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Methodological evaluation of reviews that support recommendations from three consensus workshops in periodontology

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ABSTRACT

Objective: This study aimed to evaluate comprehensiveness and reproducibility of reviews that support consensus guidelines in periodontology.

Methods: We included the reviews that support consensus guidelines from three workshops in periodontology, which were overseen by likely the two most important organisations in the field: the European Federation of Periodontology and the American Academy of Periodontology. We independently evaluated the comprehensiveness of literature searches by determining whether authors had searched reference lists, journals, registries and grey literature and whether the searches were limited to only one or a few languages. We evaluated whether review authors reported the eligibility criteria, the search strategies, and the list of included/excluded articles. We tested whether the search and selection of articles in one major database was reproducible.

Results: Twenty-nine reviews were evaluated. Two (7%) reviews reported grey literature searches, and more than two-thirds of the reviews did not report hand-searching. Almost half of the reviews did not report whether there was language restriction for the literature searches. Two-thirds of the reviews reported the use of keywords only (without Boolean operators). One-fourth of the reviews reported the presence of a list of excluded articles after the full-text assessment. None of the reviews reported a detailed list of excluded articles after screening of titles/abstracts. None of the reviews reported enough information to allow reproduction of the findings of the PubMed search.

Conclusions: There is room to improve the reporting of the methodologies that are used in reviews that support periodontology consensus guidelines, although heterogeneity in reporting was found across all the reviews.

1. Introduction

Clinical guidelines are important for supporting patient treatment in any field of medicine, including dentistry and periodontology. These guidelines are usually based on information from well-designed studies, such as systematic reviews [1,2]. The idea is that guidelines' recommendations should be based on accurate and unbiased evidence to benefit patients and improve quality of care [3]. However, some potential negative effects can occur when clinical guidelines do not observe rigorous methodological principles [3,4]. For example, when reviews that support clinical guidelines are based on limited information, different types of reporting bias may occur [5]. Because reporting bias is widespread in the medical literature [6], information that supports clinical guidelines should be comprehensive enough to reduce any risk of bias.

Clinical recommendations that are established through a consensus, which are usually made by specialists in the field, have the same effect as a standard clinical guideline (i.e. they provide recommendations/statements for clinical practice, teaching and further research). Therefore, clinical recommendations through consensus meetings should receive the same methodological attention as standard guidelines.

The present study had two main objectives: a) to evaluate the methodological quality used to develop the consensus recommendations in periodontology, with a focus on comprehensiveness [7–9] and reproducibility [10,11], and b) to specifically check for the potential reproducibility of reviews that were used to support the elaboration of the consensus guidelines.

2. Methodology

2.1. Eligibility criteria, search and selection procedures

We included reports of reviews that support consensus guidelines.

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These were drawn from workshops on periodontology that were overseen by likely the two most important periodontology organisations in the world: The American Academy of Periodontology (AAP) and the European Federation of Periodontology (EFP). These two organisations are at the forefront of dental research holding regular workshops, striving to improve and publishing their work, aiming to improve and further understanding, knowledge and management of oral health. The workshops included the 10th European Workshop on Periodontology [12] and the AAP Regeneration Workshop [13]. Documents from these workshops were published in 2014 [12] and 2015 [13], respectively. These two workshops were chosen because they directly dealt with clinical decisions regarding the treatment of patients and they are the most recent workshops of these organisations with focus on therapeutic interventions. In fact, great methodological rigour should always be used to produce unbiased and accurate evidence to provide therapeutic benefits to patients.

We also reviewed reports from the 2017 World Workshop for the classification of periodontal and peri-implant diseases [14], which were published in 2018 concomitantly by the two main periodontology organisations (AAP and EFP) to provide the most updated information on the methodology that was used to produce the recommendations. This workshop aimed to update the previous classification (from 1999) [15] on gingival and periodontal diseases and to design a new standard definition for peri-implant diseases based on scientific advancements. Therefore, we independently scrutinised volume 41, issue S15 of the *Journal of Clinical Periodontology*, volume 86, issue 2S of the *Journal of Periodontology* and volume 45, issue S20 of the *Journal of Clinical Periodontology* to understand the methodology behind the reviews that were used to support the recommendations/statements of the consensus guidelines.

2.2. Data extraction

Data from the reviews were directly retrieved in a standardised form, and they contained the following information: type of document (narrative, systematic review or other study design), country of the first author, number of authors, periodontology organisation, number of citations in Google Scholar, topic of research and specific information on reproducibility and comprehensiveness (see section data analysis).

