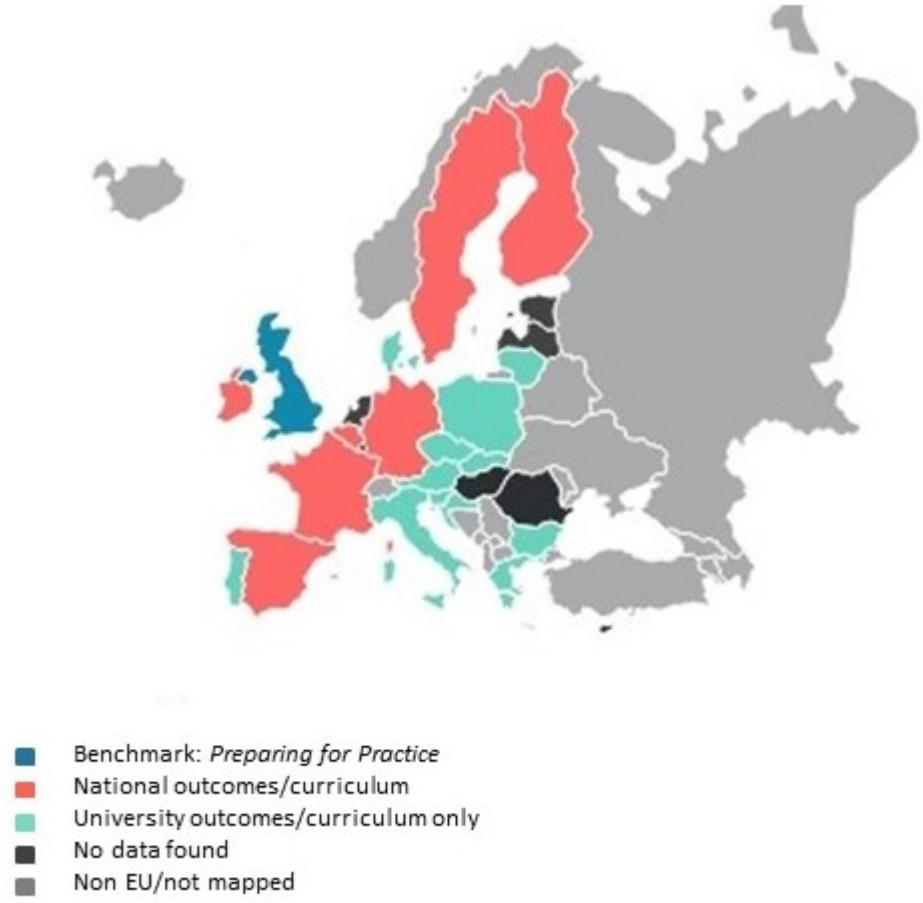


Figure 2: Summary of national or institutional level data sources used in mapping exercise

In terms of overarching outcomes (Table 3), most countries had good evidence that their graduating standards included 'Demonstrate effective clinical decision making' and 'Apply an evidence-based approach to learning, practice, clinical judgment and decision making and utilise critical thinking and problem solving skills'. Less than half of countries explicitly mapped to the overarching outcomes 'making the high quality long term care of patients the first concern', 'Describe the principles of good research' and 'Recognise the importance of lifelong learning'. Only five countries had any information that outcomes included graduates' ability to 'Accurately assess their own capabilities and limitations'.

Table 4 shows seven countries (Croatia, Czech Republic, Germany, Greece, Ireland, Slovakia, Spain) where all the clinical skills related to individual clinical care in the GDC's *Preparing for Practice* were included as graduating outcome standards. Of these, Germany, Ireland, and Spain were mapped at national level. In addition, there were three countries (Denmark, Malta, Slovenia) where only one of the outcomes was missing, as mapped at university (institutional) level. In terms of individual outcomes, there was less evidence that countries included outcomes in: 'Patient and public safety', 'Treatment of acute oral conditions', 'Management and treatment of periodontal disease', and 'Management of the developing and developed dentition'. The domains of Communication and Professionalism were well represented (Table 5) but there was less evidence in the elements of 'Teamwork' and 'Development of self and others.' The domain of Management and Leadership was less well represented than 'Communication' and 'Professionalism' and only eight countries mapped outcomes to the element of 'Managing self' or referred to practitioners' abilities to be aware of their own limitations.

Note: In tables 3, 4, and 5 the following symbols have been used to differentiate between the sources of information used in the mapping exercise:

