Journal of Clinical Periodontology

WILEY

Journal of Clinical Periodontology

REVIEW OPEN ACCESS

Continuing Professional Development (CPD) and Vocational Education and Training (VET) in Periodontology and Implant Dentistry

Joerg Meyle[1,2] | France Lambert[3,4] | Lewis Winning[5] | Kristina Bertl[6] | Corinna Bruckmann[7] | Martin Biosse Duplan[8,9] | Peter Harrison[5] | Isabelle Laleman[3,4] | Nikos Mattheos[10,11] | Ana Molina[12] | Andreas Stavropoulos[13,14] | Yvonne C. M. de Waal[15] | Haitam Yousfi[3,4] | Henrik Dommisch[16,17] | Ioannis Polyzois[5] | Moritz Kebschull[18,19,20]

[1]Department of Periodontology, University of Giessen, Giessen, Germany | [2]Department of Periodontology, University of Berne, Bern, Switzerland | [3]Department of Periodontology, Oro-Dental and Implant Surgery, CHU of Liège, Liège University, Liège, Belgium | [4]Dental Biomaterials Research Unit, Liège University, Liège, Belgium | [5]Dublin Dental University Hospital, Trinity College Dublin, Dublin, Ireland | [6]Department of Periodontology, Dental Clinic, Faculty of Medicine, Sigmund Freud University, Vienna, Austria | [7]Clinical Division of Periodontology, University Dental Clinic, Medical University Vienna, Vienna, Austria | [8]UFR Odontologie, Université Paris Cité, Paris, France | [9]Service de Médecine Bucco-Dentaire, Hopital Bretonneau APHP, Paris, France | [10]Department of Oral and Maxillofacial Dentistry, Chulalongkorn University, Bangkok, Thailand | [11]Department of Dental Medicine, Karolinska Institute, Stockholm, Sweden | [12]Etiology and Therapy of Periodontal and Peri-Implant Diseases (ETEP) Research Group, Faculty of Dentistry, University Complutense of Madrid, Madrid, Spain | [13]Department of Periodontology, Faculty of Odontology, University of Malmö, Malmö, Sweden | [14]Division of Conservative Dentistry and Periodontology, University Clinic of Dentistry, Medical University of Vienna, Vienna, Austria | [15]Center for Dentistry and Oral Hygiene, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands | [16]Department of Periodontology, Oral Medicine and Oral Surgery, Charité - Universitätsmedizin Berlin, Berlin, Germany | [17]Corporate Member of Freie Universität Berlin, Humboldt-Universität Zu Berlin and Berlin Institute of Health, Berlin, Germany | [18]The School of Dentistry, University of Birmingham, Birmingham, UK | [19]Birmingham Community Healthcare NHS Trust, Birmingham, UK | [20]Division of Periodontics, Section of Oral, Diagnostic and Rehabilitation Sciences, Columbia University College of Dental Medicine, New York, New York, USA

Correspondence: Joerg Meyle (prof.dr.j.meyle@t-online.de) | France Lambert (france.lambert@chuliege.be)

Received: 13 March 2024 | **Revised:** 19 August 2024 | **Accepted:** 2 September 2024

Funding: The authors received no specific funding for this work.

Keywords: continuning professional development | peri-implant mucositis | peri-implantitis | periodontitis | vocational education and training

ABSTRACT

Aim: To (i) evaluate structured postgraduate part-time programs in periodontology, including those addressing peri-implant diseases, among members of the European Federation of Periodontology (EFP), (ii) the impact of the 2018 classification scheme and EFP clinical practice guidelines and (iii) propose a framework for periodontal vocational education and training.

Materials and Methods: A summary of relevant European guidelines for vocational education and training was compiled. In a survey and in a systematic review, current part-time programs in continuing professional education in periodontology as well as in prevention and management of peri-implant diseases were examined. The implementation and dissemination of the 2018 classification scheme and the EFP clinical practice guidelines were assessed by literature analysis. Based on these findings, a framework for periodontal vocational education and training was generated.

Joerg Meyle, France Lambert and Lewis Winning contributed equally to this study.

Henrik Dommisch, Ioannis Polyzois and Moritz Kebschull contributed equally to this study.

[Correction added on 5 November after first online publication. Section number has been removed and supplementary table citations has been updated in this version.]

Results: Part-time programs for professional development in periodontology are established in nine EFP member countries. The systematic review identified lack of knowledge in prevention and management of peri-implant diseases among dental practitioners and hygienists. Continuing professional development was found to be important for education in prevention, classification and management of periodontal as well as peri-implant diseases. The proposed European framework consists of an escalator model with three levels (certificate, diploma and master).
Discussion: Considering the identified variation in the national programs, there is a need to improve education in periodontal and peri-implant diseases. The proposed framework will help harmonize the national structures.
Conclusion: The proposed framework for part-time professional development is expected to enhance professional qualification.

1 | Introduction

Periodontitis is the most common non-communicable disease in humans, leading to tooth loss and independently associated with premature mortality (Winning et al. 2021). Oral diseases (mostly periodontitis) are globally responsible for more years lost to disability than any other human disease (James et al. 2018).

In addition to periodontology and the well-known traditional restorative concepts, implant dentistry has grown exponentially over the last decades and has become a standard of care in oral rehabilitation. While the initial provision of implant dentistry was limited to specialized professionals, today, straightforward implant procedures are increasingly performed by general dental practitioners (GDPs) (M. Sanz and Saphira 2009). Peri-implant diseases, especially peri-implantitis, represent a growing public health problem due to their high prevalence and their consequences (implant and implant-supported prosthesis loss), including substantial dental care costs (Herrera et al. 2023). Hence, the prevention and management of peri-implant diseases and conditions is of utmost importance and must be adequately addressed at the different levels of dental education.

Still, in Europe, there is a paucity of dentists and dental professionals with sufficient additional training in periodontology and implant dentistry for the treatment of more advanced cases of the diseases (Griffiths and Preshaw 2014).

As early as in 1996, the European Federation for Periodontology (EFP) developed guidelines for postgraduate qualification, recognizing that a specialization in periodontology and implant therapy is a prerequisite for improving the quality of care in these important fields in dentistry in European countries (EFP 2019).

Already in conjunction with the Bologna Process in 2008, a need for further specialization was discussed (M. Sanz, Widstrom, and Eaton 2008). Then the 1st European Consensus Workshop on Periodontal Education, in 2009, strongly called for a pathway for a specialization at the European level, not only in orthodontics and oral surgery but also in periodontology (M. Sanz and Meyle 2010; Van der Velden and Sanz 2010).

Since this consensus workshop (M. Sanz and Meyle 2010), four important developments within the field of periodontology and implant dentistry have been published within the last 5 years:

1. The 2018 Classification of Periodontal and Peri-Implant Diseases and Conditions (Caton et al. 2018).
2. Treatment of stage I–III periodontitis—The European Federation of Periodontology (EFP) S3 level clinical practice (M. Sanz et al. 2020).
3. Treatment of stage IV periodontitis: The EFP S3 level clinical practice guideline (Herrera et al. 2022).
4. Prevention and treatment of peri-implant diseases: The EFP S3 level clinical practice guideline (Herrera et al. 2023).

These four bodies of work are inextricably linked. As part of the range of reclassified conditions affecting the periodontium, the 2017 World Workshop presented a new approach to the classification of periodontitis incorporating the concept of staging and grading of disease (Tonetti, Greenwell, and Kornman 2018). The aim of this was to link disease classification with approaches to prevention and treatment, as it describes not only disease severity and extent but also the degree of complexity and an individual's risk.

Owing to the differences in the regulation of the educational systems in European countries, the establishment and accreditation of a postgraduate education in periodontology based on EFP guidelines was found to be challenging, especially when focusing on the 'protected' entity of a national specialist. Currently periodontology is a recognized specialty in 17 European countries (Eaton et al. 2022).

Since then, several consensus workshops from different organizations have defined diverse educational pathways to obtain competences related to not only periodontology but also implant dentistry (Donos, Mardas, and Buser 2009; Mattheos et al. 2009, 2010a) beyond the undergraduate level.

Throughout Europe, numerous programs have been implemented that provide knowledge transfer in the form of certificate, diploma and/or master's programs. The fourth level is related to the specialty programs that, in general, prepare specialists to carry out complex surgical and/or restorative treatments (Donos, Mardas, and Buser 2009; Mattheos et al. 2009, 2010a). This last level of postgraduate training will not be addressed in the present article.

The rapid development of new technologies and the ever-growing body of evidence are shaping the field of periodontology and implantology at swift pace, making life-long learning essential. In addition to the Bologna process governing primary education, a second framework for vocational education and training (VET) exists at the European level that focuses on learners already in the workforce, taking into account their

experience and perspectives to up-skill and re-skill. VET programs today are increasingly structured into smaller modules or units, and there is evidence that several countries have introduced more flexible approaches that allow learners to accumulate smaller parts of qualifications that are assessed separately (Cedefop 2023a). Therefore, a more differentiated view might be more appropriate to optimize treatment options for our patients, taking into account that not all patients with periodontitis will require the services of a fully qualified specialist but might be well served by a dentist with an additional qualification below that level.

Importantly, these concepts are designed to complement the highest qualification level of specialist, rather than to offer an alternative, in view of the significant requirements for skilled healthcare practitioners.

2 | VET in Periodontology in Europe

2.1 | Aim of Review

The objective of this review was to provide an overview over the European regulations and recommendations for life-long learning and upskilling, and to get a more detailed picture based on a survey which was sent to all national societies, which are members of the EFP. As a consequence, recommendations are given for possible VET programs in periodontology after graduation.

2.2 | Methods

Based on the European regulations and recommendations provided by different institutions of the European Union (EU), a short overview over professional qualification and VET is provided. For this purpose, the publications and recommendations of the EU and its affiliated institutions available on the websites of the EU, that is, the European Qualifications Network (Europass) and the European Center for the Development of Vocational Training (CEDEFOP), served as the sources of information (Cedefop 2023b; Europass 2008).

In addition, the current situation in periodontology in the different European countries was investigated by a survey in the form of an Excel-based questionnaire. This was distributed by mail via the secretary of the EFP to the EFP delegates of all member countries plus Armenia, Georgia and Morocco and to the International Associate members: Argentina, Australia, Brazil, Lebanon, Mexico, Singapore, Taiwan and Uruguay. They were asked to contribute within a given time. Two gentle reminders were sent and the information received until September was gathered in one file. The respondents were contacted personally, in case of missing information.

Based on the European VET initiative, the outcomes from the survey and in consideration of the recommendations provided by the first European workshop on education, organized by the EFP, a proposal for a VET program in periodontology is proposed (M. Sanz and Meyle 2010; Van der Velden and Sanz 2010).

2.3 | Results

2.3.1 | Regulatory Background in Europe

Education is regulated in the EU through various routes or 'processes', usually named after the European city where the agreement was reached. Regulation of education is not a core competence of the EU; that is, educational processes are not directly regulated by Brussels, but rather influenced by the development of common principles and tools that are also generally applicable to non-EU countries. In dentistry, a life-long learning process is becoming increasingly important, as medical knowledge doubles approximately every 72 days (Densen 2011).

This review focuses on structured postgraduate education for already qualified practising dentists after ending their formal training. These educational measures, often (inappropriately) summarized as continuing professional development (CPD) courses, are no longer 'primary' educational programs leading to a first qualification but intend to flexibly up-skill and/or re-skill the existing workforce to meet new challenges and opportunities. They fall under the umbrella of 'Vocational Education and Training' (VET), loosely governed by the Bruges-Copenhagen Process, initiated by the EU institutions with the Declaration of Copenhagen in 2002 and further developed in the Communiqués of Maastricht (2004), Helsinki (2006), Bordeaux (2008) and Bruges (2010), the Conclusions of Riga (2015) and the Osnabrück Declaration (2020) (Cedefop 1994, 2010; 2020).

The major governing principles of the Bruges-Copenhagen Process are the following:

i. Life-long learning at any career stage, allowing for a step-wise, often flexible, part-time progress along the entire qualification range in the European Qualifications Framework (EQF) (Europass 2008); and
ii. Linked to the above, to ensure mobility of learners by introducing a qualification and credit transfer scheme.

Based on the current prevalence of periodontitis in the adult population, there is a need for VET, especially in relation to the demographic changes in the adult population in many European countries. This concept is further supported by the increasing number of patients who receive dental implants, as a considerable percentage may develop peri-implantitis (Derks et al. 2016; Derks and Tomasi 2015).

2.3.2 | The European Higher Education Area and the EQF

The EQF is an eight-level learning outcomes–based framework for all types of qualifications that serves as a translation tool between different national qualifications frameworks (Table 1) (Europass 2008). This framework helps improve the transparency, comparability and portability of people's qualifications and makes it possible to compare qualifications from different countries and institutions.

TABLE 1 | Description of the levels of the European Qualifications Framework (EQF), reproduced from Europass (Europass 2008).

Level	Knowledge	Skills	Responsibility and autonomy
1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
4	Factual and theoretical knowledge in broad contexts within a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
5	Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
6—Dentist	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialized field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
7—Perio Master	Highly specialized knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialized problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
8—Perio Specialist	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialized skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

The EQF covers all types and levels of qualifications, and the use of learning outcomes makes it clear what a person knows, understands and is able to do. The levels increase according to the level of competency, level 1 being the lowest and level 8 being the highest. The learning outcomes are defined in three different categories: knowledge, skills, responsibilities and autonomy.

The EQF levels are compatible with the framework for qualifications in the European higher education area (EHEA), created by the Bologna process (EHEA 2005; Ministers in charge for France 1998).

In the EHEA, three cycles have been described corresponding to levels 6, 7 and 8 of the EQF: Cycle 1: Bachelor level, Cycle 2: Master level, Cycle 3: Doctoral level (EHEA 2005).

2.3.3 | European Credit System for Vocational Education and Training

This system, the European Credit system for Vocational Education and Training (ECVET), is similar to the better known European Credit Transfer System (ECTS) that underpins the programs governed by the Bologna Process (EHEA 2015), but focuses on professionally applicable learning outcomes, rather than simply assessing academic workload (Cedefop 2009).

ECVET tools and methodology comprise the description of qualifications in terms of units of learning outcomes with associated points, a transfer and accumulation process and complementary documents such as learning agreements, transcripts of records and ECVET user guides.