2.3. Data analysis (rationale)

From October to December 2018, we evaluated the retrieved reviews via three main criteria (Table 1):

- *Type of review*: We evaluated whether authors reported their intention of conducting a systematic or narrative review or did not report the type of their review.

- *Comprehensiveness*: This concept is about the comprehensiveness of a literature search to support the claims of the consensus recommendations/statements. It is about the potential risk of reporting bias in the form of publication bias [5]. In the present project, we aimed to evaluate comprehensiveness by assessing whether authors of the reviews that support the consensus reports made searches in different sources of evidence [7–9]. We used the ratings 'likely comprehensive' and 'unlikely comprehensive' by following the number of sources searched (the higher the number of sources, the more comprehensive is the review), as reported in AMSTAR-2, a recognised tool for evaluating the methodological quality of systematic reviews [16]. The following criteria were used to evaluate comprehensiveness regarding the search for evidence: searches in major electronic databases (such as PubMed), searches that were limited to either one or a few languages, searches in articles´ reference lists, hand-searching (journals), searches in registries (such as Clinicaltrials.gov) and searches of grey literature.

- *Reproducibility*: This concept is about the ability of either a researcher or an independent group to duplicate a study's results using the same methodology as the first researcher or group [10]. We conducted the evaluation in two stages. In the first stage, we recorded the following variables [17,18]: type of review (systematic or narrative (non-systematic)), report of eligibility criteria (likely or unlikely reproducible), report of keywords and Boolean operators, report of excluded articles after title/abstract assessment and report of excluded articles after full-text assessment, inclusion of a list of included articles.

In the second stage, we independently evaluated whether the search and selection of the articles' processes were potentially reproducible. We began replicating the searches by applying the keywords and Boolean operators directly to the PubMed database. We also adjusted the dates for the search period if they were reported in the manuscripts. Then, we tried to replicate the path that had been followed by the authors of the original work to reach the final selection of articles. In this phase, the lack of a reported list of excluded articles since the screening of the titles/abstracts would make it unlikely that we could track the authors' original pathway to select the articles. The lack of that report would result in discontinuity of the test. To make the procedure feasible, we focused only on searches in the PubMed database.

All steps that were performed in this study were conducted independently and in duplicate by the two authors. Disagreements in the assessment were discussed, and a consensus was reached.

3. Results

The 10th European Workshop on Periodontology (periodontal plastic surgery and soft-tissue regeneration) [12], which was promoted by the EFP, was formed by three groups of authors with two to three reviews per group that supported the elaboration of the clinical recommendations. The Enhancing Periodontal Health Through Regenerative Approaches workshop [13], which was promoted by the AAP, focused on five main topics of clinical recommendations that were supported by one review for each recommendation. The 2017 World Workshop for the classification of periodontal and peri-implant diseases [14] included 16 documents in the form of reviews that focused on periodontal and peri-implant topics (Table 2).

3.1. Sample of reviews

The three issues contained altogether 46 articles. Twelve articles were excluded because they are consensus group reports (documents reporting the recommendations). Two articles identified as commentaries, one introductory paper, as well one as a classification proposal were also excluded. Finally, one document was excluded because it was a report of epidemiologic data from two population-based samples. Therefore, a total of 29 reviews were included. The lists of the included reviews and the excluded articles (with reasons for exclusion) are

Table 1
Criteria applied to evaluate reproducibility and comprehensiveness of documents related to consensus guidelines in periodontology.

1. Type of review: the type of review used to support the statements reported in the consensus guidelines. Here described as systematic and non-systematic evidence	2. Reproducibility: we investigated whether there was enough information reported to allow the reproduction of the steps to produce the documents to support the consensus guidelines	3. Comprehensiveness: we investigated whether the documents used to support the consensus guidelines were comprehensive enough, based on high-methodological standards, as suggested by a well-stablished reference for methodological quality (AMSTAR-2) (see Table S2, supplementary material for details)

Table 2
Reviews supporting the consensus guidelines.