+ Mapped to outcomes or curriculum from a national authority

* Mapped to outcomes or curriculum from a single dental school / university

% No dental school

^ No documents / information available

Table 3: Mapping against overarching outcomes in Preparing for Practice

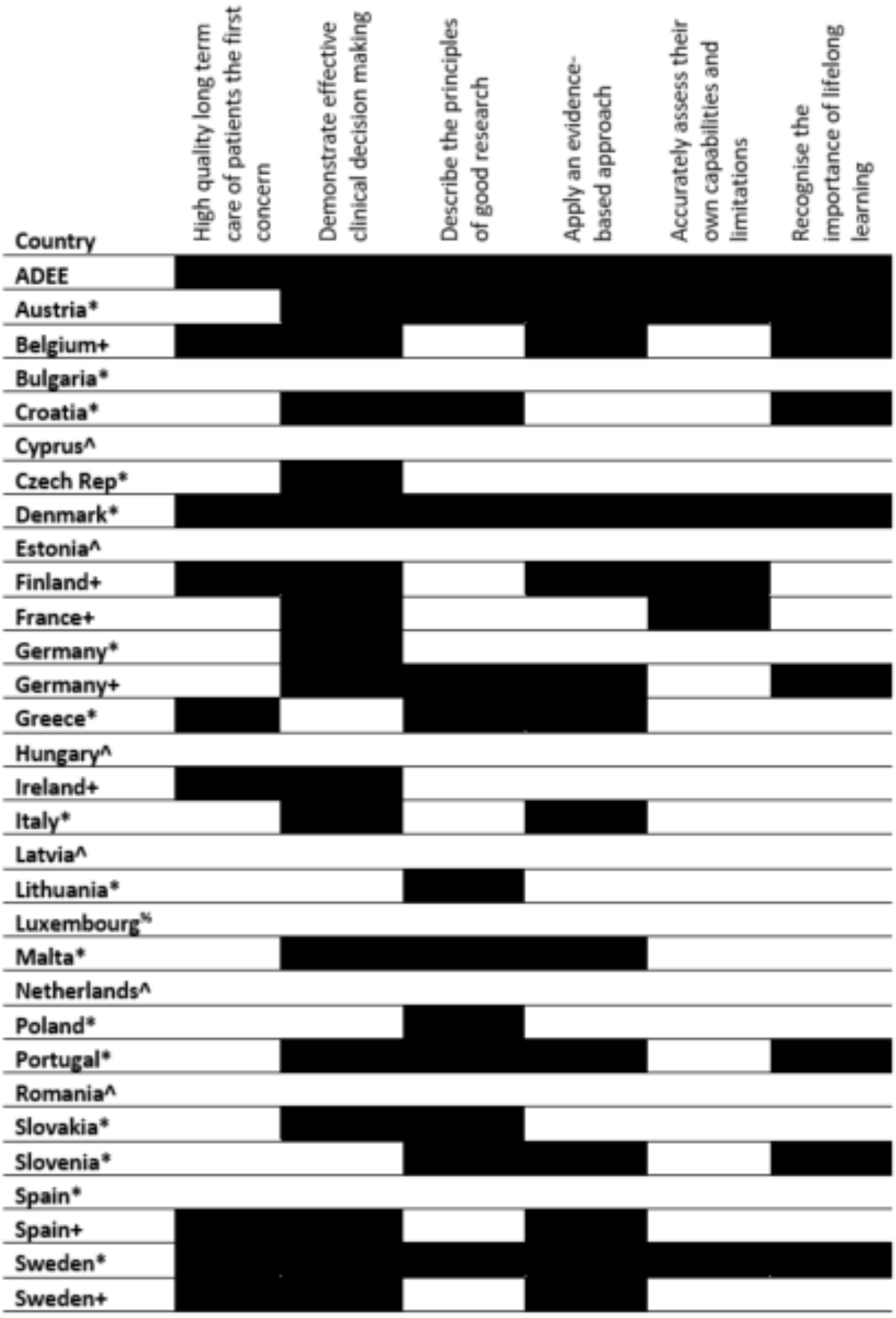


Table 4: Mapping against clinical elements in Preparing for Practice

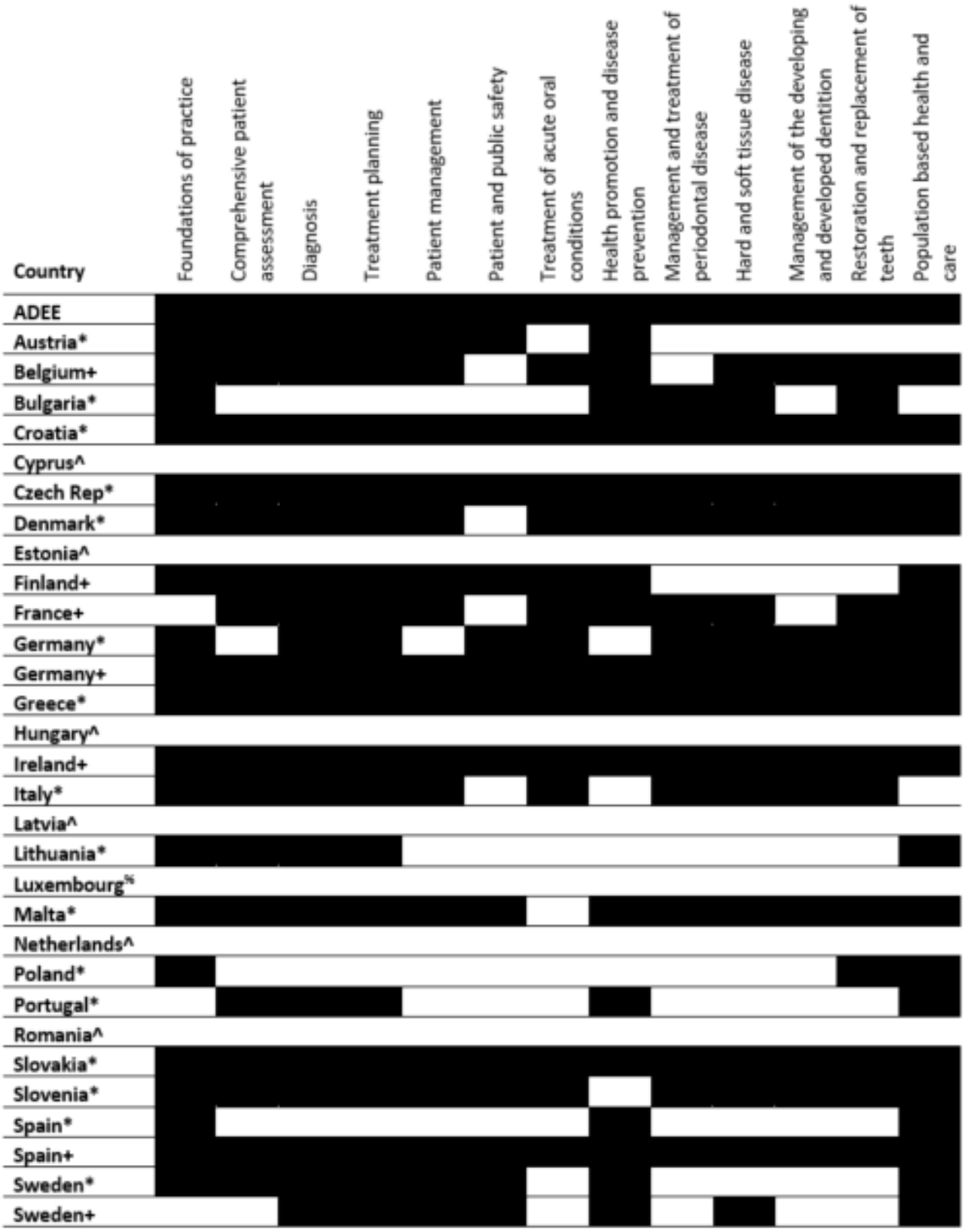
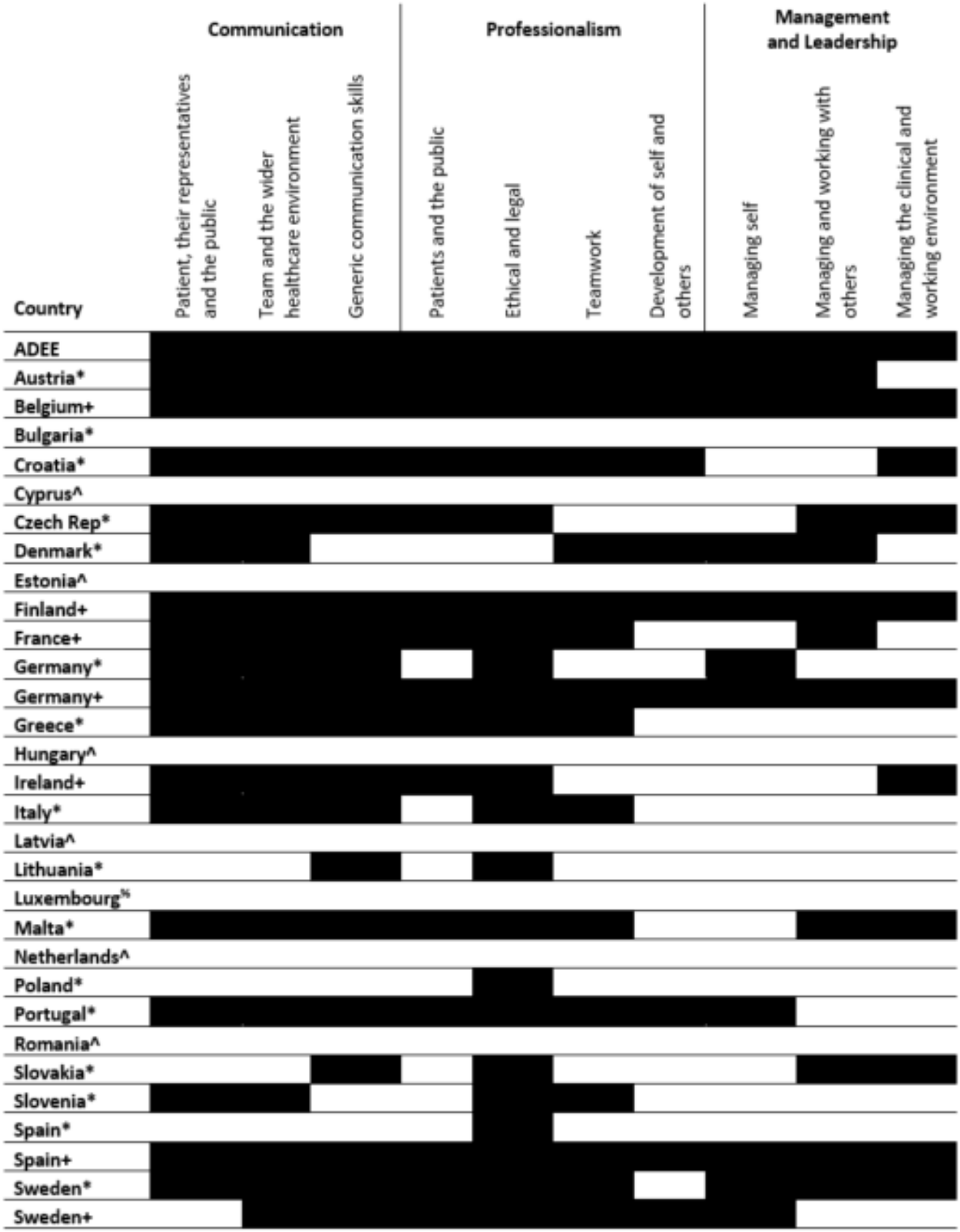


Table 5: Mapping against communication, professionalism, and management and leadership elements in Preparing for Practice



Country level findings

In this section, we report summaries of the information that we were able to identify from our website searches for each European Union member state, and supplemented with information obtained from the questionnaire responses. Overall, the extent of the information publicly available online varied considerably and there are, therefore, instances in which information was not found to address all our research questions in full for each country. This does not mean, however, that graduate outcomes or quality assurance processes for instance, do not exist in a country, but rather that we did not find evidence of them through our searches.

Findings are presented in three groups below; first, the EU member states where we identified a set of national learning outcomes for dentistry; second, EU member states where no national learning outcomes were identified, but where we found institution-level learning outcomes; and finally the EU member states for whom no learning outcomes were found at either country or institution level.

Group 1 – Country-level learning outcomes

Belgium

In Belgium, basic dental training takes 5 years and graduates qualify with either *Master in de Tandheelkunde* (Flemish) or *Licencie en Sciences Dentaires* (French). The course is divided into three phases: a three-year Bachelors stage and a two-year Masters stage, plus vocational training. Following the 5-year training, there is 1-year vocational training in order to register. Dental schools are part of universities, and there are no other private dental schools.

Clinical contact starts in the first year of the Masters course, which is the fourth year of training. For example, at the University of Liege, students undertake 2-week observation placements in each of the 3 phases of the course.

The Federal Public Service Health, Food Chain Safety and Environment, holds the register of dentists ("CADASTRE"), regulates the profession and publishes a domain-based set of competences for the general dentist: https://organesdeconcertation.sante.belgique.be/fr/documents/avis-2017-1-du-27032017-concernant-le-profil-de-competences-du-dentiste-dentiste. Quality assurance for the dental schools is provided by the Ministry of Education, however the standards for this process were not found.

Table 6: Mapping against Preparing for Practice - Belgium

Overarching Outcomes	
High quality long term care of patients the first concern	■
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	■
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	■
Managing and working with others	■
Managing the clinical and working environment	■

Finland

The undergraduate course lasts 5.5 years at each of the four awarding universities: (Eastern Finland, Helsinki, Oulu or Turku). There are no private providers of basic dental education.

Basic dental education is divided into preclinical and clinical stages. The preclinical phase lasts for two years and is largely consistent with medical studies. The clinical phase, beginning in year 3, consists mainly of theoretical studies in the various disciplines of dentistry, related workshops and demos and clinical nursing practice. Each university decides on the extent of clinical experience required to qualify. In Helsinki, a designated number of clinical procedures are required.

The professional title is *Licentiate of Dentistry*, HLL. Quality assurance is undertaken by the Ministry of Education however the standards for this process were not found.

Registration is administered by National Supervisory Authority for Welfare and Health (Valvira) (the competent authority). Once graduated, dentists do not need to undertake an extra vocational year in order to be licensed. Licensed professionals are entered in the Central Register of Health Care Professionals (known as *Terhikki*).

A set of national competences are based on the ADEE learning outcomes: https://tkharjoittelu.hammaslaakariliitto.fi/syventava-harjoittelu and these were mapped against *Preparing for Practice* in the mapping exercise.