A unit is a component of a qualification, consisting of a coherent set of knowledge, skills and competence that can be assessed and validated with a number of associated ECVET points. In principle, a qualification consists of several units and is made up of the whole set of units. Thus, a learner can achieve a qualification by accumulating the required units, achieved in different countries and different contexts (formal and, where appropriate, non-formal and informal), in compliance with national legislation on accumulation of units and recognition of learning outcomes.

A unit may be specific to a single qualification or common to several qualifications. The expected learning outcomes that define a unit can be achieved regardless of where or how they are achieved. A unit is therefore not to be confused with a component of a formal program of study or training. There are some requirements for the composition and properties of a unit (Table S2.1).

Procedures and guidelines for the assessment, validation, accumulation and recognition of units of learning outcomes are developed by the relevant competent institutions and partners involved in the training process. Similar to the European ECTS, 60 ECVET credits are the equivalent to a full year of study or work in VET.

2.3.4 | Outcomes From the Survey: Types of VET in Periodontology—Current Situation in Some European Countries

Part-time VET programs are currently accredited in Austria, France, Germany, Luxembourg, Spain and Singapore, where postgraduate students with some or significant practical experience are accepted (Table S2.2).

There are variations in length and content. Based on the ECVET system, a maximum number of 120 ECVET points is achievable in 2 years, but it would require full-time education and study.

In the supplementary material, only programs that are offered by universities or scientific societies, either in collaboration or independently, are listed (Table S2.2).

2.3.4.1 | Armenia. In Armenia, a short part-time program is offered leading to a certificate in periodontology.

2.3.4.2 | Austria. In Austria, the nationally regulated pathways to specialization in dentistry are limited to orthodontics—and this pathway has just been opened recently.

On the other hand, there exist multiple VET level 7 courses leading to a Masters' degree at Austrian universities that are accredited by the Austrian national accreditor.

Recently, the Austrian Society of Periodontology (ÖGP) together with the Austrian Dental Board set up a short curriculum (6 months) consisting of five modules (eight ETCS) that entitles the graduates to use this board diploma on the official dentist list.

2.3.4.3 | France. In France, two main types of part-time programs are established: the certificate is the lowest level, and above that the Diploma of the university (DU) is a structured program (Table S2.2). They are organized locally by each university and officially recognized by the national dental chamber (registry board). The content and duration vary from one university to another. Scientific societies, such as SFPIO (French Society of Periodontology and implantology), and private institutions also offer continuing professional education courses in periodontology.

2.3.4.4 | Germany. In some regions of the country, structured continuing education in periodontology and implant therapy has been established for many years. These programs are accredited by the local dental chambers.

After successful completion, the participants receive a certificate, and as soon as they demonstrate to the chamber a certain number of completed periodontal treatments, they are permitted to display to the public that their practice has a focus on periodontology.

In addition, there are some part-time Masters' programs that are established at different universities and have been accredited at the national level (Table S2.2). They are structured in a number of different modules, which may be offered at the same place or at different universities.

Importantly, some of these courses on level 7 can be upgraded to the level of specialization accredited by the National Society, the German Society of Periodontology (DGPARO), via an at least yearlong structured program, working with universities and other large accredited institutions to deliver an additional 60 credits.

2.3.4.5 | Italy. In Italy there are modular part-time VET courses at four different universities, which are offering a

Masters' degree. Their length varies, as well as the ECVET credits given.

2.3.4.6 | **Lithuania.** Periodontology is recognized as a dental specialty. There are currently no part-time programs offered.

2.3.4.7 | **Luxembourg.** Luxembourg does not have any university offering undergraduate dentistry degrees. On the other hand, it is centrally located in Europe and an attractive destination for professionals from neighbouring countries and is also home to a broad range of European institutions that are keen to implement European frameworks. At this point, a postgraduate university for medicine and dentistry, the DTMD University, is active in Luxembourg and across Europe and Asia, offering accreditation agency and ISO-certified programs of EQF levels 6, 7 and 8 in the field of periodontology, that is, from a VET certificate to professional doctorate levels.

2.3.4.8 | **Portugal.** In Portugal, three programs are available ranging from 6 to 180 ECVETs.

2.3.4.9 | **Singapore.** A non-modular program is offered in Singapore (Table S2.2).

2.3.4.10 | **Spain.** There are more than 20 dental schools in Spain. Some of them belong to public universities (12) and others belong to private ones. In addition, some scientific societies, such as SEPA (Spanish Society of Periodontology), offer VET courses (some in collaboration with the university), and there is also an enormous catalogue of courses offered by private institutions (such as dental clinics/groups, private training institutions not affiliated to universities or even private practitioners). Recently, the Spanish law on postgraduate education has been amended, which now enforces a split of certain 3-year Masters' programs into two parts: a 2-year Masters' program and a consecutive 1-year program, to complete a 3-year education program. In this way, the programs comply with the Spanish law and follow European guidelines. It is important to note that in some Spanish universities, credits are based on a workload of 10 h instead of the 25 h required by the EU (EHEA 2015).

2.3.4.11 | **United Kingdom.** The United Kingdom is home to a broad range of well-established universities and higher education establishments, offering both postgraduate degrees in periodontology leading to the UK and/or EFP specialist, as well as VET programs at levels 6 and 7. Importantly, these VET programs, in line with the European regulations, do not necessarily need to be run by universities—if necessary quality controls are in place, VET programs run by private institutions and also by for-profit institutions can be (and are) accredited.

2.3.4.12 | **Other European Countries.** In Belgium, Croatia, the Netherlands, Sweden and Turkey, there are no part-time structured VET programs.

As Table S2.2 shows, there are considerable differences in the VET activities in the different European countries. This may be due to the fact that there are also differences in the legal situation in the different countries.

2.3.5 | Accreditation Procedures

The programs are accredited either by the national scientific societies or by accreditation agencies recognized by the states. For evaluation, the agencies contract dental education professionals (e.g., academics/professors in periodontology from national and/or international universities). Some institutions may, in addition, be accredited by more than one agency or by multiple agencies across national borders and/or be ISO-certified.

2.3.6 | Proposal for a Part-Time VET System in Periodontology

A part-time VET-system should respect the current European trends, and therefore the design should have a modular structure (Cedefop 2023a).

A proposed VET qualification structure in periodontology is presented in Figure 1, which is based on the EQF.

For dentists in private practice with a vital interest in periodontics, there could be at least three different steps for further professional qualification. On successful completion of a basic VET program, a 'Certificate in Periodontology' will be awarded (Figure 1). Further qualification and clinical experience will lead to a 'Diploma in Periodontology', which may be followed by a 'Master in Periodontology' degree (Figure 1). This degree also requires the preparation of a master thesis. Each level should consist of different units, and each unit should be composed of a number of courses that ensure a high level of education and professional development.

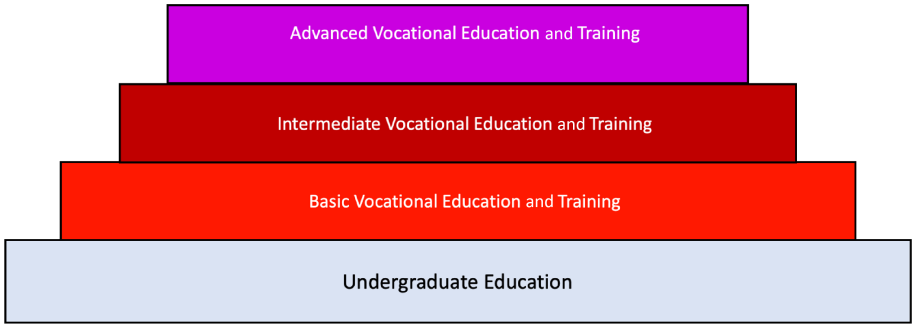

FIGURE 1 | Suggested modular system for vocational education and training (VET) in periodontology. The intermediate level may be awarded by a diploma and represents a step between basic VET and advanced VET.

2.3.7 | Levels of Qualification and Learning Outcomes

The education comprises of a number of units. Each unit consists of a number of different courses, which are based on the list of learning outcomes in Tables 2 and 3. The whole program for each student is provided by a university or a comparable officially recognized scientific organization. Students are free to select different courses within the units at different accredited universities, but the exam at the end of each unit should be taken at their home organization.

After successful completion of further education in basic aspects of periodontology (basic VET), a certificate will be provided. It comprises 20 ECVETS. Three well-documented, focused cases should be presented at the end.

An additional structured program consisting of a series of units covering all different diagnostic and therapeutic topics will offer a diploma in periodontology. At the end, five additional patient cases should be documented. One of these should be presented and defended in front of the group.

For the further educational level (diploma), a total of additional 30 ECVETS can be achieved. Upon completion of both the certificate and diploma, the candidates will have earned a total of 50 ECVETS.

As a part-time program, the advanced level (master) encompasses in-depth seminars and lectures covering all areas of periodontology, implant therapy and peri-implantitis therapy. In addition, two cases will be enrolled and documented in the system. Together with the master's thesis, a total of 70 ECVET credits can be achieved.

Successful completion of all three levels of VET will result in a total of 120 ECVET credits.

In addition to in-depth learning, the EQF (Table 1) emphasizes not only knowledge but also skills as part of the VET. Therefore, clinic placement and supervision of clinical practice should be part of all programs.

For the different levels in the VET program, learning outcomes have been defined and describe what a participant is expected to know or be able to do after completing a certain VET level. The learning outcomes on the three different escalator steps are based upon the undergraduate learning outcomes defined in the paper from Working Group 1. See the attached table for a detailed list of the proposed learning outcomes for the three VET levels.

Learning outcomes are typically characterized by the use of active verbs, and six categories were identified (Bloom 1956): knowledge (K) comprehension (C), application (A), analysis (AN) synthesis (S) and evaluation (E). A detailed description is provided in Table 2.

In addition to the learning outcomes at graduation, Table 3 provides a detailed description of learning outcomes for the different levels in the escalator model.

TABLE 2 | List of useful examples of verbs decribing learning outcomes (Bloom 1956).

Category	Description
Knowledge (K)	Duplicate, state, relate
Comprehension (C)	Classify, describe, recognise, review
Application (A)	Apply, demonstrate, solve
Analysis (AN)	Calculate, analyse, appraise, criticise
Synthesis (S)	Assemble, construct, plan, formulate
Evaluation (E)	Appraise, argue, predict evaluate

2.3.8 | Prerequisites for Participation

Successful completion of a degree in dentistry in a member country of the EU, or to a standard comparable to universities in the EU, is the basis for further qualification. It is also recommended that the candidates have at least 1 year of experience working as a general dentist. Enrolment requires passing a standardized written test, followed by an interview.

Based on existing experiences, the total time required for the acquisition, diagnostics, treatment, documentation and discussion of a case (including the literature research) is approximately 110 h, equivalent to 4.4 ECVETs.

A total of 10 cases should be documented and submitted to the system, and in all cases follow-up evaluations of at least 1 year should be part of the reports. One case per student from the entire collection should be presented.

2.3.9 | Teaching Methods and Examinations

The Corona virus pandemic has accelerated the implementation of different digital tools in higher education. In this respect, part of the curriculum can be offered in the form of blended learning, that is, combining traditional face to face (F2F) sessions with online educational resources. This method incorporates the benefits of online course delivery without the omission of conventional F2F interaction (Ullah et al. 2021).

In all cases, it is necessary to test the knowledge and skills at the end of the units by a written examination, in which the students will have to demonstrate their knowledge and increasing competencies. The choice of form and timing of assessments can also serve to support the flexibilization and individualization of the programs (Cedefop 2023a).

2.3.10 | Accreditation

Owing to differences in national legislation, applications for accreditation should be submitted to the national authorities. In future, it may be advantageous if a scientific authority like the

TABLE 3 | Learning outcomes for the different qualifications in the escalator model (basic, further, advanced).

No.	Domain	Grad.	Basic	Intermediate	Advanced
Domain I: Professionalism					
1.1	Ethics				
1	Apply the moral and ethical standards involved	A	A	A	A
2	Place the patient at the centre of care	A	A	A	A
3	Obtain informed consent by providing adequate information	C	A	A	A
4	Respectful approach to the environment	C	A	A	A
1.2	Regulation				
	Minimize possible health risks	A	A	A	A
	Comply with the legislative and administrative processes	A	A	A	A
1.3	Professional behaviour				
1	Demonstrate practical skills	A	A	A	A
2	Integrate contemporary knowledge	K	A	A	A
3	Use appropriate professional behaviour	A	A	A	A
4	Reflect own decisions, actions and performance	AN	AN	AN	AN
Domain II: Safe and effective clinical practice					
2.1	Evidence-based practice				
1	Use evidence-based knowledge	A	AN	S	E
2	Evaluate critically the validity of claims	E	E	E	E
2.2	Management and leadership				
1	Implement team work and leadership skills	A	A	AN	E
2	Identify, manage and minimize adverse events	A	AN	S	E
2.3	Teamworking and communication				
1	Communicate effectively, interactively and reflectively	A	AN	S	E
2	Provide relevant information	C	A	AN	S
3	Generate a patient–dentist relationship	A	A	A	A
4	Recognize when and how to share information	C	C	A	A
2.4	Audit and risk management				
1	Carry out a safe clinical practice	A	AN	S	E
2.5	Professional education and training				
1	Promote time management skills	A	AN	S	E
2	Recognize their own limitations	A	AN	S	E
3	List available career choices	A	AN	S	E
4	Generate self-learning	A	AN	S	E
Domain III: Patient-centred care					
3.1	Application of the scientific basis in periodontal/peri-implant health care				
1	Scientific basis of periodontal and peri-implant health	K	A	AN	S

(Continues)

TABLE 3 | (Continued)

No.	Domain	Grad.	Basic	Intermediate	Advanced
2	Aetiology and pathogenesis of periodontal and peri-implant diseases	K	A	A	AN
3	Aetiology and pathogenesis of halitosis	K	A	A	A
4	Associations between periodontal or peri-implant diseases	K	A	AN	S
5	Healing processes following tooth extraction	K	A	AN	S
3.2	Gathering clinical information for the diagnosis				
1	Obtain and interpret a medical and dental history	A	AN	S	E
2	Examine the subject extra- and intra-orally	A	AN	S	E
3	Carry out a comprehensive periodontal/ peri-implant assessment	A	AN	S	E
4	Determine the necessity of conducting radiological diagnoses	A	AN	S	E
5	Select the cases that may benefit from additional diagnostic techniques	A	AN	S	E
6	Apply the current classification	A	AN	S	E
3.3	Care planning				
1	Assign the individual (tooth/implant) and general prognosis	A	A	A	A
2	Generate alternative care options	K	A	AN	S
3	Inform the individual about the diagnoses, the prognoses, etc.	A	AN	S	E
4	Develop a comprehensive prevention program	A	AN	S	E
3.4	Establishing and maintaining periodontal/peri-implant health				
1	Use validated risk factors control protocols	A	AN	S	E
2	Assess individual's oral hygiene	A	AN	S	E
3	Carry out supra and subgingival/ submarginal instrumentation	A	AN	S	E
4	Flap surgery	K	C	A	AN
5	Advanced flap surgery	K	K	C	A
6	Surgical implant therapy[a]	K	C/C[a]	A/C[a]	AN/C[a]
7	Management of peri-implant diseases	K	C	A	AN
8	Manage acute lesions	A	AN	S	E
9	Evaluate the individual response to therapy	A	AN	S	E
10	Determine the indications and identify the objectives	A	AN	S	E
11	Carry out infection control and pain management	A	AN	S	E
12	Implement personalized supportive periodontal/peri-implant care	A	AN	S	E
Domain IV: Dentistry in Society					
4.1	Dental Public Health				
1	Identify the social determinants of health	K	A	AN	S

(Continues)

TABLE 3 | (Continued)

No.	Domain	Grad.	Basic	Intermediate	Advanced
2	Comply with and contribute to dental public health	A	AN	S	E
3	Recognize the epidemiology of periodontal/peri-implant diseases	K	A	AN	S
4	Identify the structure and components of the healthcare systems	K	A	AN	S
5	Recognize the importance of collaboration	K	A	AN	S

Note: Grad. = learning outcome at graduation, Basic = level of certificate, Intermediate = level of diploma, Advanced = level of master. For the definition of the learning outcome levels, see Table 2.