Review	Organisation	Citations	Topic
Sculean et al. 2014	EFP	118	Soft tissue wound healing around teeth and dental implants.
Vignoletti et al. 2014	EFP	31	Soft tissue wound healing at teeth, dental implants and the edentulous ridge when using barrier membranes, growth and differentiation factors and soft tissue substitutes.
Cairo et al. 2014	EFP	147	Efficacy of periodontal plastic surgery procedures in the treatment of localized facial gingival recessions.
Graziani et al. 2014	EFP	61	Efficacy of periodontal plastic procedures in the treatment of multiple gingival recessions.
Thoma et al. 2014	EFP	109	Efficacy of soft tissue augmentation around dental implants and in partially edentulous areas.
Burkhardt et al. 2014	EFP	39	Fundamental principles in periodontal plastic surgery and mucosal augmentation.
Sanctis et al. 2014	EFP	30	Flap approaches in plastic periodontal and implant surgery: critical elements in design and execution.
Zuhr et al. 2014	EFP	104	The addition of soft tissue replacement grafts in plastic periodontal and implant surgery: critical elements in design and execution.
Lin et al. 2015	AAP	34	Emerging Regenerative Approaches for Periodontal Reconstruction.
Avila Ortiz et al. 2015	AAP	35	Periodontal Regeneration – Furcation Defects.
Kao et al. 2015	AAP	87	Periodontal Regeneration – Intrabony Defects.
Kim et al. 2015	AAP	51	Periodontal Soft Tissue Non–Root Coverage Procedures.
Chambrone et al. 2015	AAP	148	Periodontal Soft Tissue Root Coverage Procedures.
Holmstrup et al. 2018	EFP/AAP	10	Non–plaque-induced gingival diseases.
Lang et al. 2018	EFP/AAP	10	Periodontal health.
Murakami et al. 2018	EFP/AAP	12	Dental plaque–induced gingival conditions.
Trombelli et al. 2018	EFP/AAP	12	Plaque-induced gingivitis: Case definition and diagnostic considerations.
Fine et al. 2018	EFP/AAP	12	Classification and diagnosis of aggressive periodontitis.
Herrera et al. 2018	EFP/AAP	10	Acute periodontal lesions (periodontal abscesses and necrotizing periodontal diseases) and endo-periodontal lesions.
Needleman et al. 2018	EFP/AAP	7	Mean annual attachment, bone level, and tooth loss.
Albandar et al. 2018	EFP/AAP	13	Manifestations of systemic diseases and conditions that affect the periodontal attachment apparatus: Case definitions and diagnostic considerations.
Cortellini et al. 2018	EFP/AAP	13	Mucogingival conditions in the natural dentition.
Ercoli and Caton 2018	EFP/AAP	7	Dental prostheses and tooth-related factors.
Fan et al. 2018	EFP/AAP	7	Occlusal trauma and excessive occlusal forces.
Araujo et al. 2018	EFP/AAP	12	Peri-implant health.
Heitz-Mayfield et al. 2018	EFP/AAP	11	Peri-implant mucositis.
Hämmerle et al. 2018	EFP/AAP	9	The etiology of hard- and soft-tissue deficiencies at dental implants.
Renvert et al. 2018	EFP/AAP	12	Peri-implant health, peri-implant mucositis, and peri-implantitis.
Schwarz et al. 2018	EFP/AAP	16	Peri-implantitis.

*Assessed by google scholar at 7th. December 2018.

reported in the supplementary material.

3.2. Reporting on comprehensiveness

The review authors did not report searches in any trial registry, and most of the reviews (93%) did not report a search for grey literature. More than two-thirds of the reviews did not report any hand-searches and 11 (38%) reviews were restricted to evidence published in English. Thirteen (45%) reviews did not state whether there was any language restriction. The number of electronic databases that were searched was limited, with a median of one database (Table 3). The full report of scores is reported in Table 1, supplementary file.

3.3. Reporting on reproducibility

There was variability in the reporting of search strategies. Thirty-one percent of the reviews reported neither keywords nor Boolean operators, while almost half the reviews (45%) reported a full-search strategy (keywords + Boolean operators) in all the electronic databases that were searched. One (3%) review that searched in databases/sources other than electronic ones reported on the full search strategy for these extra sources (Table 3).

Almost half of the reviews (48%) presented eligibility criteria that are unlikely to be reproduced. Most of the reviews did not report the list of excluded articles after the title/abstract and full-text analyses (76% and 97%, respectively) (Table 3). The full report of scores is reported in Table 1, supplementary file.

3.4. Investigation on reproducibility

Following our criteria for assessing reproducibility, none of the included reviews were considered reproducible because none of them reported the list of excluded documents (with reasons for exclusion) after the screening of titles and abstracts. Although keywords and Boolean operators were provided in 14 (48%) reviews, we were not able to reproduce the PubMed searches. For the remaining 15 (52%) reviews, the reproducibility test could not be initiated due to either insufficient or no reporting of keywords (Table 3).

4. Discussion

4.1. Summary of key findings

In the present study we aimed to evaluate comprehensiveness and reproducibility of reviews that support consensus guidelines in periodontology. By following the criteria that were proposed in AMSTAR-2 [16], we determined that no review provided both a complete and a comprehensive search of the literature. Furthermore, none of the reviews reported enough information that could lead to reproducibility of the search and selection procedures.