Table 7: Mapping against Preparing for Practice - Finland

Overarching Outcomes	
High quality long term care of patients the first concern	■
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	■
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	
Hard and soft tissue disease	
Management of the developing and developed dentition	
Restoration and replacement of teeth	
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	■
Managing and working with others	■
Managing the clinical and working environment	■

France

In France basic dental education is a six year programme. Graduates exit with the title of Chirurgien-Dentiste. As of 2019, the first year of all health professional studies has been standardised. Clinical contact for dentists commences in the third year with observations on clinic. Students must compete hospital placements in years 4, 5 and 6. There is a minimum standard of clinic competence which is tested and formally validated by a certificate. Training is regulated by the state and the contents of the course is specified in French legislation https://beta.legifrance.gouv.fr/loda/texte_lc/JORFTEXT000027343802/2020-01-26/. A requirement for 2,000 clinical hours are stipulated in French legislation (in Annex 1 of: https://www.enseignementsup-recherche.gouv.fr/pid20536/bulletin-officiel.html?cid_bo=71552&cbo=1). There is no need for an additional year of training after qualification.

The High Council for the Evaluation of Research and Higher Education (Hcéres) is the independent administrative authority responsible for evaluating all higher education and research structures, or for validating the procedures of evaluations conducted by other bodies.

There are no private dental education providers, although they are permitted by law.

The Ordre National des Chirurgiens-Dentistes (National Association of Dental Surgeons) has produced the skills and competences for the profession (http://www.ordre-chirurgiens-dentistes.fr/fileadmin/user_upload/pdf/Referentiel-Dentistes.pdf) as well as the code of ethics. These national competences were mapped against *Preparing for Practice*.

Table 8: Mapping against Preparing for Practice - France

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	■
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	■
Managing the clinical and working environment	

Germany

In Germany, there are 30 dental schools of which all but one (in Witten-Herdecke) are publicly funded. The undergraduate course last 5.5 years. This must include two years of approved supervised experience although it is unclear how much of this is actually clinical experience with patients. This leads to submission to the admission committee of the Kassenzahnärztliche Vereinigungen (KZV). This body is responsible for supervising and controlling the duties of member dentists; to establish and manage committees for the examination and admission of dentists and to maintain the dental register. The title of *Zahnarzt* is awarded by the Zuständige Behörden.

Dentists must be a member of a KZV (Kassenzahnärztliche Vereinigungen) - these are self-governing regional dental authorities. They have a national federal dental authority the Kassenzahnärztliche Bundesvereinigung or KZBV.

Quality assurance for the dental schools is provided by control mechanisms and regulations of the universities, and the Ministry of Science and Education in each state. National competences for dentistry are available from the Medical Faculty of the Federal Republic of Germany (http://www.nklz.de/kataloge/nklz/lernziel/uebersicht) and these were used to map Germany against *Preparing for Practice*.

Table 9: Mapping against Preparing for Practice - Germany

Overarching Outcomes	+	*
High quality long term care of patients the first concern		
Demonstrate effective clinical decision making	■	■
Describe the principles of good research	■	
Apply an evidence-based approach	■	
Accurately assess their own capabilities and limitations		
Recognise the importance of lifelong learning	■	
Clinical		
Foundations of practice	■	■
Comprehensive patient assessment	■	
Diagnosis	■	■
Treatment planning	■	■
Patient management	■	
Patient and public safety	■	■
Treatment of acute oral conditions	■	■
Health promotion and disease prevention	■	
Management and treatment of periodontal disease	■	■
Hard and soft tissue disease	■	■
Management of the developing and developed dentition	■	■
Restoration and replacement of teeth	■	■
Population based health and care	■	■
Communication		
Patient, their representatives and the public	■	■
Team and the wider healthcare environment	■	■
Generic communication skills	■	■
Professionalism		
Patients and the public	■	
Ethical and legal	■	■
Teamwork	■	
Development of self and others	■	
Management and Leadership		
Managing self	■	■
Managing and working with others	■	
Managing the clinical and working environment	■	

Ireland

There are two dental schools in Ireland: Trinity College Dublin and Cork University Dental School. Both are 5-year courses. The title on qualification is Bachelor of Dental Science (B Dent Sc) from Dublin; and Bachelor of Dental Surgery (BDS) from Cork. There are no private schools.

Students commence treating patients (under supervision) in the second year at Dublin. Clinical work commences in year three at Cork.

The Dental Council is both the professional and education regulator. The Dental Council of Ireland list the competences for the dental profession. There are seven domains: Professionalism; Communication and interpersonal skills; Knowledge base, Information handling and critical thinking; Clinical information gathering; Diagnosis and treatment planning; Establishment and maintaining oral health; Health promotion. Each domain has a list of learning outcomes: (http://www.dentalcouncil.ie/files/Non%20EEA%20Exam%20-%20Learning%20Outcomes%20(approved)%20-%2020131204.pdf). These are the standards expected of those graduating from dental school and they are based on the ADEE guidance. These were used in the mapping exercise.

In addition to the national learning outcomes, the University of Cork Dental School has produced learning outcomes for its programme.

Table 10: Mapping against Preparing for Practice - Ireland

Overarching Outcomes	
High quality long term care of patients the first concern	■
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	■

Spain

In Spain basic dental training is a 5-year course. No additional year of training is required after qualification. There are 10 private providers of this course as well as 12 state owned universities.

As an example, at the University of Barcelona, students encounter patients on the University dental clinic from the second year onwards. From the second semester of the 3rd year, students carry out clinical procedures. Here, students must complete over 1,000 hours on clinic. In the 5th year, students go out on placement. The programme is also available in English.

The National Agency for Quality Assessment and Accreditation (ANECA) is an autonomous body, attached to the Ministry of Science, Innovation and Universities, which accredits higher education institutions. In addition to this, quality assurance is undertaken by self-evaluation of the institutions. As an example, the previous self-evaluation of the University of Barcelona is published.

The Spanish Dental Council (El Consejo General de Dentistas) regulate the profession, and publishes the ethical code. The competences of the profession are defined by statute in ORDER CIN / 2136/2008. The competences are divided into: 1) professional values attitudes and behaviours; 2) scientific foundations of dentistry; 3) clinical skills (https://www.boe.es/boe/dias/2008/07/19/pdfs/A31687-31692.pdf). These were used to map Spain against *Preparing for Practice*.

Table 11: Mapping against Preparing for Practice - Spain

Overarching Outcomes	+	*
High quality long term care of patients the first concern	■	
Demonstrate effective clinical decision making	■	
Describe the principles of good research		
Apply an evidence-based approach	■	
Accurately assess their own capabilities and limitations		
Recognise the importance of lifelong learning		
Clinical		
Foundations of practice	■	■
Comprehensive patient assessment	■	
Diagnosis	■	
Treatment planning	■	
Patient management	■	
Patient and public safety	■	
Treatment of acute oral conditions	■	
Health promotion and disease prevention	■	■
Management and treatment of periodontal disease	■	
Hard and soft tissue disease	■	
Management of the developing and developed dentition	■	
Restoration and replacement of teeth	■	
Population based health and care	■	■
Communication		
Patient, their representatives and the public	■	
Team and the wider healthcare environment	■	
Generic communication skills	■	
Professionalism		
Patients and the public	■	
Ethical and legal	■	■
Teamwork	■	
Development of self and others	■	
Management and Leadership		
Managing self	■	
Managing and working with others	■	
Managing the clinical and working environment	■	

Sweden

In Sweden, basic dental training takes 5 years at university. All universities offering the course are public. After graduation, student exit with the title *Tandläkare*. No additional year of training is required. There are no private dental schools. Graduates must obtain a licence to practise from the competent dental authority, the Socialstyrelsen, who hold the register of dentists.

As an example, at the Karolinska Institutet, the first patient contact commences in the 3rd semester. Clinical skills training with patients starts from semester 4, which initially takes place under supervision. In later parts of the education, the degree of difficulty increases, and the student's skills training takes place more independently and with greater powers and responsibility. The patient work includes first adult patients and then all patient groups including children, the elderly and the chronically ill. Clinical skills training ends in the final year with general dental care including audit and emergency patients.

Quality assurance for the dental schools is provided by the Swedish Higher Education Authority. All programmes are subject to a quality review. This is done partly through the HEIs having responsibility for the quality assurance of their own programmes and partly by the Swedish Higher Education Authority (UKÄ) evaluating a selection of study programmes at the first, second and third-cycle levels. This selection can either be done by reviewing all programmes at individual institutions or by reviewing the same programmes at all the reviewed HEIs to provide a national overview of the quality of a particular programme. The Higher Education Authority publish the competences required of graduating dentists and these are divided into the domains of 1) knowledge and understanding; 2) competence and skills; 3) judgement and approach (https://www.uhr.se/en/start/laws-and-regulations/Laws-and-regulations/The-Higher-Education-Ordinance/Annex-2/#MSc_DentalSurg). These competences were used to map Sweden against *Preparing for Practice*.