[a] Treatment of biological implant complications/Surgical placement of dental implants.

EFP provides a confirmation that the national system is based on the common European standards.

2.4 | Discussion

In the past, the European strategy towards a harmonization of the educational systems has generated many efforts, and the Bologna process has initiated many changes and adaptations in the different European countries (European Ministers of Education 1999).

In addition to 'primary' education and learning, that is, the processes leading to a primary qualification, the main objective of Cedefop (European Centre for the Development of Vocational Training) is to enable a 'life-long learning for all', that is, an environment allowing for 'secondary' upskilling and reskilling the existing workforce (Cedefop 2023b). This initiative is of special importance in medicine and dentistry. Given the rapid changes in the medical field, both in scientific knowledge and clinical practice, it is self-evident that life-long learning and regular upskilling are prerequisites for best clinical practice and a commitment to patients.

Many of our colleagues are thus willing to improve their skills and to invest a considerable amount of time and money, but it will not be a good substitute for traditional university-based full-time programs leading to a primary qualification, because these programs were not designed to take into account their commitments to practices and families, which render dropping out of the workforce for prolonged periods rather challenging.

Europe with its many nations and key problems of demographic nature, but also key commonalities and a clear spirit of common standards and science-driven endeavours, delivers a strong mandate for us as professionals to share our knowledge and to help in the upskilling of our colleagues, and to enable life-long learning. VET in periodontology and implant dentistry should build on the shoulders of what has previously been achieved, and therefore the learning outcomes that have been defined for undergraduate education are the basis for further improvements during professional life.

The three-level structure of the proposed framework for VET in periodontology in Europe offers the possibility to start focusing only on the accomplishment of the 'Basic VET', which is to be documented by a certificate. The next level, the 'Intermediate' or 'Further' VET can follow immediately or at a later date. This will facilitate combining these trainings with daily practice. The 'Advanced VET' level will lead to the 'Master in Science' degree, which is a great achievement for all who are participating in these part-time programs.

Importantly, the framework puts a strong emphasis on the practical, patient-focused professional skills of the VET students. The assessment of a structured and evidence-based documentation of 10 successfully treated, in part complex, periodontal patient cases in all three levels combined is a minimum requirement emphasizing the key role of demonstrated clinical competencies in these programs. This number proposed herein is well in line with the documented reality in accredited programs around Europe (c.f. above) and will allow for significant insights into the capabilities of individual candidates to assess and address their strengths and weaknesses.

VET in periodontology should be supervised by the EFP, which represents the most competent institution in this field. Supervision should be documented by a regulated accreditation process.

All national activities should follow common guidelines not only as regards the structure and the contents of the programs but also the qualifications of the teaching staff. It would be very beneficial if a common database could be established. Sanz already in 2008 reported on the heterogeneous situation as regards prostgraduate education and specialization. Still, in 2021, a common European database is lacking (Dixon et al. 2021; M. Sanz, Widstrom, and Eaton 2008).

Many teaching methods have been developed, and blended learning is one of the most advanced concepts in vocational education.

Skills development in addition to theoretical knowledge is of critical importance since periodontists are seeing patients on a daily basis and should be able to provide sophisticated treatment. Depending upon the legal situation in the different countries, there might be limitations, as not all concepts can be learned using models, dummy patients or pig jaws.

2.5 | Conclusions

Critically, in line with the European regulations on VET, 'life-long learning' is a reality today and there is thus a clear need for

the provision of continuous and follow-up refresher training to maintain and preserve a training standard and to possibly upskill further. Indeed, there are several opportunities, often supported by the National Societies, for example, during national and international conferences, offering a wide range of training options in specific areas of periodontology. Dentists and dental professionals at all levels of training require continuous and documented updating of skills and knowledge from accredited and quality-controlled providers.

It is in the spirit of the VET that maximum of freedom is part of the concept focusing on the outcomes of the programs. Apart from language barriers, common standards open the doors for exchange at the international (European) level (Cedefop 2023a).

3 | Addressing Peri-Implant Health and the Management of Peri-Implant Diseases During Continuing Professional Development: A Scoping Review

3.1 | Aim of Review

There is a wide variety of CPD educational pathways in implant dentistry, ranging from product training organized by companies to 3-year full-time academic postgraduate programs leading to specialist degrees (Figure 2A,B). The differences between them are mainly in the following areas: the duration (from a hours to 3 years full-time programs), the organization (e.g., companies, scientific organizations, national societies, private institutions and universities), content/learning outcomes (basic, specific to comprehensive), educational methods (e.g., theoretical, hands-on training, clinical training and/or mentoring) and teaching concepts (face-to-face teaching, blended teaching and learning and other online formats).

Therefore the present study aimed to

- investigate the current attitudes and needs for CPD in the field of implant dentistry with a specific emphasis on the prevention and management of peri-implant diseases among practising dental professionals and CPD providers;
- analyse the existing recommendations from consensus meetings regarding CPD for the prevention and management of peri-implant diseases;
- identify the necessary updates or developments of the competencies and skills required for the prevention and management of peri-implant diseases, based on the recently published classification of peri-implant diseases and conditions (Berglundh et al. 2018; J. G. Caton et al. 2018), and the EFP S3 clinical practice guidelines (Herrera et al. 2023);
- explore recognized national and international programs on periodontology and/or implant dentistry in Europe leading to accredited certificates, diplomas or Masters' degrees for educational content on (a) implant dentistry (ID) and (b) the prevention and management of peri-implant diseases (PMPID); and
- provide suggestions for the development of a comprehensive approach in addressing the prevention and management of peri-implant diseases in implant dentistry CPD programs.

More specifically, the focus research questions (RQs) were the following:

1. According to practising dental professionals and CPD providers, what are the needs for CPD in the field of implant dentistry regarding the prevention and management of peri-implant diseases? (RQ1)
2. What is the educational content of nationally/internationally recognized programs in periodontology and/or implant dentistry leading to accredited certificates, diplomas or Masters' degrees concerning (a) implant dentistry and (b) the prevention and management of peri-implant diseases? (RQ2)

3.2 | Methods

The first research question (RQ1) focused on the needs for CPD in the field of implant dentistry regarding the prevention and

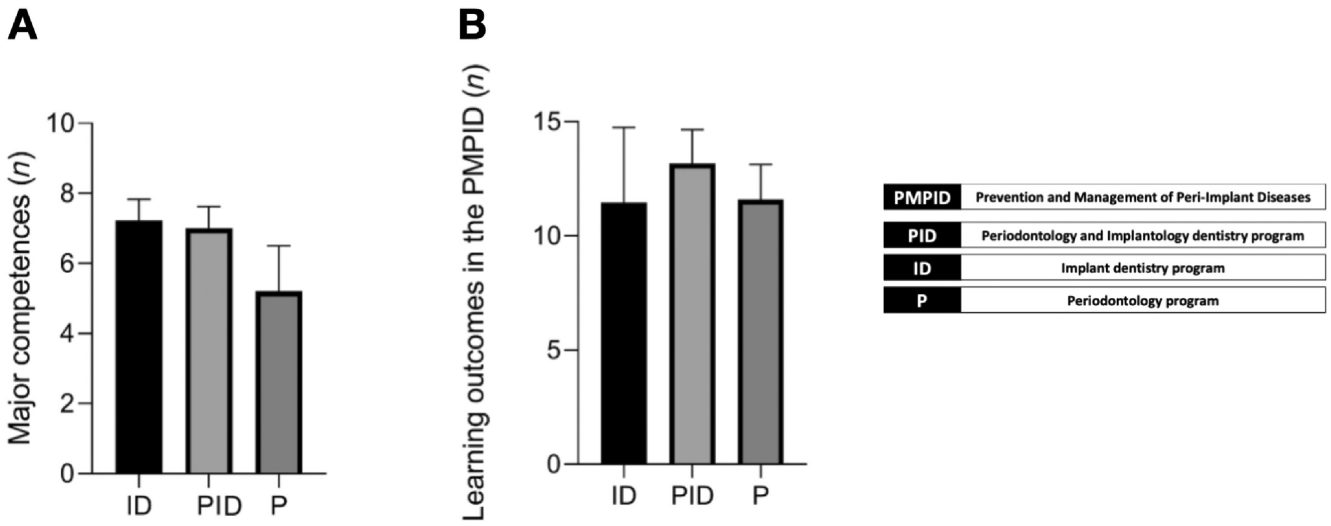

FIGURE 2 | Major competences (A) and learning outcomes in the PMPID (B) according to the type of program.

management of peri-implant diseases based on surveys questioning practising dental professionals and CPD providers.

3.2.1 | Search Strategy

A systematic electronic search was performed in July 2023 on PubMed, Embase and the Cochrane Library. The search strategy for PubMed can be found in Table S3.1. Additional hand searches included the bibliographies of previous reviews/consensus papers on this subject and of all included full-text articles.

3.2.2 | Eligibility Criteria

Inclusion criteria were as follows:

- Original articles describing CPD related to implant dentistry (questionnaires, surveys, etc.);
- Among all types of dental professionals (hygienists, GDPs, dental specialists, etc.) or CPD providers;
- Published from 2010 (after the 1st European Workshop on periodontal education);
- Reporting data on peri-implant health and diseases;
- At least 20 respondents;
- Articles published in English, French or Dutch.

Exclusion criteria were the following:

- Reviews and consensus papers;
- Published before 2010;
- Fewer than 20 respondents;
- No relation to implant dentistry.

3.2.3 | Study Selection

After eliminating duplicates, the reviewers (H.Y., I.L.) independently screened titles/abstracts and subsequently the full texts with the online application Covidence. If the decision was inconclusive after title/abstract screening, these articles were included for full-text screening. Any disagreement regarding inclusion and exclusion during the full-text screening were resolved through discussion between the two reviewers. To assess their agreement, Cohen's kappa coefficient (κ) was calculated (Landis and Koch 1977).

3.2.4 | Data Extraction

The attitudes and needs of dental professionals (GDPs and dental hygienists) regarding the prevention and management of peri-implant diseases were extracted from surveys according to the inclusion and exclusion criteria. Data were stratified according to their profiles, attitudes regarding the diagnostic, preventive and therapeutic measures and the reported needs for CPD. Surveys among educational/CPD providers were also examined in order to identify the specific needs for further developments. Formats, methods and regulation aspects for CPD were not addressed in the present review.

To answer the second research question (RQ2), information was sought regarding the content and learning outcomes of European national or international structured programs in periodontology and/or implant dentistry. The criteria for program inclusion were the following:

- CPD training programs for GDPs in practice (part-time, extra-occupational);
- Comprehensive CPD programs in periodontology and/or implantology leading to accredited certificates, diplomas or Master's program and structured in several modules or teaching units (levels 2 and 3) (Master's degree's leading to a specialty and/or to an EFP-accredited award were not included);
- Programs recognized by universities, local scientific organizations in periodontology or implantology or notified regulatory bodies (dental chambers, councils, etc.).

In this review, selected European CPD programs in the field of periodontology and implant dentistry were identified as recognized programs, and their content and learning outcomes were analysed.

The selective identification of the national programs was based on the recommendations from opinion leaders in the field as well as national societies of periodontology and/or implantology in representative countries. Information regarding the practical details and the content (learning outcomes) was collected based on the official programs retrieved from their website or provided by the institutions. General data related to program type (periodontology/periodontology and implant dentistry/implant dentistry), type of degree (certificate, diploma, master's), ECTS or CPD hours (prerequisites, and teaching modes [theoretical, hands-on, clinical internship, mentoring and case documentation]) were collected. Additionally, the program content regarding learning outcomes (a) in implant dentistry and (b) in the prevention and management of peri-implant diseases was extracted. The clinical competencies in implant dentistry were stratified as outlined in the 1st European Consensus Workshop on Implant Dentistry University Education (Donos, Mardas, and Buser 2009) and only the major competencies were identified. Regarding the prevention and management of peri-implant diseases, as the training standard are not yet structured, we defined the competencies based on the recently published Clinical Practical Guidelines (Herrera et al. 2023) as follows:

- Classification, prevalence and physiopathogenesis of peri-implant diseases;
- Assessment of the patient's risk profile (history of periodontitis, poor plaque control, poor glycaemic control, bruxism/oral parafunction, smoking status);

- Management of modifiable risk/indicators factors;
- Education and motivation of the patient for oral hygiene and home care;
- Promotion of professional periodontal and implant supportive care;
- Assessment of periodontal conditions and periodontal therapy to achieve periodontal stability before implant placement;
- Alternatives to dental implants with conventional prosthetic procedures;
- Dental implant treatment planning: adequate 3D implant positioning;
- Assessment and management of hard- and soft-tissue quality/quantity (prior to, during and after implant therapy);
- Management of implant-supported prosthesis design allowing optimal plaque control (modifying the implant-supported prosthesis to enable oral hygiene access);
- Follow-up, monitoring and maintaining peri-implant health (primary, secondary prevention);
- Diagnostics of peri-implant diseases (peri-implant mucositis/peri-implantitis);
- Management of peri-implant mucositis;
- Non-surgical management of peri-implantitis;
- Surgical treatment of peri-implantitis using open flap procedures, resective procedures and reconstructive procedures (including decision making);
- Augmentation of peri-implant soft tissues.