4.2. Interpretation and implications

The present results indicate that there is still room for improvement regarding the methodology of reviews that support the recommendations that stemmed from the reports of consensus meetings in periodontology. For example, many reviews did not report comprehensive search strategies. The concept of comprehensiveness should be a priority for providing unbiased information to support clinical recommendations. The risk of reporting bias in the form of publication bias [5] increases when a limited amount of information is used to support decision making. For example, if a therapeutic intervention is based on a limited amount of scientific literature, some important information might be excluded from the assessment. Although the analysis of a tested intervention compared to a control, when it is based on limited information, may indicate a positive effect, no difference may

Table 3
Characteristics of reviews supporting the consensus guidelines in periodontology (N = 29).

	n (%)
Review	
Not reported/declared	9 (31)
Narrative	10 (34.5)
Systematic	10 (34.5)
Eligibility criteria	
Not reported/declared	8 (28)
Reported and *unlikely* reproducible	14 (48)
Reported and *likely* reproducible	7 (24)
Key-words and Boolean-operators	
Not reported/declared	9 (31)
Only key-words	5 (17)
Key-words + boolean (in not *all* electronic databases)	2 (7)
Key-words + boolean (electronic databases only)	12 (42)
Key-words + Boolean (electronic databases + other sources)	1 (3)
List of excluded articles (after title/abstract assessment)	
Not reported/declared	28 (97)
Reported with reasons for exclusion	1 (3)§
Reported without reasons for exclusion	0 (0)
List of excluded articles (after full-text assessment)	
Not reported/declared	22 (76)
Reported with reasons for exclusion	7 (24)
Reported without reasons for exclusion	0 (0)
List of included articles*	
Not reported/declared	0 (0)
Reported	29 (100)
Language	
Not reported/declared	13 (45)
Limited (for example, only English)	11 (38)
Not limited (comprehensive)	5 (17)
Reference Lists	
Search not reported/declared	17 (59)
Searched	12 (41)
Journals (hand-searching)	
Search not reported/declared	20 (69)
Searched	9 (31)
Registries	
Search not reported/declared	29 (100)
Searched	0 (0)
Grey Literature	
Search not reported/declared	27 (93)
Searched	2 (7)
Number of authors (IQR)	
Median : 3.000 (2–4)	
Number of electronic databases (IQR)	
Median : 1.000 (1–2)	

IQR: interquartile range.

* We considered the report of included articles in tables, article´s text, as well as the main reference list of articles. §: One study provided a summarized list of reasons for exclusion but reasons were not individually reported for each study.

exist [19]. Furthermore, when limited information supports recommendations, it might even harm patients [20].

A similar rationale is applied to reviews without the possibility of reproducibility. Reproducibility is considered a core concept in research [21] because it allows for adequate verification of the published data. In other words, readers of a piece of research will become more confident about its accuracy if an independent group is able to reproduce the original research and reach similar results. Although many reviews of the present sample reported key-words, there was significant heterogeneity regarding to what extent the searches were reported in detail. This lack of detailment in the reporting process may hinder reproducibility.

This study tested reproducibility in only a limited domain/area of the evaluated documents. The reproducibility test should also be extended to other domains (for example, data extraction, quality assessment of primary studies etc). Tests for reproducibility should become a standard practice in science [22], even considering their inherent logistic and technical challenges; however, awareness of reproducing study results is notably increasing [23]. Furthermore, developments in data sharing [24] might have the potential to improve the level of reproducibility and facilitate the logistics in the development of systematic reviews. Therefore, the level of reporting of a scientific article should include enough detail to allow at least the possibility of reproducibility. For example, in our assessment, the lack of reporting of the list of excluded documents after title/abstract assessment hindered the adequate evaluation of reproducibility. One can consider that reporting only the reasons for exclusion (without the complete list of excluded references) might be enough for reproducibility purposes. In our sample of reviews, we found three different levels of reported exclusions of articles after the screening of titles/abstracts: the first level only reported the total number of excluded articles; the second level reported the total number of excluded articles plus summarised the reasons for the exclusions but did not specify the frequency for each reason separately; and the third level reported the total number plus the frequency for each reason for exclusion separately. However, this variability in reporting may hinder the reproducibility process. Furthermore, the eligibility criteria for reviews might occasionally be either ambiguous or inaccurate. In this situation, the reproducibility of the entire pathway in the selection process is even more difficult if the full references are not reported. Therefore, a complete report of the list of excluded articles with reasons already in the screening of titles/abstracts phase will allow researchers involved in the reproducibility process to better understand and verify whether the eligibility criteria was strictly followed by the systematic review authors. We understand that the reproducibility of systematic review steps (not only the reproducibility of results) is therefore necessary. Furthermore, with the development of new technologies for automating the development and analysis of systematic reviews [25], a full report of the references will likely facilitate the use of these tools. Finally, reporting adequate information for verifying data accuracy is also a matter of trust and ethics in research [26].