Table 12: Mapping against Preparing for Practice - Sweden

Overarching Outcomes	+	*
High quality long term care of patients the first concern	■	■
Demonstrate effective clinical decision making	■	■
Describe the principles of good research		■
Apply an evidence-based approach	■	■
Accurately assess their own capabilities and limitations		■
Recognise the importance of lifelong learning		■
Clinical		
Foundations of practice		■
Comprehensive patient assessment		■
Diagnosis	■	■
Treatment planning	■	■
Patient management	■	■
Patient and public safety	■	■
Treatment of acute oral conditions		
Health promotion and disease prevention	■	■
Management and treatment of periodontal disease		
Hard and soft tissue disease	■	
Management of the developing and developed dentition		
Restoration and replacement of teeth		
Population based health and care	■	■
Communication		
Patient, their representatives and the public	■	■
Team and the wider healthcare environment	■	■
Generic communication skills	■	■
Professionalism		■
Patients and the public	■	■
Ethical and legal	■	■
Teamwork	■	■
Development of self and others	■	
Management and Leadership		
Managing self	■	
Managing and working with others		■
Managing the clinical and working environment		■

Group 2 – Institution-level learning outcomes

Austria

Students who complete basic dental training in Austria exit with the qualification of *Diplomstudium der Zahnmedizin*. The course takes 6 years, which is divided into 3 phases. The clinical element takes place in the third phase, which begins in the 6th semester (4th year).

There are both state universities and private universities, which provide basic dental training. Graduates from private universities are accorded the same rights as state university graduates and this is enshrined in law. Training of dentists qualified elsewhere must be in accordance with EU Directive 2005/36 in order that they be allowed to practise in Austria.

The Austrian Dental Association regulates the profession as well as continuing education, but not basic dental training. The federal government regulates the provision of basic dental training, but the standards by which this is assessed were not found. Whilst national standards of dental training were not found, individual universities do publish their curricula, for example the University of Vienna, and this curriculum was used in the mapping exercise. At this university, for example, students provide treatment directly to patients under direct supervision of qualified personnel.

Table 13: Mapping against Preparing for Practice - Austria

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	■
Recognise the importance of lifelong learning	■
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	
Health promotion and disease prevention	■
Management and treatment of periodontal disease	
Hard and soft tissue disease	
Management of the developing and developed dentition	
Restoration and replacement of teeth	
Population based health and care	
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	■
Managing and working with others	■
Managing the clinical and working environment	

Bulgaria

In Bulgaria, graduates of the 5-year basic dental training must have completed a 6-month internship prior to graduation. The title of the qualification is Physician of Dental Medicine with a Master's Degree. There are no private dental schools, however the state run universities accept fee paying students from abroad.

Dental training is quality assured by the Ministry of Education, however the standards for this process were not found. No national competences were found, therefore Bulgaria was mapped against *Preparing for Practice* using the curriculum of Sofia Medical University.

Table 14: Mapping against Preparing for Practice - Bulgaria

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	
Describe the principles of good research	
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	
Diagnosis	
Treatment planning	
Patient management	
Patient and public safety	
Treatment of acute oral conditions	
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	
Restoration and replacement of teeth	■
Population based health and care	
Communication	
Patient, their representatives and the public	
Team and the wider healthcare environment	
Generic communication skills	
Professionalism	
Patients and the public	
Ethical and legal	
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Croatia

In Croatia, basic dental training takes 6 years (12 semesters). Upon completion, students graduate with a *Doctor Dentalne Medicine* and must undertake a further year of residency in order to register. There is one private university (Split) and two state universities (Zagreb and Rijeka).

Quality assurance for the dental schools is provided by the Republic of Croatia Ministry of Science and Education, however the standards for this process were not visible.

At the University of Zagreb, for example, clinical work begins in the 4th year, when students provide care to patients under direct supervision of clinicians. In addition, during final semester, students spend 500hrs on practical training in outreach community dental offices.

Dentists obtain their licence from the Croatian Dental Chamber whilst regulation of the practice of dentistry is through the Croatian Dental Chamber and by the Ministry of Health. No set of national competences were found, therefore, the mapping of Croatia against *Preparing for Practice* used the University of Zagreb as an example.

Table 15: Mapping against Preparing for Practice - Croatia

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	■
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	■

Czech Republic

In the Czech Republic, basic dental training takes 5 years. Graduates are given the title of *Doktor Zubníholékařství*. No private providers were found.

Following graduation, dentists must complete 5 or 6 months in practice as part of dental training. The Ministry of Health is responsible for accrediting the placement providers and professional training courses. No information was found about the accreditation of basic dental training at university.

In the Pilsen Dental School, patient contact starts in year 2 (4th semester) with time on clinic learning communication with patients including, for example, giving oral hygiene advice. In Year 3, under supervision by a lecturer, students start clinical procedures.

The Czech Dental Chamber regulates the profession and CPD but not basic dental training. No set of national competences were found, therefore the mapping against *Preparing for Practice* used the Curriculum of the Pilsen Dental School as an example.

Table 16: Mapping against Preparing for Practice - Czech Republic

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	■
Managing the clinical and working environment	■

Denmark

There are two dental schools in Denmark. The education is a 2-cycle curriculum (3 years for the first cycle, and 2 years for the second) with a Bachelors degree after the first cycle and a Masters after the second. Graduates of this programme are awarded the title of *Tandlaege*. There are no private providers of basic dental training.

Clinical contact commences in the 5th semester (3rd year) of training at both dental schools. Clinical classes have compulsory attendance.

Basic dental training at university is accredited by the Danish Accreditation Institution. Institutions are expected to have their own quality assurance methods in place before, during and after the accreditation process. Positive programme accreditation is valid for 6 years.

On completion of dental education, candidates receive an authorisation from the Danish Health and Medicines Authority. The authorisation gives the right to work as a dentist under supervision. In order to work independently, they must undertake a clinical year under supervision and guidance of an experienced dentist. Dentists are registered at the Danish Health and Medicines Authority.

No set of national competences were found. However, the two dental schools have their own learning outcomes, which have been approved as meeting the EU Directive. The learning outcomes from the University of Copenhagen were used in the mapping exercise.

Table 17: Mapping against Preparing for Practice - Denmark

Overarching Outcomes	
High quality long term care of patients the first concern	■
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	■
Recognise the importance of lifelong learning	■
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	
Professionalism	
Patients and the public	
Ethical and legal	
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	■
Managing and working with others	■
Managing the clinical and working environment	

Greece

Dental training is provided by two public dental schools. Since January 2014, a licence to practise is provided by the Hellenic Dental Association, instead of the Prefecture. The Hellenic Dental Association is, on behalf of the Ministry of Health, the competent authority. The Diploma is awarded after five years, the first two being devoted to medico-biological sciences shared with medical students.

The learning outcomes of the basic training have been based on the text proposal on "European Dentist's Physiognomy and Competences", as formulated by the ADEE (Association for Dental Education in Europe). No set of national competences were found. The curriculum of the University of Athens was used for the mapping exercise.

Table 18: Mapping against Preparing for Practice - Greece

Overarching Outcomes	
High quality long term care of patients the first concern	■
Demonstrate effective clinical decision making	
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Italy

There are 32 public schools and two private schools (University Cattolica in Rome and San Raffaele in Milan). From 2010/11 courses were extended to 6 years. The qualification of *Diploma di laurea in Odontoiatria e Protesi Dentaria* is awarded by the university. The professional title is *Odontoiatra*.

To register as a dentist, an applicant must have a degree or diploma in dentistry included in the Annex of the EU Directive 2005/36 or be recognised both by the Ministry of Health (Foreign Affairs) and by one dental faculty.

The prerequisite for professional practice is the registration as a dentist at a related provincial Chamber. The registration list is held by the Federazione Ordini dei Medici Chirurghi e degli Odontoiatri - the competent authority for dentistry. The registration process is the same for all dentists, and there are no regulatory tests.

Quality assurance for the dental schools is provided by the MIUR (Ministry of Education, University and Research), with some joint responsibility with the Ministry of Health.

No national competences were found, therefore, the curriculum of the University of Turin was used to map against *Preparing for Practice*.

Table 19: Mapping against Preparing for Practice - Italy

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	
Treatment of acute oral conditions	■
Health promotion and disease prevention	
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	
Ethical and legal	■
Teamwork	■
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Lithuania

In Lithuania, basic dental training takes 5 years. Graduates exit with the title *Gydytojas odontologas*. The clinical element of the course begins in the 5th year (10th semester) with a 20-credit internship. No private providers of basic dental training were found.

The Lithuanian University of Health Sciences Faculty of Odontology is a member of the ADEE. Detailed analyses and evaluations performed by the DentEd project in 2001 and the EU TAIEX commission in 2002 showed that the Faculty of Odontology met all the EU requirements for specialist training, and the study programmes of the Faculty received accreditation. The study programmes and the research activity of the Faculty undergo regular evaluations and accreditation by international experts. The Centre for Quality Assessment in Higher Education has evaluated the course and recommended an increase in clinical contact.

The Lithuanian Dental Chamber, which has been responsible for licensing dentists and clinics and overseeing CPD, may soon relinquish these activities to the Ministry of Health. No national competences were found, therefore, the curriculum of Vilnius University was used for mapping against *Preparing for Practice*.

Table 20: Mapping against Preparing for Practice - Lithuania

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	
Describe the principles of good research	■
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	
Patient and public safety	
Treatment of acute oral conditions	
Health promotion and disease prevention	
Management and treatment of periodontal disease	
Hard and soft tissue disease	
Management of the developing and developed dentition	
Restoration and replacement of teeth	
Population based health and care	■
Communication	
Patient, their representatives and the public	
Team and the wider healthcare environment	
Generic communication skills	■
Professionalism	
Patients and the public	
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Malta

The University of Malta is the only dental school in Malta and has an intake of eight students per year. Graduates exit with Master's in Dental Surgery. The course is 5 years. The learning outcomes are to provide a broad knowledge and understanding of the following: application of basic clinical sciences; information handling; clinical reasoning and judgement; clinical information gathering; treatment planning; communication; treatment procedures; health promotion; attitudes, ethics and legal responsibilities; personal development; the role of the dentist within the Health Service and the Community.