For ethical reasons, the collected data regarding the institution's identities and origins of the listed programs were kept anonymous.

Program characteristics, competencies and learning outcomes data were collected and analysed using Microsoft Excel (Figure 2A,B).

3.3 | Results

The systematic search (RQ1) retrieved one study focusing on CPD providers (Cheung, Hopcraft, and Darby 2020) and seven studies examining dental professionals (Cheung, Hopcraft, and Darby 2019, 2021; Cheung et al. 2016; Jayachandran et al. 2015; Lang-Hua et al. 2013; Rudeejaraswan et al. 2021; Ward et al. 2012; Zellmer et al. 2020). One study was split up in two publications: in 2019 Cheung et al. described the implant education patterns of the respondents to their questionnaire and in 2021 the preferences in implant maintenance and hygiene instruction from the same group of respondents (Cheung, Hopcraft, and Darby 2019, 2021).

3.3.1 | Dental Professionals

The studies questioning dental professionals are summarized in Table S3.2. They were heterogenous in study set-up and the group of dental professionals examined. Five studies questioned GDPs and two looked at dental hygienists. Two of them were carried out in Australia (by the same group) and two in the United States; the others were carried out in Thailand, China and the United Kingdom.

3.3.1.1 | Attitudes and Needs. Of the respondents, 78%–99.7% believe that GDPs have a role in implant maintenance (Cheung, Hopcraft, and Darby 2021; Rudeejaraswan et al. 2021) and 25%–88.9% of GDPs do carry out implant maintenance themselves (Cheung, Hopcraft, and Darby 2021; Cheung et al. 2016; Lang-Hua et al. 2013; Rudeejaraswan et al. 2021). One study questioned the obstacles for GDPs to perform implant maintenance themselves (Rudeejaraswan et al. 2021). The two most important reasons were insufficient knowledge and training (50.5%) and lack of a properly equipped clinical environment (30%). The other arguments for this were the policy of the clinic, which restricted such procedures to specialists, and the belief that implant maintenance should be the responsibility of the dentist who initiated implant treatment (Rudeejaraswan et al. 2021). The latter was also mentioned in a study done in the United Kingdom, where only 2 (of the 87) respondents answered that it was the responsibility of the referring dentist to maintain implant restored mouths; the majority thought this was up to the specialist who provided the implant provision (Jayachandran et al. 2015).

In another study, 90.4% of GDPs indicated that they should be able to detect the signs of peri-implant diseases or technical complications with the implant prosthesis (Rudeejaraswan et al. 2021). In the same study, 65.3% of the respondents stated that they knew the causes of peri-implant diseases (Rudeejaraswan et al. 2021). In 2016, 96% of the questioned GDPs said that they did perform implant-specific diagnostic procedures (Cheung, Hopcraft, and Darby 2021). Whitin the same group, 41.9% of the group treated peri-implant mucositis and 18.2% treated peri-implantitis themselves (Cheung, Hopcraft, and Darby 2021).

The studies examining implant maintenance by dental hygienists focused more on their clinical practices than their attitudes (Ward et al. 2012; Zellmer et al. 2020). A major hurdle, reported in the study conducted by Zellmer et al. (2020) surveying 2018 dental hygienists, was that 44% reported difficulty removing plaque around implants compared to natural teeth.

3.3.2 | CPD Pathways

The majority of the studies questioned the source of knowledge about implants. Most of the questioned GDPs mentioned that their knowledge about implants is mainly based on what they learned during different types of CPD rather than during their undergraduate education (Rudeejaraswan et al. 2021). In the study of Jayachandran et al. (2015), 23% of GDPs from the United Kingdom answered that they did not have any implant training at all in their undergraduate education.

Two studies examined the highest implant training levels. For 7.9%–8% of the respondents, this was postgraduate non-specialist education. For 73.3%–86.6%, this was based on CPD courses

(Cheung, Hopcraft, and Darby 2019; Cheung et al. 2016). The most cited CPD courses were those organized by implant companies (60.7%–86.6%), followed by those by associations/societies (58.7%) and by universities (31.25%–36%) (Cheung, Hopcraft, and Darby 2019; Cheung et al. 2016). In contrast, Lang-Hua et al. (2013) found that most of the Chinese respondents to their questionnaire obtained their implant training through university CPD (75%).

Zellmer et al. found that for dental hygienists, continuing education courses were the most important source for knowledge about implant maintenance, as cited by 91%. The second and third most important sources were magazines (83%) and their employer/dentists (70%). One-third of the respondents mentioned that they did not receive or had limited information about implant (maintenance) during their undergraduate training (Zellmer et al. 2020). Dental hygienists whose undergraduate training did not cover implant maintenance were more likely to attend CPD on implant care than those whose undergraduate training included this content (Ward et al. 2012).

3.3.3 | CPD Providers

One survey examined dental implant maintenance teaching among education providers for dental professionals of all levels (from undergraduate and CPD to postgraduate diplomas and specialization) (Cheung, Hopcraft, and Darby 2020). The 43 different programs that were evaluated comprised 10 CPD programs for dentists and 2 for oral health providers (dental hygienists, dental therapists, oral health therapists).

Lectures emerged as the most popular format to teach implant maintenance content in CPD courses (used by 100% of them). On the other hand, none of them included supervised practice or a mentorship program. Concerning the teaching of implant diagnosis procedures, oral hygiene assessment, soft-tissue examination, pocket depth probing, evaluation of bleeding on probing, suppuration and radiographic bone loss seem to be included in (almost) every program (90%–100% of the programs), while recession measurement and assessment of implant mobility are less discussed (50%–70%).

The second research question (RQ2) of the present work delved into the education content, especially the learning objectives of established CPD programs in periodontology and/or implantology in Europe with a specific emphasis on the prevention and management of peri-implant diseases.

3.3.4 | General Program Characteristics

Following the inclusion strategy, a total of 24 programs were identified: 6 international programs and 18 national programs from nine different European counties (Belgium, Germany, France, Luxembourg, Italy, UK, Spain, Switzerland, Portugal). Whitin these included programs, 13 were in implant dentistry (ID), 6 were in periodontology (P) and 5 were combined programs in periodontology and implant dentistry (PID). All programs were part-time programs designed for dentists seeking to acquire knowledge in the field of periodontology and/or implant dentistry up to an intermediate ($n = 8$) or an advanced level ($n = 7$) while maintaining their professional activities. The programs usually consisted of a series of modules (ranging from 4 to 14) over a period of 1 to 3 years, leading to a certificate, a diploma or a master's degree. The total ECTS credits or CPD hours were heterogenous, and theoretical lectures (100%), case presentations (87.5%) and hands-on in implant dentistry (62.5%) were the most common teaching methods. More than half of the programs also proposed individual mentoring (54.2%) and clinical internships (54.2%). Characteristics of the included programs are displayed in Table S3.3.

3.3.5 | Content and Learning Outcomes

In general, the included programs covered a certain number of competencies and learning outcomes, varying from 54% to 100%. The content regarding the competencies in ID and the learning outcomes in the PMPID of the included programs are displayed in Table 4.

3.3.6 | Type of Program (ID vs. PID vs. P)

The major competencies in implant dentistry were in general better covered in 'implant dentistry and periodontology' and 'implant dentistry' programs when compared to 'periodontology' programs.

Among all type of programs, 'Long-term maintenance of implants' was considered in all but two programs (91.7%; 22/24) (Table 4).

Regarding the number of learning outcomes (LOs) in PMPID, in general, no difference could be found between the three types of programs (ID vs. PID vs. P) (Figure 2A,B).

Although some ID programs addressed the learning outcomes related to PMPID very well, the PID programs addressed those LOs more consistently.

Details regarding competences and learning outcomes according to specific characteristics of the programs (program type, ECTS credits and teaching methods diversity) are displayed in Table S2.3.

3.4 | Discussion

The present scoping review showed that both GDPs and dental hygienists still perceive a lack of knowledge and skills to carry out implant maintenance, although this is suggested in several previous workshops as a competence to be acquired in the undergraduate curriculum. This finding underscores the fact that these recommendations are not yet fully implemented across all undergraduate curricula, as previously mentioned by several other authors. Moreover, the majority of practising dentists graduated prior to the establishment of these guidelines. As a result, many lack basic knowledge about the prevention and treatment of peri-implant diseases. Our investigation of some existing part-time CPD programs

TABLE 4 | Content and learning outcomes of the included programs.

		PROGRAMS																							DESCRIPTIVE DATA			
	Consecutive Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
	MAJOR COMPETENCIES IN ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	PID	PID	PID	PID	PID	PID	P	P	P	P	P	TOTAL (24)	ID (13)	PID (6)	P (5)
A MAJOR COMPETENCIES IN IMPLANT EDUCATION	1. The theoretical background and knowledge related to implant dentistry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100%	100%	100%	100%
	2. Patient examination and diagnosis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100%	100%	100%	100%
	3. Treatment planning and patient management	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	95.8%	100%	100%	80%
	4. Anesthesia, sedation, pain, infection and anxiety control	0	1	1	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	25%	38.5%	16.7%	0%
	5. Hard and soft tissue implant related surgery	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	91.7%	100%	100%	60%
	6. Implant-supported prosthodontics	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	83.3%	100%	83.3%	40%
	7. Management of complications and emergencies	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	87.5%	100%	100%	40%
	8. Long-term maintenance of implants	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	91.7%	85.6%	100%	100%
	TOTAL	87.5%	100%	87.5%	87.5%	87.5%	100%	87.5%	75%	100%	87.5%	100%	87.5%	87.5%	100%	87.5%	87.5%	87.5%	87.5%	75%	62.5%	50%	50%	75%	87.5%				
	LEARNING OUTCOMES IN PMPID																												
B PREVENTION AND MANAGEMENT OF PI DISEASE	1. Classification, prevalence and physiopathogenesis of peri-implant diseases	1	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	83.3%	69.2%	100%	100%
	2. Assessment of the patient's risk profile	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	95.8%	100%	100%	80%
	3. Management of modifiable risk/indicators factors	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	79.2%	69.2%	100%	80%
	4. Education and motivation of the patient for oral hygiene and home care	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	54.2%	15.4%	100%	100%
	5. Promotion of professional periodontal and implant supportive care	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	58.3%	23.1%	100%	100%
	6. Assessment of periodontal conditions and periodontal therapy to achieve periodontal stability before implant placement	1	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	83.3%	69.2%	100%	100%
	7. Alternatives to dental implants with conventional prosthetics procedures	1	1	1	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	1	0	0	0	1	0	54.2%	76.9%	33.3%	20%
	8. Dental implant treatment planning: adequate 3D implant positioning	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	1	0	79.2%	100%	83.3%	20%
	9. Assessment and management of hard and soft tissue quality / quantity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	87.5%	100%	100%	40%
	10. Management of implant-supported prosthesis design allowing optimal plaque control	0	0	1	1	1	1	0	1	0	1	1	1	0	0	1	0	1	0	1	0	0	0	1	0	54.2%	69.2%	33.3%	40%
	11. Follow-up, monitoring and maintaining peri-implant health	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	91.7%	84.6%	100%	100%
	12. Diagnostics of peri-implant disease	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	83.3%	69.2%	100%	100%
	13. Management of mucositis	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	75%	69.2%	83.3%	80%
	14. Non-surgical management of peri-implantitis	1	0	0	1	1	0	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	70.8%	69.2%	66.7%	80%
	15. Surgical treatment of peri-implantitis using open flap procedures, resective procedures and reconstructive procedure	1	0	0	1	1	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	66.7%	69.2%	50%	80%
	16. Augmentation of peri-implant soft tissues	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	1	75%	92.3%	66.7%	40%
	TOTAL	81.3%	50%	43.8%	87.5%	75%	43.8%	37.5%	81.3%	100%	75%	87.5%	81.3%	87.5%	81.3%	75%	68.8%	87.5%	87.5%	93.8%	87.5%	68.8%	68.8%	62.5%	75%				

DESCRIPTION	
1	Information provided
0	Incomplete or no information available
PID	Periodontology and Implantology dentistry program
ID	Implant dentistry program
P	Periodontology program

showed that such programs could potentially bridge the knowledge gap, because they seem to address these topics on a knowledge and competency base. Nonetheless, we should keep in mind that these part-time programs are not feasible for every dentist because of a lack of, for example, availability in her/his proximity, financial reasons and time constraints. Upon reviewing the profiles of the GDPs answering the included questionnaires, it is clear that only a small part of them had a part-time or full-time training focused on implant dentistry. There is thus a need for qualitative CPD in the form of short courses on implant maintenance and diseases. However, to offer further recommendations, it is imperative to acquire more information concerning the necessary content/learning outcomes of these types of courses.

A review of the literature showed that most GDPs and dental hygienists believe that they have a role in implant maintenance. However, a great many of them fail to take up this role, mainly because they feel they do not have the needed knowledge and competencies.

On one hand, this seems surprising because since the 1st European Consensus Workshop on Implant Dentistry University Education, already 15 years ago, recognizing peri-implant health and disease has been seen as a competence to be acquired in the undergraduate dental curriculum (Mattheos et al. 2009, 2014, 2010a; M. Sanz and Meyle 2010). Next to this, maintaining oral health in implant patients and the treatment of patients with peri-implant mucositis are also competencies that one should develop during undergraduate training (Mattheos et al. 2009, 2014, 2010a; M. Sanz and Meyle 2010). On the other hand, we should not lose sight of the fact that these consensus proceedings in Europe have not led to obligations to implement this in undergraduate curricula. In addition, for the universities that did implement these suggestions, we can assume that this process took several years. We can therefore suppose that those who graduated more than 10 years ago most likely had only limited training in implantology. This will of course depend on the country and the university. In addition, not all freshly graduated students have necessarily acquired this knowledge during the undergraduate curriculum. In the study by Rudeejaraswan et al. (2021), where 78% of the respondents were recent (< 10 years) graduates, half of them stated that they have not yet integrated the essential knowledge and training to carry out implant maintenance (Rudeejaraswan et al. 2021). The same trend can be seen in a cross-sectional study examining the first implant experience of 1015 respondents of 84 countries (Dragan et al. 2019). In this study, they discriminated several clusters of practitioners including one with mostly recent graduates who reported lower competence indicators and acknowledging they were inadequately prepared for implant practice.