Quality assurance of the course of study is regulated by the Programme Validation Committee that may refer a programme of studies to external review abroad.

Dentists are automatically registered with the Medical Council of Malta after graduation. Dentists are given a warrant to work by the Medical Council. The Medical Council has produced an ethical code, but no set of national competences were found. The mapping for Malta used the curriculum of the dental school at the University of Malta.

Table 21: Mapping against Preparing for Practice - Malta

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	■
Managing the clinical and working environment	■

Poland

There are 10 dental schools in Poland, which are all publicly funded. The course comprises 5 years or 5,000 hours of full time training. Clinical contact begins in year 2 and incrementally increases throughout the rest of the course.

Quality assurance is provided by the qualification recognition centre and by internal self-evaluation within the institutions.

In order to be awarded the 'Right to practice the profession' a graduate has to complete vocational training – an obligatory one-year postgraduate internship (*staż podyplomowy*). The body awarding the evidence of qualifications is Wyższa Szkoła.

The professional title is *Lekarz Dentysta* and is regulated by the Regional Chamber of Physicians and Dentists (Okręgowa Izba Lekarska).

No national competences were found. The curriculum of the University of Lodz was used in the mapping exercise for this country.

Table 22: Mapping against Preparing for Practice - Poland

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	
Describe the principles of good research	■
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	
Diagnosis	
Treatment planning	
Patient management	
Patient and public safety	
Treatment of acute oral conditions	
Health promotion and disease prevention	
Management and treatment of periodontal disease	
Hard and soft tissue disease	
Management of the developing and developed dentition	
Restoration and replacement of teeth	■
Population based health and care	
Communication	
Patient, their representatives and the public	
Team and the wider healthcare environment	
Generic communication skills	
Professionalism	
Patients and the public	
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Portugal

There are three state universities and four private providers of basic dental training. The course lasts 5 years. There is no additional year of training once qualified.

Both public and private education providers are accredited by the Higher Education Evaluation and Accreditation Agency (A3ES). The reports for the institutions are available on the A3ES website, but no set of standards for dental education were found.

The learning outcomes of the integrated Master's in Dental Medicine at the University of Porto are available, and as an example, this school has a dental clinic which treats patients.

The Ordem dos Médicos Dentistas (OMD) regulates the profession. The OMD has published an ethical code but no set of national competences were found. However, competences for the specialities are in development. The learning outcomes of the University of Porto were used in the mapping exercise.

Table 23: Mapping against Preparing for Practice - Portugal

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	■
Clinical	
Foundations of practice	
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	
Patient and public safety	
Treatment of acute oral conditions	
Health promotion and disease prevention	■
Management and treatment of periodontal disease	
Hard and soft tissue disease	
Management of the developing and developed dentition	
Restoration and replacement of teeth	
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	■
Professionalism	
Patients and the public	■
Ethical and legal	■
Teamwork	■
Development of self and others	■
Management and Leadership	
Managing self	■
Managing and working with others	
Managing the clinical and working environment	

Slovakia

There are four dental schools in Slovakia. The course takes 6 years and graduates exit with the MDDr qualification. No private providers of dental training were found. The extent of clinical contact on the course was not found.

The Ministry of Health Accreditation Commission accredits dental training, but the standards for this process were not found. The Slovenská Komora Zubných Lekárov (Slovak Chamber of Dentists) maintains the register of dentists, but no set of national competences were found, therefore, the curriculum of the University in Kosice was used in the mapping exercise.

Table 24: Mapping against Preparing for Practice - Slovakia

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	■
Describe the principles of good research	■
Apply an evidence-based approach	
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	■
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	
Team and the wider healthcare environment	
Generic communication skills	■
Professionalism	
Patients and the public	
Ethical and legal	■
Teamwork	
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	■
Managing the clinical and working environment	■

Slovenia

The basic dental training takes 6 years and graduates qualify with the title *Doctor Dentalne Medicine*. This is followed by a 12-month period of vocational training. The Medical Chamber of Slovenia registers all dentists. There is one dental school, at the University of Ljubljana, which is state-funded, and there are no private providers.

Clinical contact is undertaken in years 4 to 6 of the course.

The dental school is inspected for course curriculum quality by the registration authority, Zdravniška Zbornica Slovenije and the quality assurance report is available. No national competences were found, therefore, the learning outcomes of the University of Ljubljana were used in the mapping exercise.

Table 25: Mapping against Preparing for Practice - Slovenia

Overarching Outcomes	
High quality long term care of patients the first concern	
Demonstrate effective clinical decision making	
Describe the principles of good research	■
Apply an evidence-based approach	■
Accurately assess their own capabilities and limitations	
Recognise the importance of lifelong learning	
Clinical	
Foundations of practice	■
Comprehensive patient assessment	■
Diagnosis	■
Treatment planning	■
Patient management	■
Patient and public safety	■
Treatment of acute oral conditions	■
Health promotion and disease prevention	
Management and treatment of periodontal disease	■
Hard and soft tissue disease	■
Management of the developing and developed dentition	■
Restoration and replacement of teeth	■
Population based health and care	■
Communication	
Patient, their representatives and the public	■
Team and the wider healthcare environment	■
Generic communication skills	
Professionalism	
Patients and the public	
Ethical and legal	■
Teamwork	■
Development of self and others	
Management and Leadership	
Managing self	
Managing and working with others	
Managing the clinical and working environment	

Group 3 – No learning outcomes identified

Cyprus

The first dental school opened in Cyprus in 2019, providing a 5-year course where students will qualify with a Bachelor of Dental Surgery from the European University of Cyprus. There is no information detailing the extent of patient contact on the course. The course uses the ADEE 2009 *Profile and Competences for Graduating European Dentist*.

The Cyprus Dental Association regulates continuing education. No set of national competences were found, and no further information was found through the dental school, therefore this country was unable to be mapped.

Estonia

In Estonia, the degree in dentistry with the professional title of *Hambaarst* is awarded by University of Tartu, the only provider of basic dental training in Estonia.

The period of study in dental science is 5 years. In the 4th and 5th years training includes some practice conducted in dental institutions.

Quality assurance for the dental school is provided by the Ministry of Education and Social Affairs. The standards for this process were not found.

The register is administered by the Healthcare Board/General Dental Council, within the Commission for Licence (the competent authority). Certificates of competency of dentists are issued by the Estonian Dental Association. No set of national competences were found and no further information about the curriculum at the University of Tartu was found, therefore this country was unable to be mapped.

Hungary

In Hungary five-year courses are offered by four universities: Szeged (Doctor in Dentistry), Budapest Semmelweis (Doctorate in Dentistry), Debrecen (Doctor of Dental Medicine - DMD) and Pecs (DMD). The qualification of *Fogorvos Dentist* (DMD). Is regulated by the Ministry of Health. The Competent Dental Authority is the Health Registration and Training Centre Department of Migration and Human Resources.

It is not clear to what extent clinical contact is made at Szeged and Budapest Semmelweis Universities but at Debrecen it is from 4th year and at Pecs there is a clinical module, but it is unclear at what stage this is taken.

All the dental schools are state funded, although some of the students have to pay their own fees.

No national competences were found and there was insufficient information found through dental school websites to enable Hungary to be mapped.

Latvia

There is one dental school in Latvia, at the Riga Stradins University, and graduates are awarded the title of *Zobārsts*. This is a 5-year programme in either Latvian or English. The extent of clinical contact on the course could not be established. Quality assurance for the dental school is provided by Faculty Council within the University.

Professionals need to be registered with the Latvian Health Inspectorate, in the Ministry of Health.

The competent authority is the Latvian Dental Association, but no set of national competences were found. Insufficient information was found on the Riga University website, therefore, this country was unable to be mapped.

Luxembourg

There are no dental schools in Luxembourg. To practice as a dentist, you must have a diploma attesting to the training of a dental practitioner issued by an EU country (Annex V point 5.3.2 of European directive 2005/36/EC). This country was not mapped against *Preparing for Practice*.

Netherlands

Registration as a dentist requires a diploma from a dental school. This can be gained from one of the three dental schools, (as at 2013) which are part of colleges/faculties of medicine in the universities. All the dental schools are state-funded. The course lasts for 6 years. The Ministry of Education and Science monitors the quality of the training.

The competent Authority is the BIG register, which is maintained by CIBG on behalf of the Ministry of Health, Welfare and Sport.

No national competences were found. There was insufficient information found through faculty websites to enable Netherlands to be mapped against *Preparing for Practice*.

Romania

Basic dental training takes 6 years to complete. Graduates qualify with the title Dr Medic. There are 10 state run dental schools and three private dental schools in Romania. Every state funded faculty also has the right to manage a limited number of private places for students each year, for both budgeted and fee-paying students. It is possible for non-nationals to study dentistry in Romania with teaching delivered in English, French or Romanian. Information about the extent of clinical contact on the course was not found.

The Ministry of Education monitors the quality of the training and the Council of the Faculty is directly responsible. No standards for quality assurance were found.

The Competent Dental Authority for Romania is the Colegiol Medicilor Dentisti (Romanian College of Dental Practitioners) and they register all dental physicians. No national competences were found and there was insufficient information found through dental schools to enable Romania to be mapped.

Discussion

The information identified during this mapping exercise offers insights into the development of basic dental training in Europe, the broad range of proposals for harmonisation of curricula, and the scarcity of evidence on the extent to which this harmonisation agenda has been achieved. This information comes from a range of sources, collected by multiple methods, and varies in its quality, depth and consequent value for informing ongoing discussions about the ease of comparing educational experiences and achievements (in terms of attained outcomes/competences) across national boundaries. In overview, a number of key issues have arisen from across the study that merit further thought when considering processes around basic dental training in EU member states in comparative perspective.