The situation for dental hygienists appears to be different. To the best of our knowledge, the first and only consensus meeting concerning education in European dental hygiene schools took place in 2018 (Jongbloed-Zoet et al. 2020), 10 years after the first consensus meeting on dental curricula. Regarding implants, the following two statements were made (Öhrn et al. 2020):

- At the time of qualification, and in keeping with their scope of practice, a dental hygienist should be able to apply the scientific knowledge base relating to the aetiology, pathology, diagnosis and preventive management of peri-implant diseases;

- At the time of qualification, and in keeping with their scope of practice, a dental hygienist should be able to effectively gather, record and interpret information relating to common oral diseases and disorders including peri-implant diseases.

These statements seem to refer to a role for the dental hygienists in the maintenance of dental implants. This careful wording may have been chosen because only a limited number of European countries permit dental hygienists to take care of implants and peri-implant tissues (European Commission 2016; Jongbloed-Zoet et al. 2020).

In the United States, there exist an official competency standard for Dental Hygiene Education issued by the Commission on Dental Accreditation (CODA), but currently dental implant maintenance is not included as a necessary competence (Commission on Dental Accreditation, 2022).

The present literature review identified an important knowledge gap about implant maintenance, the early detection of peri-implant disease signs and treatment of peri-implant mucositis for both GDPs and dental hygienists. As a result, there is a clear need for CPD in these domains with a specific focus on hands-on/clinical training. To provide further insights into the content of these CPD programs in Europe, a survey of European dentists on this subject is required. It is worth noting that all the studies included in the analysis examined dental professionals outside of the EU.

Exploration of some existing part-time CPD programs revealed that they address most of the major competencies as described in the 1st European Consensus Workshop on Implant Dentistry University Education (Donos, Mardas, and Buser 2009). The sole competence that was poorly considered in all of these CPD programs was 'anesthesia, sedation, pain, infection and anxiety control'; the other competencies were well covered. 'Anesthesia, sedation, pain, infection and anxiety control' represent general competencies typically expected to be acquired during the undergraduate education, and the CPD providers may not find it necessary to revise this basic knowledge. From these results, it can be concluded that both ID and PID programs seem to address the teaching of implant dentistry comprehensively and based on the recommendations of previous consensus meetings. However, most of the P programs did not cover several knowledge of implants, prosthodontics, complication management and, most surprisingly, the competencies related to hard- and soft-tissue management. The P programs appear to rather focus on the prevention and management of peri-implant diseases rather than on overall implant rehabilitation.

It is also reassuring to observe that, in general, all types of programs (ID, PID, P) address the long-term maintenance of implants as defined in the current recommendation for the implant dentistry curriculum. Nevertheless, since its establishment in 2009, the competencies for the long-term maintenances of dental implants are rather superficially formulated when considering the prevention and management of peri-implant diseases.

Recent advancements within the field of periodontology and implant dentistry aiming at providing recommendations for evidence-based and good practice (Berglundh et al. 2018; Caton et al. 2018; Herrera et al. 2023, 2022) are expected to play a substantial role in the update of education standards in the field, including CPD programs such as those explored in the present report. Based on the recent guidelines, we identified and extracted the most important learning outcomes necessary to address the PMPID concerns. The main outcomes showed that all types of programs considered a significant number of these learning outcomes. However, the ID programs did not often consider learning outcomes on the education and motivation of the patient for oral hygiene and home care as well as the promotion of professional periodontal and implant supportive care. On the other hand, several competencies related the primordial prevention of peri-implant diseases such prosthodontic designs, tissue augmentations and 3D implant positioning were less often addressed in P programs. These results are not surprising, as they may relate to the primary objectives of the programs. Nevertheless, considering the recent guidelines in PMPID, it would be relevant to update all the curricula in implant dentistry.

As suggested by several consensus workshops (Mattheos et al. 2009, 2014, 2010a; M. Sanz and Meyle 2010), implant dentistry should be integrated during the undergraduate curriculum of dental degree courses. Graduate dentists must be competent in all the aspects of maintaining oral health in patients with dental implants, including early diagnosis of pathology and secondary prevention. However, these recommendations are not yet fully implemented in all undergraduate curricula. Furthermore, the majority of practising dentists graduated before these guidelines were even established. Consequently, many practising dentists still lack basic knowledge in this field. Therefore, ensuring the quality of CPD education for different levels of complexity in implant dentistry (straightforward, advanced, complex) is of paramount importance. More specifically, within implant dentistry, CPD education for the prevention and management of peri-implant diseases merits careful attention, as peri-implant diseases represent a growing public health issue (Herrera et al. 2023). Therefore, the training for supportive implant care should extend to other dental professionals such as dental hygienists.

While the present results are compelling, it is important to acknowledge the limitations of the present sampling method. The most important one is the bias created by the selection of the studied programs. Since an extensive mapping of part-time certificates, diplomas and master's degrees in EU was not realistic, our goal was rather to explore a few recognized programs supported by national and/or international organizations as well as universities. In addition, a more exhaustive identification of CPD program content in implantology may have been widely redundant.

3.5 | Conclusions

Despite the existing recommendations for educational standards to be acquired in implant dentistry during undergraduate education, the present scoping review underlined that GDPs and dental hygienists still perceive a deficiency in their knowledge and the competencies to carry out peri-implant supportive care.

With its limits, the present investigation regarding CPD programs in implant periodontology and/or implant dentistry underscores the need for enhancing educational standards regarding the prevention and management of peri-implant diseases.

4 | Introduction of the 2018 Classification and Clinical Practice Guidelines in Relation to CPD

4.1 | Aim of Review

The aims of this narrative review are the following:

1.To provide a narrative overview of implementation and dissemination strategies for both the 2018 World Workshop Classification and CPGs for the treatment of periodontitis relating to CPD activities. Since the CPGs for peri-implant diseases were only recently published (Herrera et al. 2023), this review mainly focuses on the 2018 classification (Caton et al. 2018) and CPGs for periodontitis (Herrera et al. 2022; M. Sanz et al. 2020);

2.To perform a quantitative bibliometric analysis of scientific production of literature for the three topic areas: *The 2018 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions*; *Treatment of stage I–III periodontitis—The EFP S3 level clinical practice guideline*; and *Treatment of stage IV periodontitis: The EFP S3 level clinical practice guideline*; and

3.To discuss potential barriers to CPD/life-long learning that can negatively impact the implementation of the World Workshop Classification and CPGs in practice.

4.2 | Review

4.2.1 | Implementation and Dissemination Strategies of the World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions Relevant to CPD Activities

The World Workshop Classification system for periodontal and peri-implant diseases and conditions (Caton et al. 2018) was developed in order to accommodate advances in knowledge derived from both biological and clinical research that have emerged since the 1999 International Classification of Periodontal Diseases (Armitage 1999). In total, 19 review papers and 4 consensus reports were commissioned, covering the relevant areas in periodontology and implant dentistry. The workshop took place in Chicago from 9 to 11 November 2017, with all articles simultaneously published in special issues of the *Journal of Clinical Periodontology* and *Journal of Periodontology* in June 2018. Following the official launch of the new classification system for periodontal and peri-implant diseases, the key stakeholders (EFP and AAP) took a lead in its dissemination to the broader dental community. CPD activities (lectures, training courses, seminars, workshops, webinars/online courses, online open-access resources) would become central to this dissemination and the upskilling of the dental community in the use of the new classification.

To fit the new classification into established national dental practice systems, some countries made subtle adaptations to the new classification. The British Society of Periodontology (BSP), for example, established an implementation group, which was made up of a working group of specialists and general practitioners. A particular focus of the group was to describe how the new classification system integrates with the established diagnostic parameters and pathways, such as the 'basic periodontal examination (BPE)', which is a screening tool embedded in U.K. dental practice. Other modifications included a simplified system of staging of periodontitis based on radiographic bone loss alone (rather than CAL or other factors) and a modified threshold for grading (grade A: <0.5, grade B: 0.5–1.0, grade C: >1.0). These were primarily communicated to the U.K. dental community through an explanatory implementation article (Dietrich et al. 2019), followed by a series of case reports demonstrating its use (Wadia et al. 2019; Walter, Chapple, et al. 2019; Walter et al. 2019a, 2019b; Walter, Ower, et al. 2019). These were all published in the U.K. dental profession's main journal, *The British Dental Journal*. Other dissemination material published by the BSP included a user-friendly decision-making flowchart (algorithm) to help practitioners adapt to the new classification. Ireland, which also uses the BPE screening system, adopted these BSP modifications of the new classification and similarly published explanatory implementation notes for general practitioners in the *Journal of the Irish Dental Association* (Lee Kin and Reynolds 2019; Roberts, Milward, and Harrison 2021) and a case series of its application (da Mata, Hayes, and Roberts 2021; Nolan et al. 2021; Reynolds et al. 2021).

Ultimately, impact of the new classification on the dental community should be measured on its actual use in primary dental care. Although beyond the scope of the current review, some recent studies have explored use of the new classification at a general practice level. In a study carried out in the south-west region of the United Kingdom, there was a positive uptake of the new classification in general practice, with 85% of 75 periodontal referrals to a hospital department made using the new periodontal classification (Jayawardena et al. 2021). However, results showed that there was only 50.7% and 57.3% agreement for staging and grading, respectively, when comparing consultants to the referring clinicians. The authors suggested that further educational need had been highlighted by a trend of underestimating the severity of periodontal disease when using the new classification by referring practitioners (Jayawardena et al. 2021). Inter-examiner reliability was also reported in a recent study involving the faculty, graduates and students of 16 EFP and 73 AAP postgraduate programs. One-hundred and seventy-four participants completed the survey, with reported agreement of 68.7% in assigning the stage, 82.4% in assigning the grade and 75.5% in assigning the extent. Academic position or the experience of the participants did not have any significant influence on classifying periodontitis as the gold standard (Abrahamian et al. 2022).

4.2.2 | Implementation and Dissemination Strategies of the EFP S3 Level Clinical Practice Guidelines Relevant to CPD Activities

A distinct aim of the new classification was to facilitate the use of appropriate preventive and therapeutic interventions specific to a patient's individual diagnosis. The new classification of

periodontitis, therefore, facilitated a new set of evidence-based CPGs providing recommendations to treat periodontitis, structured according to this new framework. In this context, the EFP conducted a series of workshops that aimed to establish evidence-based CPGs for the treatment of periodontitis. The first of these workshops focused on treatment of stage I–III periodontitis and was published in the *Journal of Clinical Periodontology* in June 2020 (M. Sanz et al. 2020). The stage IV CPGs required an additional workshop to reflect the added complexities of multidisciplinary treatment approaches required to treat/rehabilitate patients following associated sequelae of advanced periodontal attachment loss and tooth loss. The stage IV CPG workshop was published in the *Journal of Clinical Periodontology* in June 2022 (Herrera et al. 2022).

CPD has been identified as having a central role in the dissemination and implementation of both sets of CPGs. Specifically, the guidelines reference 'Dissemination via educational programs on dental conferences' and 'Generation of educational material for dental professionals and patients, and dissemination via the EFP member societies' (Herrera et al. 2022; M. Sanz et al. 2020). The CPGs were designed as supranational guidelines and not specifically developed to be implemented in a specific geographic context. 'Adolopment' describes the process wherein CPGs of S3 standard can be implemented flexibly in each country to ensure best 'fit' at local level in light of social, political and healthcare considerations operational in each country. The word 'adolopment' is a composite term derived from the three underpinning concepts of guideline adoption, adaptation and development. In principle, three options were available at national level for implementation:

- *Commentary*: Highlighting the existence of the CPG, outlining the important aspects of the guideline and its value to clinical practice at the local/national level;
- *Adoption*: Adopting entire CPG, without any changes, as the national guideline of that country. This process must be voted on at national level and may be impractical where previous local guidelines or protocols exist and cannot be changed;
- *Adaptation*: Via the GRADE Adolopment process—The CPG is used as a guideline document and template for the development of a national guideline. A consensus development workshop with involvement of an expert panel and key stakeholders must be convened and each individual treatment recommendation evaluated and voted upon. Effectively, the society must decide whether to adopt each recommendation unchanged or modify it, and whether additional recommendations be made.

CPD related to the CPGs would therefore similarly require individually tailored national approaches. An overview of implementation and dissemination activities by EFP national societies is provided in Table 5. Different countries have followed different processes: commentary, adoption or adaptation (Schunemann et al. 2017). The periodontal societies of Germany, Spain and the United Kingdom followed the process of adaptation and shared the effort of updating the systematic reviews. Uniquely, the U.K. adaptation process involved patients as the 'end user' of the CPGs. Other countries such as Ireland and Sweden chose a commentary option, while countries such as France opted for adoption. EFP also has a number of associate and international associate member societies, many of whom participated in dissemination in their own countries. For example, the Lebanese and Argentinian societies provided commentary on the guideline at the national level, the Georgian and Mexican societies adapted the guideline for use, while the Taiwanese society adapted it in full. While it is clear that dissemination has occurred widely in countries where the national society has an established link with EFP, the 'reach' has been even extended to non-member countries, as seen in the example of adaptation by the Ukrainian Society of Periodontology for national use.

Regarding the translation of the CPG, the guideline has now been translated into a number of languages including Chinese, Croatian, French, German, Greek, Hungarian, Hebrew, Italian, Lithuanian, Norwegian, Polish, Portuguese, Serbian, Spanish, Turkish and Georgian. The Spanish translation of the EFP CPG, which was prepared by SEPA, will be the basis for the uptake process in Latin American countries, as the Iberopanamerican Federation of Periodontology (FIPP) has adopted the guideline via commentary, as a preliminary step for adoption via commentary in different Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Panama, Peru, Uruguay and Venezuela).