Firstly, it is clear that European Union attention on higher education aimed at facilitating transferability of qualifications between member states in order to raise educational standards, attract international students, and support freedom of movement, drove a focus on harmonisation from the late 1990s onwards. The impetus for this harmonisation agenda was enshrined in the Bologna declaration, the subsequent Bologna process, and the 2005 EU Directive on professional qualifications which sought to modify/adapt wider harmonisation efforts to meet the specific needs of various professional spheres, particularly in the health professions. There is evidence that this harmonisation agenda was taken up by dental educators, particularly through the DentEd and ADEE projects that culminated in the production of ADEE's *Profile and Competences of the European Dentist.* Subsequently, educators, often working through special interest groups representing particular subfields within dentistry or dental education, have proposed curricula and learning outcomes to elaborate on the higher-level ADEE competences with detailed competences for their own particular topic area. However, there is little to evidence how far these efforts have progressed beyond aspiration. We have found limited information about how far such proposed curricula have been adopted and implemented, and there is little sign of rigorous evaluations of either process or outcomes.

At national level, we found evidence of competences or a defined curriculum setting out the expectations for basic dental training in Belgium, Finland, France, Germany, Ireland, Spain and Sweden. For other EU member states, we did not identify competences at the national level, though this is not to say that such standards may not exist elsewhere. Some of those documents that were identified were shared by respondents to our questionnaire, and had not been readily accessible via our online searches. Mapping the available graduate outcomes, whether at national or institutional level, to *Preparing for Practice*, again served to illustrate the variation across Europe and to raise questions about how readily basic dental training can be compared between countries, at least

based on this type of information. Most countries for which information could be mapped had outcomes comparable to the GDC's over-arching outcome of 'demonstrating effective clinical decision-making' and at domain level, the elements under the 'clinical skills' were able to be mapped more often. Overall, the domains of 'communication' and 'professionalism' were well represented, but the 'management and leadership' domain was less well represented. However, there were gaps where elements present in *Preparing for Practice* could not be mapped in the information that we identified, and of course, there were cases where information could not be identified at all. The picture that results is, therefore, inevitably, somewhat fragmented.

Moreover, looking across all of the evidence we identified, the issue of variation at institutional level came through strongly. Dental schools' individual freedom to develop their curricula is important for educational choice and innovation, and not in itself problematic. However, this variation at institution level does mean that even where national level competences are in place, these may need to be treated with a degree of caution rather than taken as an absolute indication of the content of training programmes being delivered.

The apparent absence of clinically-centred or profession-specific quality assurance processes in many countries also means that, while there may be competences in place, we cannot know that these are being satisfactorily implemented by institutions or attained by their students. In many countries, where quality assurance processes were evident, these were under the auspices of generic higher education quality assurance bodies, comparable to the Quality Assurance Agency for Higher Education in the UK, and did not appear to focus on clinical or professional content and competence. Again though, where we did not find evidence of quality assurance processes, this should not be taken to mean that they definitively do not happen in a country, but rather that evidence of them was not apparent. In addition, although many countries used the higher education-focused model for quality assurance, this should not be assumed to be the case for those countries where information was lacking.

Given the level of variation across dental schools, within and across national boundaries, it is difficult to establish with any confidence the extent of the clinical experience with patients to which dental students are exposed through their studies. Even where we were able to identify evidence of clinical experience, it proved very challenging to establish whether this took the form of individual practice with patients, or was in fact chairside observation, assisting a tutor, or working in a group with a number of other students. Furthermore, it is clear that in several countries, an additional vocational year is in place to provide further clinical experience and that this may be intended to comprise the majority of a newly trained dentist's clinical exposure.[16] However, where this vocational year occurs

after graduation, this may present challenges if, having graduated and qualified, individuals from these training systems can register to practise in the UK without undertaking that vocational element of training (even where they may not be eligible for registration or licensure in the country in which they have trained without completing the additional year).

This mapping exercise has provided a snapshot of the range of current approaches to setting graduate outcomes for basic dental training, and to regulating and quality assuring that training, within EU member states. However, it is important to recognise that as dental practice continues to develop and change, so too will dental education, as training programmes are revised to encompass new technological advances, diagnostic techniques, treatments, laws and governance issues. National level curricula and graduate outcomes must, therefore, also be kept under review, as they must be able to respond to and assimilate newly emerging elements of dentistry and practice.

Using a range of methods and identifying information from different sources, enabled us to identify a variety of materials. However, there are gaps in the information that it was possible to identify within the scope of the project, and where there was an absence of evidence, this should not be taken to necessarily indicate an absence of activity. The picture that emerges is one of a patchwork of diverse systems for the provision and quality assurance of basic dental training, born of differing political, cultural, and educational traditions. It is important to state that our mapping and analysis does not assume that differing levels of visibility of information or different methods of organising professional regulation and quality assurance carry implications for the quality of educational provision. Rather, these differences serve only to highlight the on-going challenges presented by questions of educational comparability and the transferability of qualifications, especially in a field such as dentistry where the assurance of patient safety is paramount.

Conclusion

Moves to harmonise higher education provision across the EU have brought about a considerable degree of aspiration and many collaborative proposals for cross national education initiatives, but have also engendered clear challenges for those tasked with regulating clinical practice within national boundaries and according to nationally-bounded systems which continue to vary. Beyond this, variation at the level of individual training provider institutions makes comparisons or judgements about dental education provision at national level additionally challenging.

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Appendices

Appendix A: Literature review search strategies

Embase <1996 to 2019 Week 42>
Search history sorted by search number ascending

#	Searches	Results
1	dental education/	10847
2	dental student/	4591
3	(dent* adj3 school*).ab,kw,ti.	6217
4	(dent* adj3 graduat*).ab,kw,ti.	822
5	(dent* adj3 educat*).ab,kw,ti.	5238
6	(dent* adj3 student*).ab,kw,ti.	5801
7	(dent* adj3 college*).ab,kw,ti.	2278
8	1 or 2 or 3 or 4 or 5 or 6 or 7	20179
9	curriculum development/	4368
10	curriculum/	66262
11	(curriculum or curricula).ab,kw,ti.	56725
12	(patient* adj3 contact).ab,kw,ti.	12400
13	(course adj3 content*).ab,kw,ti.	1919
14	(module adj3 content*).ab,kw,ti.	208
15	(program* adj3 content*).ab,kw,ti.	2163
16	(teaching or learning or training).ab,kw,ti.	818987
17	or/9-16	867836
18	learning outcomes.ab,kw,ti.	3887
19	(graduate* adj3 outcomes).ab,kw,ti.	263
20	"quality assess*".ab,kw,ti.	24946
21	"quality assur*".ab,kw,ti.	32981
22	(clinic* adj3 competen*).ab,kw,ti.	6384
23	clinical practice.ab,kw,ti.	243728
24	"transition*".ab,kw,ti.	358270
25	standards.ab,kw,ti.	159939
26	(regulation or regulator*).ab,kw,ti.	1326052
27	preparedness.ab,kw,ti.	14308
28	(prepar* adj3 practice).ab,kw,ti.	2199
29	or/18-28	2093912
30	8 and 17 and 29	1027
31	exp Europe/	1208322
32	(european or europe or eu or "e.u.").ab,ti.	460909
33	(belgium or belgian or belgique or belgie or belgien).ab,ad,in,ti.	323229
34	"bulgaria*".ab,ad,in,ti.	31432
35	(czech* or ceska).ab,ad,in,ti.	136077
36	(denmark or danish or danmark).ab,ad,in,ti.	274683
37	(german* or deutschland).ab,ad,in,ti.	1612466
38	(estonia* or esti).ab,ad,in,ti.	16549

#	Searches	Results
39	(greece or greek).ab,ad,in,ti.	176726
40	(spain or spanish or espana or espania).ab,ad,in,ti.	783542
41	(france or french or francaise).ab,ad,in,ti.	1102959
42	(ireland or irish).ab,ad,in,ti.	288384
43	(italy or italia*).ab,ad,in,ti.	1050671
44	(cyprus or cypriot).ab,ad,in,ti.	10541
45	(latvia or latvija).ab,ad,in,ti.	7321
46	luxembourg.ab,ad,in,ti.	9977
47	(hungary or hungarian or magyar*).ab,ad,in,ti.	100254
48	(malta or maltese).ab,ad,in,ti.	7338
49	(holland or dutch or nederland or netherlands).ab,ad,in,ti.	660669
50	(austria* or osterreich).ab,ad,in,ti.	229953
51	(poland or polish or polska).ab,ad,in,ti.	277066
52	(portugal or portuguese).ab,ad,in,ti.	155938
53	"romania*".ab,ad,in,ti.	60857
54	(slovenia* or slovenija).ab,ad,in,ti.	35991
55	(slovakia* or slovensko).ab,ad,in,ti.	35145
56	(finland or finnish or suomi).ab,ad,in,ti.	164007
57	(sweden or swedish or sverige).ab,ad,in,ti.	406148
58	("United Kingdom" or "U.K." or uk or britain or british or "G.B." or gb or england or english or wales or wales or scotland or scottish).ab,ad,in,ti.	2470329
59	(British or European).jx.	998430
60	or/31-59	9262824
61	(andorrra* or armenia* or azerbajan* or belarus* or georgia* or liechtenstein* or moldova* or monaco* or norway or norwegian or monaco* or russia* or san marino or switzerland or swiss or ukrain* or vatican).ab,ad,in,ti.	988939
62	or/31-61	9787553
63	30 and 62	467
64	limit 63 to yr="2000 - 2020"	**441**

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) <1946 to October 24, 2019>

Search history sorted by search number ascending

#	Searches	Results
1	exp education, dental/	19198
2	students, dental/	6273
3	(dent* adj3 school*).ab,kw,ti.	9461
4	(dent* adj3 graduat*).ab,kw,ti.	1151
5	(dent* adj3 educat*).ab,kw,ti.	7939
6	(dent* adj3 student*).ab,kw,ti.	7328
7	(dent* adj3 college*).ab,kw,ti.	2397
8	or/1-7	35210
9	curriculum/	72666

#	Searches	Results
10	(curriculum or curricula).ab,kw,ti.	49869
11	(patient* adj3 contact).ab,kw,ti.	9545
12	(course adj3 content*).ab,kw,ti.	1702
13	(module adj3 content*).ab,kw,ti.	129
14	(program* adj3 content*).ab,kw,ti.	1908
15	(clinic* adj3 (contact or experience or training)).ab,kw,ti.	56511
16	(teaching or learning or training).ab,kw,ti.	705974
17	or/9-16	805221
18	learning outcomes.ab,kw,ti.	3300
19	(graduate* adj3 outcomes).ab,kw,ti.	247
20	"quality assess*".ab,kw,ti.	19246
21	"quality assur*".ab,kw,ti.	25621
22	(clinic* adj3 competen*).ab,kw,ti.	4662
23	clinical practice.ab,kw,ti.	173219
24	"transition*".ab,kw,ti.	387830
25	standards.ab,kw,ti.	136692
26	(regulation or regulator*).ab,kw,ti.	1208493
27	preparedness.ab,kw,ti.	12402
28	(prepar* adj3 practice).ab,kw,ti.	2000
29	or/18-28	1913814
30	8 and 17 and 29	1102
31	exp Europe/	1376456
32	(european or europe or eu or "e.u.").ab,ti.	283128
33	(belgium or belgian or belgique or belgie or belgien).ab,in,ti.	221137
34	"bulgaria*".ab,in,ti.	18421
35	(czech* or ceska).ab,in,ti.	84112
36	(denmark or danish or danmark).ab,in,ti.	207798
37	(german* or deutschland).ab,in,ti.	1084717
38	(estonia* or esti).ab,in,ti.	11097
39	(greece or greek).ab,in,ti.	119343
40	(spain or spanish or espana or espania).ab,in,ti.	539324
41	(france or french or francaise).ab,in,ti.	786916
42	(ireland or irish).ab,in,ti.	105634
43	(italy or italia*).ab,in,ti.	758003
44	(cyprus or cypriot).ab,in,ti.	7308
45	(latvia or latvija).ab,in,ti.	3796
46	luxembourg.ab,in,ti.	6147
47	(hungary or hungarian or magyar*).ab,in,ti.	67947
48	(malta or maltese).ab,in,ti.	4902
49	(holland or dutch or nederland or netherlands).ab,in,ti.	483638
50	(austria* or osterreich).ab,in,ti.	147664
51	(poland or polish or polska).ab,in,ti.	180790
52	(portugal or portuguese).ab,in,ti.	103272
53	"romania*".ab,in,ti.	29739
54	(slovenia* or slovenija).ab,in,ti.	23038

#	Searches	Results
55	(slovakia* or slovensko).ab,in,ti.	14278
56	(finland or finnish or suomi).ab,in,ti.	144288
57	(sweden or swedish or sverige).ab,in,ti.	334806
58	("United Kingdom" or "U.K." or uk or britain or british or "G.B." or gb or england or english or wales or wales or scotland or scottish).ab,in,ti.	1827441
59	(British or European).jw.	1032297
60	or/31-59	7826709
61	(andorrra* or armenia* or azerbajan* or belarus* or georgia* or liechtenstein* or moldova* or monaco* or norway or norwegian or monaco* or russia* or san marino or switzerland or swiss or ukrain* or vatican).ab,in,ti.	717129
62	or/31-61	8298753
63	30 and 62	477
64	limit 63 to yr="2000 - 2020"	**422**

#	**CINAHL with Full Text**	Results
1	TI dent* N3 educat* OR AB dent* N3 educat* OR (MH "Education, Dental")	5,303
2	TI dent* N3 student* OR AB dent* N3 student* OR (MH "Students, Dental")	3,564
3	TI dent* N3 graduat* OR AB dent* N3 graduat*	351
4	TI dent* N3 school* OR AB dent* N3 school*	2,676
5	TI dent* N3 college* OR AB dent* N3 college*	455
6	S1 OR S2 OR S3 OR S4 OR S5	9,378
7	TI (curriculum or curricula) OR AB (curriculum or curricula) OR (MH "Curriculum+")	50,830
8	TI patient* N3 contact OR AB patient* N3 contact	4,447
9	TI course N3 content* OR AB course N3 content*	1,292
10	TI module N3 content* OR AB module N3 content*	169
11	TI program* N3 content* OR AB program* N3 content*	1,622
12	TI (teaching or learning or training) OR AB (teaching or learning or training)	287,155
13	S7 OR S8 OR S9 OR S10 OR S11 OR S12	319,679
14	TI "learning outcomes" OR AB "learning outcomes"	2,048
15	TI graduate* N3 outcomes OR AB graduate* N3 outcomes	281
16	TI quality N3 assess OR AB quality N3 assess	5,679
17	TI quality N3 assur* OR AB quality N3 assur*	7,236
18	TI clinic* N3 competen* OR AB clinic* N3 competen*	3,417
19	TI clinic* N1 practice OR AB clinic* N1 practice	70,349
20	TI clinic* N3 practice OR AB clinic* N3 practice	76,458
21	TI prepar* N3 practice OR AB prepar* N3 practice	2,482
22	TI transition OR AB transition	37,936
23	TI standards OR AB standards	185,079
24	TI (regulation or regulator*) OR AB (regulation or regulator*)	84,082
25	S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24	382,836
26	S6 AND S13 AND S25	360
27	S6 AND S13 AND S25 Limiters - Published Date: 20000101-20191231	**351**

#	**AMED - The Allied and Complementary Medicine Database**	Results
1	TI dent* N3 educat* OR AB dent* N3 educat* OR KW dent* N3 educat*	11
2	TI dent* N3 student* OR AB dent* N3 student* OR KW dent* N3 student*	23
3	TI dent* N3 graduat* OR AB dent* N3 graduat* OR KW dent* N3 graduat*	0
4	TI dent* N3 school* OR AB dent* N3 school* OR KW dent* N3 school*	25
5	TI dent* N3 college* OR AB dent* N3 college* OR KW dent* N3 college*	4
6	S1 OR S2 OR S3 OR S4 OR S5	59
7	TI (curriculum or curricula) OR AB (curriculum or curricula) OR KW (curriculum or curricula)	1,901
8	TI patient* N3 contact OR AB patient* N3 contact OR KW patient* N3 contact	211
9	TI course N3 content* OR AB course N3 content* OR KW course N3 content*	88
10	TI module N3 content* OR AB module N3 content* OR KW module N3 content*	13
11	TI program* N3 content* OR AB program* N3 content* OR KW program* N3 content*	123
12	TI (teaching or learning or training) OR AB (teaching or learning or training) OR KW (teaching or learning or training)	27,265
13	S7 OR S8 OR S9 OR S10 OR S11 OR S12	28,420
14	TI "learning outcomes" OR AB "learning outcomes" OR KW "learning outcomes"	149
15	TI graduate* N3 outcomes OR AB graduate* N3 outcomes OR KW graduate* N3 outcomes	16
16	TI quality N3 assess OR AB quality N3 assess OR KW quality N3 assess	439
17	TI quality N3 assur* OR AB quality N3 assur* OR KW quality N3 assur*	501
18	TI clinic* N3 competen* OR AB clinic* N3 competen* OR KW clinic* N3 competen*	530
19	TI clinic* N1 practice OR AB clinic* N1 practice OR KW clinic* N1 practice	3,657
20	TI clinic* N3 practice OR AB clinic* N3 practice OR KW clinic* N3 practice	3,983
21	TI prepar* N3 practice OR AB prepar* N3 practice OR KW prepar* N3 practice	117
22	TI transition OR AB transition OR KW transition	2,135
23	TI standards OR AB standards OR KW standards	9,893
24	TI (regulation or regulator*) OR AB (regulation or regulator*) OR KW (regulation or regulator*)	3,313
25	S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24	20,086
26	S6 AND S13 AND S25	2

Set#	Searched for	Databases	Results
S1	MAINSUBJECT.EXACT("Dental Education") OR MAINSUBJECT.EXACT("Dental Students") OR ti(dent* N/3 (school* or college* or educat* or student* or graduat*)) OR ab(dent* N/3 (school* or college* or educat* or student* or graduat*))	PsycINFO	1071
S2	(MAINSUBJECT.EXACT("Curriculum") OR MAINSUBJECT.EXACT("Curriculum Development")) OR ti(curriculum or curricula or teaching or training or learning) OR ab(curriculum or curricula or teaching or training or learning) OR ti(content* N/3 (course* or program* or module*)) OR ab(content* N/3 (course* or program* or module*)) OR ti(patient* N/3 contact) OR ab(patient* N/3 contact)	PsycINFO	654772