It must be noted that publication of the Stage I–III CPG occurred during the restrictions of COVID-19 pandemic, in the context of reduced/postponed in-person conferences. Some challenges naturally were faced in the dissemination of CPG, and many of the resulting activities occurred online (lectures, webinars) or in print (newsletters, news items and publications within national dental publications), with more recent activities including in-person presentations by periodontists at dental, dental hygienist and periodontal conferences.

4.2.3 | A Bibliometric Analysis of the Scientific Literature Relating to the New Classification and CPGs

Self-directed learning in the context of CPD involves members of the dental team taking the initiative and responsibility for their own learning. One of the main forms of self-directed learning is the review of scientific articles in journals. As previously outlined, the World Workshop Classification and CPGs were primarily disseminated in the form of scientific publications. Citations generated from the original source papers represent an indirect measure of impact on the field. Although this may be a crude measure of how it impacts a practitioner at an individual level, it does offer some form of measurement in terms of scientific reach. For the purpose of this review, a bibliometric analysis exploring how citations relating to the workshops have had impacts on the scientific literature was performed. Seed papers from the World Workshop Classification and CPGs were identified in the Science Citation Index Expanded (SCIE) in Web of Science Core Collection, and citation reports were generated up to 25 July 2023. Web of Science is commonly used in bibliometric studies because of its wide coverage of themes, the count of the citations

TABLE 5 | Summary of EFP national societies activities related to Stage I–III CPG implementation.

National society	Society type	Society decision	Translation carried out	Methods for dissemination	Journal publications
Austrian	Member	Commentary	Yes	Electronic newsletter; letter to dental board	No
Azerbaijani	Member	Adaptation	Yes	Register with Ministry of Health as national guideline	No
Belgian	Member	Commentary	Yes	Plans only: webinar, dissemination	No—but planned
British	Member	Adolopment	—	Webinars; publication	Yes
Croatian	Member	#N/A	—	—	—
Czech	Member	#N/A	—	—	—
Danish	Member	Commentary	—	Mail with link; already has national guideline	No
Dutch	Member	Using Dutch guidelines	—	—	—
Finnish	Member	Commentary	—	—	—
French	Member	Adoption	Yes	—	Considering a summary 2021
German	Member	Adolopment	Yes	Website/booklet for members/journal articles nationally	Planned 2021
Hellenic	Member	Commentary	Yes	Planned report and print copy	—
Hungarian	Member	Adoption	Yes	Translation online; planned journal nationally	Planned
Irish	Member	Commentary	—	Journal article commentary	Yes
Israeli	Member	Adoption	Yes	Translation sent to all members; webinar	—
Italian	Member	Adoption	Yes	—	—
Lithuanian	Member	Adaptation	Yes	Translated summary on website/ emailed to members; meeting	—
Norwegian	Member	Adaptation	Yes	Plans only	Planned
Polish	Member	Adoption	Yes	Handbook for students & doctors	
Portuguese	Member	Adoption	Yes	Translation publication; webinar	No
Romania	Member	Commentary	—	No	No
Serbian	Member	Adoption	—	—	—
Slovenian	Member	Adoption	—	—	—
Spanish	Member	Adolopment	Yes	Report published online; journal publication	Yes

(Continues)

TABLE 5 | (Continued)

National society	Society type	Society decision	Translation carried out	Methods for dissemination	Journal publications
Swedish	Member	Commentary	—	Link to CPG online; national guidelines already	No
Swiss	Member	Commentary	Yes		
Turkish	Member	Adoption	—		

Source: EFP (2021).

received by the articles and its ability to measure factors such as geographic spread and scientific category of citing journals (Tarazona-Álvarez et al. 2021). As the World Workshop Classification articles were simultaneously published in special issues of the *Journal of Clinical Periodontology* and *Journal of Periodontology*, citations for each duplicate article were combined. The evolution of scientific productivity over time, geographic location of citing literature, citing journals and scientific field were all explored.

Total citations per year, as captured by the Web of Science, are displayed in Tables S4.1a–c. Given the differing years of publication of the new classification (2018), stage I–III CPG (2020) and stage IV CPG (2022), and the different number of articles from each workshop, it is unsurprising to observe major differences in the total number of citations. The new classification collection of manuscripts generated 8813 citations over a 6-year time span, with the manuscripts describing the concept of stage and grade scoring, as expected, highest with about 1500 citations. Stage I–III CPG has generated 1194 citations over a 4-year span and stage IV CPG has generated 141 in the ~1 year since publication. Tables S4.2a–c show the top 25 countries of origin of citation literature. Countries with larger populations, producing more scientific research, naturally place higher in these lists. Interestingly, the CPGs, despite being mainly an EFP initiative, have citations not just restricted to European countries. Tables S4.3a–c show the top 25 journals containing the cited articles. The new classification is mainly cited in periodontal and implant journals, while the CPGs are mainly cited in periodontal journals. However, there is evidence of multi-disciplinary spread outside of these journals further down the lists. This is reinforced by Tables S4.4a–c. These tables show category description of the citing journals. Dentistry journals are the highest citing, with 58% for the new classification, 58% for the stage I–III CPG and 49% for the stage IV CPG. However, beyond this there is evidence of impacts in other categories.

The new classification represents a global consensus on essentially *all* periodontal and peri-implant diseases and conditions. The high number of citations generated shows the huge effect this has had on scientific literature and the reach of the new classification since its publication. The top citing articles in the new classification relate to the staging/grading of periodontitis (Tonetti, Greenwell, and Kornman 2018) and the consensus paper from the periodontitis working group (Papapanou et al. 2018). Although relatively new, a similar pattern in growth of citations linked to CPGs can also be observed. This is, however, to a lesser extent than the new classification, and probably relates to the type of publication that will generate a citation relating to the discrete treatment of periodontitis versus the breath of the new classification. In the CPGs, the top cited articles are the guidelines themselves (Herrera et al. 2022; M. Sanz et al. 2020), which is positive, as these were the focus of the two workshops. It is thus highly likely that a clinician engaging in self-directed learning through the review of scientific articles will come across some description of a periodontal or peri-implant disease or condition that references the new classification. The fact that the EFP has enabled these articles to be published open access undoubtedly facilitates dissemination. An important limitation to note is that the citations of these

articles only represent a snapshot in time and are not indicative of future patterns. Furthermore, citations in the context of CPD only represent the scientific reach of the 2018 classification and CPG papers across the literature and do not directly represent engagement at a practitioner level as a measure of self-directed learning.

4.2.4 | Barriers to CPD/Life-Long Learning

A number of barriers to CPD/life-long learning have been identified over the last decade that can be applied to the implementation of the new classification and the CPGs in practice (Polyzois et al. 2010). In a number of countries around the world, including several in Europe, CPD is not compulsory, and this situation relies on an ethical obligation to undergo CPD rather than a mandatory requirement (Bullock et al. 2020). This means that unless legislative changes are made, CPD cannot be made a mandatory requirement for ongoing registration. Thus, in the countries with relevant missing legislation, there is a need for one professional body to take the responsibility for both implementation and regulation of the CPD points.

Family commitments, inability to get time off work, career breaks and financial restrictions have been cited as the major barriers for CPD (Brown and Wassif 2017; Polyzois et al. 2010). Additionally, given the choice, practical hands-on CPD courses are preferred by most dentists, leaving theoretical CPD like the ones necessary for the dissemination of the new classification relatively unattractive for the GDP (Skapetis, Cheema, and El Mustapha 2022). However, increased availability of CPD via on-line resources might be the solution for those working part-time and limited by family commitments (Bullock et al. 2020). However, also this approach may have drawbacks, as any on-line activity requires the participant to have a certain level of computer skill and some of the older dentists might feel disadvantaged in this respect.

Universities, professional societies and associations need to share the responsibility of designing good-quality and easily accessible CDE courses for the practicing dentists, thus supporting professional self-motivation. This way, the practitioners can take more responsibility for their own CPD by attending to their specific needs instead of just collecting the required points (Bullock et al. 2020). An on-line outcome-based CDE model, including on-line reflection on practice and some additional sessions after completion of the course to maintain engagement, might be the best way to overcome barriers and will possibly hold greater potential to positively impact the dissemination of the new classification.

Specific to the new classification and CPGs, CPD challenges lie in the fact that multiple countries across the globe have very different healthcare systems and implementation within each country may look quite different. As discussed previously, this has required national societies in the various countries to perform different tasks such as translation, and/or adaptation, to suit an individual's country's needs. CPD, therefore, may be required to be specific to that country, rather than a single, globally defined pathway.

The form of CPD is also likely to be important. Previous research has demonstrated that single, one-off didactic events are likely to be of limited value (Young and Newell 2008). More than attending an event, the support a clinician receives when they return to their practice is often more important. Absence of support and feedback at this stage may limit implementation, leading to frustration, thereby minimizing the benefit of the well-designed course (Thomson O'Brien et al. 2001). Therefore, interactive CPD courses that expand to cover the implementation period as well are reported to be more successful in leading to change (Mattheos et al. 2001, 2010b). A systematic review on continuing medical care reported that physician care was more likely to change when continuing medical education was delivered using interactive processes such as audit, feedback, academic detailing and reminders (Bloom 2005). The review also reported that a physician's practice was less likely to change when presented with CPGs, didactic presentations and printed materials alone. This should be borne in mind when designing CPD activities in relation to the treatment of periodontitis CPGs especially.

4.3 | Discussion

The need for a dentist to keep up to date is now more important than ever, especially due to the constant increase in knowledge in the various disciplines within dentistry, but also due to increased public awareness and knowledge. Furthermore, an increase in dental litigation in some countries means that it is essential that dentists maintain the highest standard of care reflecting the most current approaches to screening, assessment, diagnosis and management of periodontal diseases. Considering the widespread global prevalence of periodontal diseases (Trindade et al. 2023), it seems important that advances in the diagnosis and management of periodontal diseases are implemented among GDPs. However, previous studies have suggested that it may take up to 17 years for only a fraction (14%) of the published evidence to translate into clinical practice (Balas and Boren 2000; Westfall, Mold, and Fagnan 2007). This highlights the fact that simply developing and publishing a new classification or guidelines does not guarantee that these will be used in clinical practice. Hence, to maximize the likelihood of the use of the classification system and guidelines, coherent dissemination and implementation strategies are required (Feder et al. 1999). This includes CPD activities, which have an essential role in enhancing the uptake of the new classification and CPGs at a practitioner level.

CPD helps health professionals in general to stay up to date, acquire knowledge, improve skills and attitudes and behaviours towards patients with the ultimate goal to improve healthcare outcomes (D. Davis et al. 1999; D. A. Davis et al. 1992; Marinopoulos et al. 2007). CPD's effectiveness and impact have not been specifically investigated in terms of implementation of the new classification or CPGs. Furthermore, as CPD in many cases is either provided independently or outside the framework of national periodontal societies, it is difficult to measure the impact of the 2018 classification and CPGs on CPD activity. Studies that do relate to the impact of the new classification (Abrahamian et al. 2022; Jayawardena et al. 2021; Kakar et al. 2022; Marini et al. 2021; Ravidà et al. 2021) are mostly

questionnaire-based, which were mainly designed to investigate the agreement and use among specialists, trainees and/or general practitioners, rather than the impact on CPD activities. However, other studies have investigated the effect of education strategies, in general, in relation to guideline implementation in a dental setting. A systematic review carried out by Villarosa and colleagues specifically investigated the effectiveness of guideline implementation strategies in the dental setting (Villarosa et al. 2019). This review found that education (CPD), reminders and multifaceted interventions were the most effective implementation strategies for effecting change at the dental practice setting. Walsh and colleague carried out an RCT investigating the effect of training on the use of tobacco-use cessation guidelines among 265 dentists in practice (Walsh et al. 2012). The study found that dentists trained by means of a workshop or self-study program used components of the guideline more frequently and felt more positive towards tobacco-use cessation counselling than did dentists in the control group. Amemori and co-workers similarly investigated the impact of an educational intervention on the implementation of tobacco counselling amongst 73 dentists and 22 hygienists (Amemori et al. 2013). The study found that an education package consisting of lectures, interactive sessions, multimedia demonstrations and a role-play session resulted in a significant increase in provision of tobacco cessation counselling, but not on tobacco prevention counselling. In a study investigating antimicrobial prescribing patterns in an acute dental care department in a hospital in London, Chopra and colleagues reported that extensive training and education caused an increase in adherence to antimicrobial prescribing guidelines (Chopra et al. 2014).

In light of the continued development of evidence-based guidelines by EFP, such as the recent publication *Prevention and treatment of peri-implant diseases—The EFP S3 level clinical practice guideline* (Herrera et al. 2023), future studies should be aimed at specifically investigating the role and effectiveness of CPD activities within the broader context of other implementation strategies in the uptake of these guidelines. Such studies would in turn help guide strategies for the implementation of new or updated guidelines in the future. Specifically, developing a new classification system and/or CPGs will be of benefit to patients only if they are successfully implemented in daily clinical practice. Therefore, the impact of these publications specifically within CPD can be assessed properly only if valid data on various aspects of CPD across Europe (and worldwide) are systematically summarized and continuously updated, such as whether CPD is obligatory, is organized by authorised providers, can be freely chosen or should cover certain core topics, is continuously evaluated for its quality and content and so on. Various attempts have already been made to provide a better overview on these aspects within Europe (Barnes et al. 2013; Kravitz et al. 2015; Meli Attard, Bartolo, and Millar 2022), an EU Directive on CPD (2005/36/EC) has been issued and a 'DentCPD' project was carried out ('Dental Continuing Professional Development (CPD) Reference Manual,' Cowpe 2013). Finally, sound implementation research should be conducted based on existing frameworks designed to support implementation research. Several systematic reviews (Bergström et al. 2020; Field et al. 2014; Kirk et al. 2016) have shown that so far the use of theoretical frameworks for implementation research is often superficial, not covering all relevant aspects, and/or insufficiently reported.

4.4 | Conclusions

Effective dissemination and implementation of the new classification and CPGs will be possible only when active, well-structured, easily accessible and competency-oriented CPD programs are in place at the local and international level. In this context, a multifaceted approach to CPD is required to implement changes at the practitioner level. CPD providers should be aware of the potential barriers to effective CPD provision and consider mitigation steps. Future studies should be aimed at specifically investigating the role and effectiveness of CPD activities within the broader context of implementation strategies in the uptake of the multiple different types of CPGs. Such studies would, in turn, helpzguide strategies for the implementation and role of CPD in the new or updated CPGs in the future. Additionally, a more formalized approach to registration of CPD events at both the practitioner and national level would facilitate a more accurate approach to assessing the impact of new developments on CPD.