Set#	Searched for	Databases	Results
S3	"learning outcomes" OR (graduate* N/3 outcomes) OR (quality N/3 (assess* or assur*)) OR (clinic* N/3 (competen* or practice*)) OR transition OR standards OR (regulation or regulator*) OR (prepar* N/3 practice)	PsycINFO	465486
S4	(MAINSUBJECT.EXACT("Dental Education") OR MAINSUBJECT.EXACT("Dental Students") OR ti(dent* NEAR/3 (school* OR college* OR educat* OR student* OR graduat*)) OR ab(dent* NEAR/3 (school* OR college* OR educat* OR student* OR graduat*))) AND ((MAINSUBJECT.EXACT("Curriculum") OR MAINSUBJECT.EXACT("Curriculum Development")) OR ti(curriculum OR curricula OR teaching OR training OR learning) OR ab(curriculum OR curricula OR teaching OR training OR learning) OR ti(content* NEAR/3 (course* OR program* OR module*)) OR ab(content* NEAR/3 (course* OR program* OR module*)) OR ti(patient* NEAR/3 contact) OR ab(patient* NEAR/3 contact)) AND ("learning outcomes" OR (graduate* N/3 outcomes) OR (quality N/3 (assess* or assur*)) OR (clinic* N/3 (competen* or practice*)) OR transition OR standards OR (regulation or regulator*) OR (prepar* N/3 practice))	PsycINFO These databases are searched for part of your query.	93
S5	(MAINSUBJECT.EXACT("Dental Education") OR MAINSUBJECT.EXACT("Dental Students") OR ti(dent* NEAR/3 (school* OR college* OR educat* OR student* OR graduat*)) OR ab(dent* NEAR/3 (school* OR college* OR educat* OR student* OR graduat*))) AND ((MAINSUBJECT.EXACT("Curriculum") OR MAINSUBJECT.EXACT("Curriculum Development")) OR ti(curriculum OR curricula OR teaching OR training OR learning) OR ab(curriculum OR curricula OR teaching OR training OR learning) OR ti(content* NEAR/3 (course* OR program* OR module*)) OR ab(content* NEAR/3 (course* OR program* OR module*)) OR ti(patient* NEAR/3 contact) OR ab(patient* NEAR/3 contact)) AND ("learning outcomes" OR (graduate* N/3 outcomes) OR (quality N/3 (assess* or assur*)) OR (clinic* N/3 (competen* or practice*)) OR transition OR standards OR (regulation or regulator*) OR (prepar* N/3 practice)) AND yr(2000-2019)	PsycINFO These databases are searched for part of your query.	84

Scopus

((((TITLE-ABS-KEY (dent* W/3 school*) OR TITLE-ABS-KEY (dent* W/3 college*) OR TITLE-ABS-KEY (dent* W/3 graduat*) OR TITLE-ABS-KEY (dent* W/3 educat*) OR TITLE-ABS-KEY (dent* W/3 student*))) AND ((TITLE-ABS-KEY (curriculum OR curricula) OR TITLE-ABS-KEY (patient W/3 contact) OR TITLE-ABS-KEY (course W/3 content*) OR TITLE-ABS-KEY (module W/3 content*) OR TITLE-ABS-KEY (program* W/3 content*) OR TITLE-ABS-KEY (clinic* W/3 (contact OR experience OR training)))) AND ((TITLE-ABS-KEY ("learning outcomes" OR "graduate outcomes") OR TITLE-ABS-KEY ("quality assess*") OR TITLE-ABS-KEY ("quality assur*") OR TITLE-ABS-KEY (clinic* W/3 competen*) OR TITLE-ABS-KEY ("clinical practice" OR transition) OR TITLE-ABS-KEY (preparedness) OR TITLE-ABS-KEY (prepar* W/3 practice) OR TITLE-ABS-KEY

(standards OR regulator* OR regulation)))) AND ((((TITLE-ABS-KEY (belgium OR belgian OR belgique OR belgië OR belgien) OR TITLE-ABS-KEY (bulgaria* OR България))) OR (TITLE-ABS-KEY (czech* OR česká)) OR (TITLE-ABS-KEY (denmark OR danish OR danmark)) OR (TITLE-ABS-KEY (german* OR deutschland)) OR (TITLE-ABS-KEY (estonia* OR esti)) OR (TITLE-ABS-KEY (greece OR greek OR ελλάς)) OR (TITLE-ABS-KEY (spain OR spanish OR españa)) OR (TITLE-ABS-KEY (france OR french OR française)) OR (TITLE-ABS-KEY (ireland OR irish)) OR (TITLE-ABS-KEY (italy OR italia*)) OR (TITLE-ABS-KEY (cyrus OR cypriot OR κύπρος)) OR (TITLE-ABS-KEY (latvia OR latvija)) OR 15 OR (TITLE-ABS-KEY (luxembourg)) OR (TITLE-ABS-KEY (hungary OR hungarian OR magyarország)) OR (TITLE-ABS-KEY (malta OR maltese)) OR (TITLE-ABS-KEY (holland OR dutch OR nederland OR netherlands)) OR (TITLE-ABS-KEY (austria* OR österreich)) OR (TITLE-ABS-KEY (poland OR polish OR polska)) OR (TITLE-ABS-KEY (portugal OR portuguese)) OR (TITLE-ABS-KEY (romania* OR românia)) OR (TITLE-ABS-KEY (slovenia* OR slovenija)) OR (TITLE-ABS-KEY (slovakia* OR slovensko)) OR (TITLE-ABS-KEY (finland OR finnish OR suomi)) OR (TITLE-ABS-KEY (sweden OR swedish OR sverige)) OR (TITLE-ABS-KEY ("United Kingdom" OR "U.K." OR uk OR britain OR british OR "G.B." OR gb OR england OR english OR wales OR wales OR scotland OR scottish))) OR (TITLE-ABS-KEY (european OR europe OR eu OR e.u.)))) AND (LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012) OR LIMIT-TO (PUBYEAR , 2011) OR LIMIT-TO (PUBYEAR , 2010) OR LIMIT-TO (PUBYEAR , 2009) OR LIMIT-TO (PUBYEAR , 2008) OR LIMIT-TO (PUBYEAR , 2007) OR LIMIT-TO (PUBYEAR , 2006) OR LIMIT-TO (PUBYEAR , 2005) OR LIMIT-TO (PUBYEAR , 2004) OR LIMIT-TO (PUBYEAR , 2003) OR LIMIT-TO (PUBYEAR , 2002) OR LIMIT-TO (PUBYEAR , 2001) OR LIMIT-TO (PUBYEAR , 2000))

Appendix B: Fact finding questionnaire

Basic dental training survey

Organisation:

Country:

Registration

1. Does your country have a national register of dentists?
2. What is the body who holds this register?
3. What are the criteria for entry onto that register?
4. Is there a requirement for foundation training, internship, placement year or equivalent – before full registration?

Curriculum

5. Are there any nationally agreed learning outcomes, list of subjects, or list of competences, that individuals need to meet?
6. In which year of training do students start to perform procedural skills on real patients?
7. Is there a minimum amount of clinical experience required to qualify as a dentist in your country? Please can you state what these requirements are?

Quality assurance

8. What processes are in place to quality assure the standards of training that pre-registration dental education providers deliver to students?
9. Are there any private dental schools in your country?
10. If so, are the private dental schools required to meet the same quality assurance processes as outlined in question 8?
11. Are there any differences in the expected learning outcomes between private dental schools and non-private dental schools?
12. Are there any processes to quality assure the knowledge, skills and abilities of graduating dentists such as national licensing examinations or external review of graduating standards?

Please can you share any national documents, which outline:

1. A national set of learning outcomes / competences for basic training in dentistry
2. Standards for Quality Assurance of dental programmes in your country
3. Any example Quality Assurance reports for dental schools in your country

Appendix C: Sources of data mapped against *Preparing for Practice*

For each of the tables presented in the main report mappings are based information from the following sources:

ADEE	Profile and Competences of the Graduating European Dentists, mapped due to its high profile in the literature and references to its use in several countries.
Austria	Mapped against University of Vienna only
Belgium	Federal Public Service Health Food Chain Safety & environment – 'Competences of a general dentist'
Bulgaria	Faculty of Dental Medicine, Medical University, Sofia
Croatia	University of Zagreb study programme: competences
Cyprus	Faculty of Dentistry - Cyprus International University (searched but no information available)
Czech Rep	Faculty of Medicine - Pilsen
Denmark	University of Copenhagen
Estonia	University of Tartu (searched but no information available)
Finland	Valvira (National Supervisory Authority for Welfare and Health)
France	Skills and competences of the dentist - Order national des Chirurgiens-Dentistes, linked to ADEE competences
Germany	Charite University Berlin, state of Brandenberg
Germany	NKLZ national outcome based learning catalogue for dentistry German Science Council
Greece	University of Athens undergraduate curriculum learning outcomes
Hungary	University of Szeged (searched, but no information available) University of Semmelweiss, Budapest
Ireland	Dental Council of Ireland learning outcomes
Italy	University of Milan (searched but no information available) University of Turin website - educational objectives and expected skills
Latvia	Riga University (searched but no information available)
Lithuania	Vilnius University Faculty of Medicine - study programme dentistry
Luxembourg	There are no dental schools in Luxembourg.
Malta	University of Malta Faculty of Dental Surgery
Netherlands	University of Groningen (searched but information available too limited to map) University of Amsterdam (searched but information too limited to map) University of Nijmegen (searched but information too limited to map)
Poland	University of Lodz
Portugal	Faculty of Medicine, University of Portugal State university
Romania	University of Bucharest Faculty of Dental Medicine (searched but information too limited to map
Slovakia	Pavol Jozef Safarik University, Kosice
Slovenia	Unique Master's Degree Program in Dental Medicine, University of Ljubljana
Spain	University of Barcelona
Spain	Spanish Dental Council Ministerial order
Sweden	The Karolinska Institute, Huddinge
Sweden	UKA/Swedish Higher Education Authority