Author Contributions

All authors made substantial contributions to the conception and design of the work; the acquisition, analysis and interpretation of data; the drafting of the work and revising it critically; and the final approval of the manuscript to be published. Chapter 2 was contributed by Joerg Meyle, Corinna Bruckmann, Martin Biosse Duplan, Ana Molina and Moritz Kebschull. Chapter 3 was contributed by France Lambert, Haitam Yousfi, Isabelle Laleman, Nikos Mattheos and Henrik Dommisch. Chapter 4 was contributed by Lewis Winning, Yvonne C. M. de Waal, Kristina Bertl, Peter Harrison, Andreas Stavropoulos and Ioannis Polyzois.

Acknowledgements

The authors are grateful for information provided by national periodontal societies collated by the European Federation of Periodontology. We acknowledge Mónica Guinea for the administrative work involved, and Ina Kopp, Moritz Kebschull, Mariano Sanz and David Herrera for designing the process of adolopment. Open Access funding enabled and organized by Projekt DEAL.

Conflicts of Interest

Individual potential conflict-of-interest forms were completed by all participants and are available on file at the European Federation of Periodontology.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

Abrahamian, L., A. Pascual-LaRocca, L. Barallat, et al. 2022. "Intra- and Inter-Examiner Reliability in Classifying Periodontitis According to the 2018 Classification of Periodontal Diseases." *Journal of Clinical Periodontology* 49, no. 8: 732–739. https://doi.org/10.1111/jcpe.13618.

Amemori, M., J. Virtanen, T. Korhonen, T. H. Kinnunen, and H. Murtomaa. 2013. "Impact of Educational Intervention on

Implementation of Tobacco Counselling Among Oral Health Professionals: A Cluster-Randomized Community Trial." *Community Dentistry and Oral Epidemiology* 41, no. 2: 120–129. https://doi.org/10.1111/j.1600-0528.2012.00743.x.

Armitage, G. C. 1999. "Development of a Classification System for Periodontal Diseases and Conditions." *Annals of Periodontology* 4, no. 1: 1–6. https://doi.org/10.1902/annals.1999.4.1.1.

Balas, E. A., and S. A. Boren. 2000. "Managing Clinical Knowledge for Health Care Improvement." *Yearbook of Medical Informatics* 9, no. 1: 65–70.

Barnes, E., A. D. Bullock, S. E. Bailey, J. G. Cowpe, and T. Karaharju-Suvanto. 2013. "A Review of Continuing Professional Development for Dentists in Europe(*)." *European Journal of Dental Education* 17, no. Suppl 1: 5–17. https://doi.org/10.1111/eje.12045.

Berglundh, T., G. Armitage, M. G. Araujo, et al. 2018. "Peri-Implant Diseases and Conditions: Consensus Report of Workgroup 4 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions." *Journal of Clinical Periodontology* 45, no. Suppl 20: S286–S291. https://doi.org/10.1111/jcpe.12957.

Bergström, A., A. Ehrenberg, A. C. Eldh, et al. 2020. "The Use of the PARIHS Framework in Implementation Research and Practice—A Citation Analysis of the Literature." *Implementation Science* 15, no. 1: 68. https://doi.org/10.1186/s13012-020-01003-0.

Bloom, B. S. 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals; Handbook I: Cognitive Domain*. New York: McKay.

Bloom, B. S. 2005. "Effects of Continuing Medical Education on Improving Physician Clinical Care and Patient Health: A Review of Systematic Reviews." *International Journal of Technology Assessment in Health Care* 21, no. 3: 380–385. https://doi.org/10.1017/s026646230505049x.

Brown, T., and H. S. Wassif. 2017. "Understanding Continuous Professional Development Participation and Choice of Mid-Career General Dental Practitioners." *European Journal of Dental Education* 21, no. 1: 46–51. https://doi.org/10.1111/eje.12177.

Bullock, A., A. Kavadella, J. Cowpe, E. Barnes, B. Quinn, and D. Murphy. 2020. "Tackling the Challenge of the Impact of Continuing Education: An Evidence Synthesis Charting a Global, Cross-Professional Shift Away From Counting Hours." *European Journal of Dental Education* 24, no. 3: 390–397. https://doi.org/10.1111/eje.12514.

Caton, J. G., G. Armitage, T. Berglundh, et al. 2018. "A New Classification Scheme for Periodontal and Peri-Implant Diseases and Conditions – Introduction and Key Changes From the 1999 Classification." *Journal of Clinical Periodontology* 45, no. Suppl 20: S1–S8. https://doi.org/10.1111/jcpe.12935.

Cedefop. 1994. "Reflections on a Europe of Knowledge." https://www.cedefop.europa.eu/en.

Cedefop. 2009. "European Credit System for Vocational Education and Training (ECVET)." https://www.cedefop.europa.eu/en/projects/european-credit-system-vocational-education-and-training-ecvet.

Cedefop. 2010. "The Bruges Communiqué. Policy Documents and Studies." www.cedefop.europa.eu/en/content/bruges-communique.

Cedefop. 2020. "Osnabrück Declaration on Vocational Education and Training as an Enabler of Recovery and Just Transitions to Digital and Green Economies." Edited by European Union. https://www.cedefop.europa.eu/files/osnabrueck_declaration_eu2020.pdf.

Cedefop. 2023a. "The Future of Vocational Education and Training in Europe: Synthesis Report." In *Cedefop Reference Series*, *No 125*, edited by European Union, 2023. https://doi.org/10.2801/08824.

Cedefop. 2023b. "VET Knowledge Centre." https://www.cedefop.europa.eu/en/themes/vet-knowledge-centre.

Cheung, M. C., M. S. Hopcraft, and I. B. Darby. 2019. "Implant Education Patterns and Clinical Practice of General Dentists in Australia." *Australian Dental Journal* 64, no. 3: 273–281. https://doi.org/10.1111/adj.12708.

Cheung, M. C., M. S. Hopcraft, and I. B. Darby. 2020. "Dental Implant Maintenance Teaching in Australia–A Survey of Education Providers." *European Journal of Dental Education* 24, no. 2: 310–319. https://doi.org/10.1111/eje.12499.

Cheung, M. C., M. S. Hopcraft, and I. B. Darby. 2021. "Dentists' Preferences in Implant Maintenance and Hygiene Instruction." *Australian Dental Journal* 66, no. 3: 278–288. https://doi.org/10.1111/adj.12831.

Cheung, M. C., P. Kao, N. Lee, et al. 2016. "Interest in Dental Implantology and Preferences for Implant Therapy: A Survey of Victorian Dentists." *Australian Dental Journal* 61, no. 4: 455–463. https://doi.org/10.1111/adj.12411.

Chopra, R., R. Merali, G. Paolinelis, and J. Kwok. 2014. "An Audit of Antimicrobial Prescribing in an Acute Dental Care Department." *Primary Dental Journal* 3, no. 4: 24–29. https://doi.org/10.1308/205016814813877270.

Cowpe, J. G. 2013. "Dental Continuing Professional Development (CPD) Reference Manual." *European Journal of Dental Education* 17, no. s1: i–iv. https://doi.org/10.1111/eje.12030.

Commission on Dental Accreditation. 2022. "Accreditation Standards for Dental Hygiene Education Programs. American Dental Association." https://coda.ada.org/-/media/project/ada-organization/ada/coda/files/2022_dental_hygiene_standards.pdf..

da Mata, C., M. Hayes, and A. Roberts. 2021. "Application of the New Periodontal Classification: Part 3." *Journal of the Irish Dental Association* 67, no. 1–6.

Davis, D., M. A. O'Brien, N. Freemantle, F. M. Wolf, P. Mazmanian, and A. Taylor-Vaisey. 1999. "Impact of Formal Continuing Medical Education: Do Conferences, Workshops, Rounds, and Other Traditional Continuing Education Activities Change Physician Behavior or Health Care Outcomes?" *JAMA* 282, no. 9: 867–874. https://doi.org/10.1001/jama.282.9.867.

Davis, D. A., M. A. Thomson, A. D. Oxman, and R. B. Haynes. 1992. "Evidence for the Effectiveness of CME. A Review of 50 Randomized Controlled Trials." *JAMA* 268, no. 9: 1111–1117.

Densen, P. 2011. "Challenges and Opportunities Facing Medical Education." *Transactions of the American Clinical and Climatological Association* 122: 48–58.

Derks, J., D. Schaller, J. Hakansson, J. L. Wennstrom, C. Tomasi, and T. Berglundh. 2016. "Peri-Implantitis – Onset and Pattern of Progression." *Journal of Clinical Periodontology* 43, no. 4: 383–388. https://doi.org/10.1111/jcpe.12535.

Derks, J., and C. Tomasi. 2015. "Peri-Implant Health and Disease. A Systematic Review of Current Epidemiology." *Journal of Clinical Periodontology* 42 Suppl 16: S158–S171. https://doi.org/10.1111/jcpe.12334.

Dietrich, T., P. Ower, M. Tank, et al. 2019. "Periodontal Diagnosis in he Context of the 2017 Classification System of Periodontal Diseases and Conditions – Implementation in Clinical Practice." *British Dental Journal* 226, no. 1: 16–22. https://doi.org/10.1038/sj.bdj.2019.3.

Dixon, J., C. Manzanares-Cespedes, J. Davies, et al. 2021. "O-HEALTH-EDU: A Scoping Review on the Reporting of Oral Health Professional Education in Europe." *European Journal of Dental Education* 25, no. 1: 56–77. https://doi.org/10.1111/eje.12577.

Donos, N., N. Mardas, and D. Buser. 2009. "An Outline of Competencies and the Appropriate Postgraduate Educational Pathways in Implant

Dentistry." *European Journal of Dental Education* 13, no. Suppl 1: 45–54. https://doi.org/10.1111/j.1600-0579.2008.01528.x.

Dragan, I. F., M. Pirc, C. Rizea, J. Yao, A. Acharya, and N. Mattheos. 2019. "A Global Perspective on Implant Education: Cluster Analysis of the "First Dental Implant Experience" of Dentists From 84 Nationalities." *European Journal of Dental Education* 23, no. 3: 251–265. https://doi.org/10.1111/eje.12426.

Eaton, K. A., N. X. West, N. H. F. Wilson, and M. Sanz. 2022. "European Federation of Periodontology Survey of Postgraduate and Specialist Training in Europe in 2020." *European Journal of Dental Education* 26, no. 2: 361–367. https://doi.org/10.1111/eje.12711.

EFP. 2019. "Quality Standards for Graduate Programs in Periodontology, Periodontics and Implant Dentistry." https://www.efp.org/fileadmin/uploads/efp/Documents/Quality_Standards_2019.pdf.

EHEA. 2005. "Ministerial Conference Bergen 2005." https://www.ehea.info/cid102847/third-cycle-doctoral-education-2009.html.

EHEA. 2015. "ECTS Users' Guide." https://www.ehea.info/page-ects.

Europass, E. U. 2008, 2017. "The European Qualifications Framework (EQF)." https://europa.eu/europass/en.

European Ministers of Education. 1999. "The Bologna Declaration of June 19, 1999." European Higher Education Area, 1–6. https://www.ehea.info/Upload/document/ministerial_declarations/1999_Bologna_Declaration_English_553028.pdf.

European Commission. 2016. "Mutual evaluation of regulated professions:overview of the regulatory framework in the health services sector– dental hygienists and related professions." https://ec.europa.eu/docsroom/documents/17942/attachments/1/translations/en/renditions/pdf.

Feder, G., M. Eccles, R. Grol, C. Griffiths, and J. Grimshaw. 1999. "Clinical Guidelines: Using Clinical Guidelines." *BMJ* 318, no. 7185: 728–730. https://doi.org/10.1136/bmj.318.7185.728.

Field, B., A. Booth, I. Ilott, and K. Gerrish. 2014. "Using the Knowledge to Action Framework in Practice: A Citation Analysis and Systematic Review." *Implementation Science* 9, no. 1: 172. https://doi.org/10.1186/s13012-014-0172-2.

Griffiths, G. S., and P. M. Preshaw. 2014. "Manpower Planning in Periodontology – How Many Specialists Do We Need?" *British Dental Journal* 217, no. 8: 399–402. https://doi.org/10.1038/sj.bdj.2014.904.

Herrera, D., T. Berglundh, F. Schwarz, et al. 2023. "Prevention and Treatment of Peri-Implant Diseases-The EFP S3 Level Clinical Practice Guideline." *Journal of Clinical Periodontology* 50, no. Suppl 26: 4–76. https://doi.org/10.1111/jcpe.13823.

Herrera, D., M. Sanz, M. Kebschull, et al. 2022. "Treatment of Stage IV Periodontitis: The EFP S3 Level Clinical Practice Guideline." *Journal of Clinical Periodontology* 49, no. Suppl 24: 4–71. https://doi.org/10.1111/jcpe.13639.

James, S. L., D. Abate, K. H. Abate, et al. 2018. "Global, Regional, and National Incidence, Prevalence, and Years Lived With Disability for 354 Diseases and Injuries for 195 Countries and Territories, 1990-2017: A Systematic Analysis for the Global Burden of Disease Study 2017." *Lancet* 392, no. 10159: 1789–1858. https://doi.org/10.1016/S0140-6736(18)32279-7.

Jayachandran, S., B. S. Bhandal, K. B. Hill, and A. D. Walmsley. 2015. "Maintaining Dental Implants–Do General Dental Practitioners Have the Necessary Knowledge?" *British Dental Journal* 219, no. 1: 25–28. https://doi.org/10.1038/sj.bdj.2015.528.

Jayawardena, D. S., R. Yates, N. X. West, and A. J. Pollard. 2021. "Implementing the 2017 Classification of Periodontal and Peri-Implant Diseases – How Are We Doing in the South West Region of the UK?" *British Dental Journal*. https://doi.org/10.1038/s41415-021-3716-2.

Jongbloed-Zoet, C., Y. Nyblom, Bol, E., and Field J. C.. 2020. "A common European curriculum for dental hygiene" *European Journal of Dental Education* 24, no.4, 611–615. https://doi.org/10.1111/eje.12501.

Kakar, A., S. Blanchard, D. Shin, G. Maupomé, G. J. Eckert, and V. John. 2022. "Periodontal Diagnosis and Treatment Planning – An Assessment of the Understanding of the New Classification System." *Journal of Dental Education* 86, no. 12: 1573–1580. https://doi.org/10.1002/jdd.13037.

Kirk, M. A., C. Kelley, N. Yankey, S. A. Birken, B. Abadie, and L. Damschroder. 2016. "A Systematic Review of the Use of the Consolidated Framework for Implementation Research." *Implementation Science* 11, no. 1: 72. https://doi.org/10.1186/s13012-016-0437-z.

Kravitz, A., A. Bullock, J. Cowpe, E. Barnes, and Council of European Dentists. 2015. *EU Manual of Dental Practice Edition 5.1*. Council of European Dentists.

Landis, J. R., and G. G. Koch. 1977. "The Measurement of Observer Agreement for Categorical Data." *Biometrics* 33, no. 1: 159–174.

Lang-Hua, B. H., N. P. Lang, E. C. Lo, and C. P. McGrath. 2013. "Attitudes of General Dental Practitioners Towards Implant Dentistry in an Environment With Widespread Provision of Implant Therapy." *Clinical Oral Implants Research* 24, no. 3: 278–284. https://doi.org/10.1111/j.1600-0501.2012.02537.x.

Lee Kin, R., and I. Reynolds. 2019. "Introduction to the New Classification on Periodontal and Peri-Implant Diseases and Conditions." *Journal of the Irish Dental Association* 65, no. 4: 202–206.

Marini, L., M. S. Tonetti, L. Nibali, et al. 2021. "The Staging and Grading System in Defining Periodontitis Cases: Consistency and Accuracy Amongst Periodontal Experts, General Dentists and Undergraduate Students." *Journal of Clinical Periodontology* 48, no. 2: 205–215. https://doi.org/10.1111/jcpe.13406.

Marinopoulos, S. S., T. Dorman, N. Ratanawongsa, et al. 2007. "Effectiveness of Continuing Medical Education." *Evidence Report/Technology Assessment (Full Report)*, no. 149: 1–69.

Mattheos, N., T. Albrektsson, D. Buser, et al. 2009. "Teaching and Assessment of Implant Dentistry in Undergraduate and Postgraduate Education: A European Consensus." *European Journal of Dental Education* 13, no. Suppl 1: 11–17. https://doi.org/10.1111/j.1600-0579.2008.00556.x.

Mattheos, N., H. de Bruyn, M. Hultin, et al. 2014. "Developing Implant Dentistry Education in Europe: The Continuum From Undergraduate to Postgraduate Education and Continuing Professional Development." *European Journal of Dental Education* 18, no. Suppl 1: 3–10. https://doi.org/10.1111/eje.12075.

Mattheos, N., S. Ivanovski, L. Heitz-Mayfield, I. Klineberg, P. Sambrook, and S. Scholz. 2010a. "University Teaching of Implant Dentistry: Guidelines for Education of Dental Undergraduate Students and General Dental Practitioners. An Australian Consensus Document." *Australian Dental Journal* 55, no. 3: 329–332. https://doi.org/10.1111/j.1834-7819.2010.01245.x.

Mattheos, N., M. Schittek, R. Attström, and H. C. Lyon. 2001. "Distance Learning in Academic Health Education." *European Journal of Dental Education* 5, no. 2: 67–76. https://doi.org/10.1034/j.1600-0579.2001.005002067.x.

Mattheos, N., M. Schoonheim-Klein, A. D. Walmsley, and I. L. C. Chapple. 2010b. "Innovative Educational Methods and Technologies Applicable to Continuing Professional Development in Periodontology." *European Journal of Dental Education* 14, no. s1: 43–52. https://doi.org/10.1111/j.1600-0579.2010.00624.x.

Meli Attard, A., A. Bartolo, and B. J. Millar. 2022. "Dental Continuing Professional Development – Part I: Background on Dental Continuing Professional Development in Europe." *European Journal of Dental Education* 26, no. 3: 539–545. https://doi.org/10.1111/eje.12730.

Ministers in Charge for France, Germany, Italy and the United Kingdom. 1998, 2020. "Joint Declaration on Harmonisation of the Architecture of the European Higher Education System." http://www.ehea.info/.

Nolan, M., S. A. Aljudaibi, P. Harrison, and L. Winning. 2021. "Application of the New Periodontal Classification: Part 2." *Journal of the Irish Dental Association* 67: 1–6. (Periodontics).

Öhrn, K., A. van Boxtel, and J. Field. 2020. "A common European Curriculum for Dental Hygiene - Domain II: Safe and Effective Clinical Practice." *European Journal of Dental Education* 24: 619–621. https://doi.org/10.1111/eje.12509.

Papapanou, P. N., M. Sanz, N. Buduneli, et al. 2018. "Periodontitis: Consensus Report of Workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions." *Journal of Clinical Periodontology* 45, no. Suppl 20: S162–S170. https://doi.org/10.1111/jcpe.12946.

Polyzois, I., N. Claffey, R. Attström, A. Kelly, and N. Mattheos. 2010. "The Role of the Curriculum and Other Factors in Determining the Medium-To Long-Term Attitude of the Practicing Dentist Towards Life-Long Learning." *European Journal of Dental Education* 14, no. 2: 84–91. https://doi.org/10.1111/j.1600-0579.2009.00595.x.

Ravidà, A., S. Travan, M. H. A. Saleh, et al. 2021. "Agreement Among International Periodontal Experts Using the 2017 World Workshop Classification of Periodontitis." *Journal of Periodontology* 92, no. 12: 1675–1686. https://doi.org/10.1002/jper.20-0825.

Reynolds, I., D. Naughton, L. Winning, and P. Harrison. 2021. "Application of the New Periodontal Classification: Generalised Periodontitis." *Journal of the Irish Dental Association* 67: 1–6. (Periodontics).

Roberts, A., M. Milward, and P. Harrison. 2021. "Periodontitis: Implementation Tools for Daily Practice." *Journal of the Irish Dental Association* 67, no. 1: 20–24.

Rudeejaraswan, A., P. P. Pisarnturakit, N. Mattheos, A. Pimkhaokham, and K. Subbalekha. 2021. "Dentists' Attitudes Toward Dental Implant Maintenance in Thailand." *JDR Clinical & Translational Research* 8, no.1: 23800844211049405. https://doi.org/10.1177/23800844211049405.

Sanz, M., D. Herrera, M. Kebschull, et al. 2020. "Treatment of Stage I-III Periodontitis-The EFP S3 Level Clinical Practice Guideline." *Journal of Clinical Periodontology* 47, no. S22: 4–60. https://doi.org/10.1111/jcpe.13290.

Sanz, M., and J. Meyle. 2010. "Scope, Competences, Learning Outcomes and Methods of Periodontal Education Within the Undergraduate Dental Curriculum: A Consensus Report of the 1st European Workshop on Periodontal Education – Position Paper 2 and Consensus View 2." *European Journal of Dental Education* 14, no. Suppl 1: 25–33.

Sanz, M., and L. Saphira. 2009. "Competencies in Implant Therapy for the Dental Graduate: Appropriate Educational Methods." *European Journal of Dental Education* 13, no. Suppl 1: 37–43. https://doi.org/10.1111/j.1600-0579.2008.00544.x.

Sanz, M., E. Widstrom, and K. A. Eaton. 2008. "Is There a Need for a Common Framework of Dental Specialties in Europe?" *European Journal of Dental Education* 12, no. 3: 138–143. https://doi.org/10.1111/j.1600-0579.2008.00510.x.

Schunemann, H. J., W. Wiercioch, J. Brozek, et al. 2017. "GRADE Evidence to Decision (EtD) Frameworks for Adoption, Adaptation, and De Novo Development of Trustworthy Recommendations: GRADE-ADOLOPMENT." *Journal of Clinical Epidemiology* 81: 101–110. https://doi.org/10.1016/j.jclinepi.2016.09.009.

Skapetis, T., S. Cheema, and M. El Mustapha. 2022. "Evaluation of Clinical Versus Non-Clinical Continuing Education in Terms of Preferences and Value for Oral Healthcare Workers." *Medical Education Online* 27, no. 1: 2125630. https://doi.org/10.1080/10872981.2022.2125630.

Tarazona-Álvarez, B., A. López-Roldan, A. Vidal-Infer, D. López-Padilla, and A. Alonso-Arroyo. 2021. "Bibliometric Analysis of the Scientific Production of Literature on Peri-Implant Diseases in the Web of Science." *Clinical Implant Dentistry and Related Research* 23, no. 4: 625–634. https://doi.org/10.1111/cid.13024.

Thomson O'Brien, M. A., N. Freemantle, A. D. Oxman, F. Wolf, D. A. Davis, and J. Herrin. 2001. "Continuing Education Meetings and Workshops: Effects on Professional Practice and Health Care Outcomes." *Cochrane Database of Systematic Reviews* 2, no. 2: Cd003030. https://doi.org/10.1002/14651858.Cd003030.

Tonetti, M. S., H. Greenwell, and K. S. Kornman. 2018. "Staging and Grading of Periodontitis: Framework and Proposal of a New Classification and Case Definition." *Journal of Clinical Periodontology* 45, no. Suppl 20: S149–S161. https://doi.org/10.1111/jcpe.12945.

Trindade, D., R. Carvalho, V. Machado, L. Chambrone, J. J. Mendes, and J. Botelho. 2023. "Prevalence of Periodontitis in Dentate People Between 2011 and 2020: A Systematic Review and Meta-Analysis of Epidemiological Studies." *Journal of Clinical Periodontology* 50, no. 5: 604–626. https://doi.org/10.1111/jcpe.13769.

Ullah, R., F. Siddiqui, S. Adnan, A. S. Afzal, and M. Sohail Zafar. 2021. "Assessment of Blended Learning for Teaching Dental Anatomy to Dentistry Students." *Journal of Dental Education* 85, no. 7: 1301–1308. https://doi.org/10.1002/jdd.12606.

Van der Velden, U., and M. Sanz. 2010. "Postgraduate Periodontal Education. Scope, Competences, Proficiencies and Learning Outcomes: Consensus Report of the 1st European Workshop on Periodontal Education–Position Paper 3 and Consensus View 3." *European Journal of Dental Education* 14 Suppl 1: 34–40. https://doi.org/10.1111/j.1600-0579.2010.00622.x.

Villarosa, A. R., D. Maneze, L. M. Ramjan, R. Srinivas, M. Camilleri, and A. George. 2019. "The Effectiveness of Guideline Implementation Strategies in the Dental Setting: A Systematic Review." *Implementation Science* 14, no. 1: 106. https://doi.org/10.1186/s13012-019-0954-7.

Wadia, R., C. Walter, I. L. C. Chapple, et al. 2019. "Periodontal Diagnosis in the Context of the 2017 Classification System of Periodontal Diseases and Conditions: Presentation of a Patient With Periodontitis Localised to the Molar Teeth." *British Dental Journal* 226, no. 3: 180–182. https://doi.org/10.1038/sj.bdj.2019.93.

Walsh, M. M., M. Belek, P. Prakash, et al. 2012. "The Effect of Training on the Use of Tobacco-Use Cessation Guidelines in Dental Settings." *Journal of the American Dental Association (1939)* 143, no. 6: 602–613. https://doi.org/10.14219/jada.archive.2012.0239.

Walter, C., I. L. C. Chapple, P. Ower, et al. 2019a. "Periodontal Diagnosis in the Context of the BSP Implementation Plan for the 2017 Classification System of Periodontal Diseases and Conditions: Presentation of a Patient With a History of Periodontal Treatment." *British Dental Journal* 226, no. 4: 265–267. https://doi.org/10.1038/s41415-019-0015-2.

Walter, C., I. L. C. Chapple, P. Ower, et al. 2019b. "Periodontal Diagnosis in the Context of the BSP Implementation Plan for the 2017 Classification System of Periodontal Diseases and Conditions: Presentation of a Patient With Severe Periodontitis Following Successful Periodontal Therapy and Supportive Periodontal Treatment." *British Dental Journal* 226, no. 6: 411–413. https://doi.org/10.1038/s41415-019-0143-8.

Walter, C., I. L. C. Chapple, P. Ower, et al. 2019. "Periodontal Diagnosis in the Context of the BSP Implementation Plan for the 2017 Classification System of Periodontal Diseases and Conditions: Presentation of a Pair of Young Siblings With Periodontitis." *British Dental Journal* 226, no. 1: 23–26. https://doi.org/10.1038/sj.bdj.2019.2.

Walter, C., P. Ower, M. Tank, et al. 2019. "Periodontal Diagnosis in the Context of the 2017 Classification System of Periodontal Diseases and Conditions: Presentation of a Middle-Aged Patient With Localised Periodontitis." *British Dental Journal* 226, no. 2: 98–100. https://doi.org/10.1038/sj.bdj.2019.45.

Ward, S. T., C. A. Czuszak, A. L. Thompson, M. C. Downey, and M. A. Collins. 2012. "Assessment and Maintenance of Dental Implants: Clinical and Knowledge-Seeking Practices of Dental Hygienists." *Journal of Dental Hygiene* 86, no. 2: 104–110.

Westfall, J. M., J. Mold, and L. Fagnan. 2007. "Practice-Based Research—"Blue Highways" on the NIH Roadmap." *JAMA* 297, no. 4: 403–406. https://doi.org/10.1001/jama.297.4.403.

Winning, L., C. C. Patterson, K. Linden, K. M. Cullen, F. Kee, and G. J. Linden. 2021. "Systemic Inflammation and the Relationship Between Periodontitis, Edentulism, and All-Cause Mortality: A 17-Year Prospective Cohort Study." *Journal of Clinical Periodontology* 48, no. 9: 1260–1269. https://doi.org/10.1111/jcpe.13510.

Young, L. J., and K. J. Newell. 2008. "Can a Clinical Continuing Education Course Change Behavior in Dental Hygiene Practice?" *Journal of Dental Hygiene* 82, no. 4: 33.

Zellmer, I. H., E. T. Couch, L. Berens, and D. A. Curtis. 2020. "Dental Hygienists' Knowledge Regarding Dental Implant Maintenance Care: A National Survey." *Journal of Dental Hygiene* 94, no. 6: 6–15.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.