We chose two recent workshops that had mainly focused on therapeutic interventions to illustrate the impact of results in clinical practice. We also included a recent workshop that was run by two organisations that discussed the classification of periodontal and peri-implant diseases. One can argue that publication bias would have a lesser impact on evidence that supports the classifications of diseases than on therapeutic interventions. Furthermore, it is also challenging to produce systematic reviews for broader research questions [27] as well as when several issues/topics are evaluated within the same document. However, in this specific case (classification of periodontal and peri-implant diseases), a systematic approach to evaluating evidence is of paramount importance due to the potential implications in different domains (teaching, research, clinical practice and policy making). This classification of these diseases will likely be accepted by health organisations, dental schools and health insurance companies because the involved organisations are amongst the most respected regarding the development of periodontology worldwide. Notably, these organisations strive to disseminate this classification to wider audiences [28]. Furthermore, the impact of these reviews on the periodontology community can be verified by the high number of citations that were made within a short timeframe (n = 1167 from 29 articles) (Table 2, Fig. 1).

There was also variability in the methodological quality among reviews from the same workshop. For example, some reviews were based on non-systematic evidence (narrative), which might have influenced the results of the therapeutic interventions. Narrative reviews might produce less conservative (or more positive) conclusions than systematic reviews, and they are also less prone to identifying the methodological limitations of primary studies [29]. Furthermore, applying a review that is of a narrative nature hinders the possibility of accuracy verification. Hence, non-systematic reviews should be avoided as supports for decision making that is directly related to patients' treatment. Additionally, the reviews in this sample reported the use of a

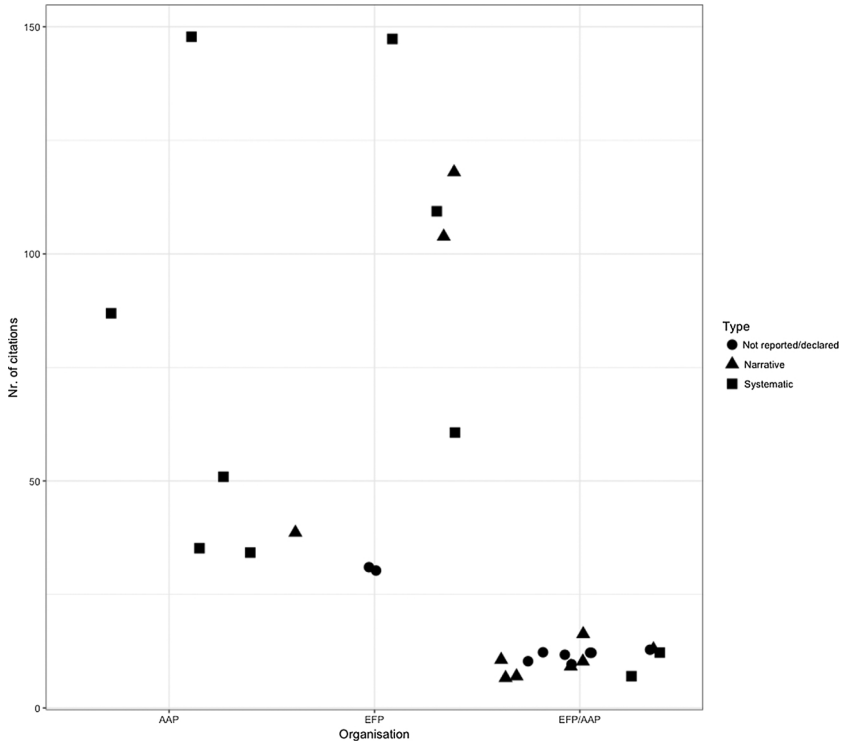

Fig. 1. Association between review-type supporting the consensus guidelines and the number of citations (AAP: American Academy of Periodontology; EFP: European Federation of Periodontology).

low number of electronic databases (median = 1, IQR 1–2), which could imply a higher risk of publication bias. Some evidence has suggested that searching in only one major database might not guarantee adequate literature coverage [30]. The language was an issue of concern regarding the quality of reporting of this information. Almost half the articles did not report whether there was any language restriction for including primary studies in the reviews. It is difficult to interpret a risk of language bias [5] when this information is not reported. None of the reviews reported any search strategies for registries of clinical studies. Although it is more common to register interventional studies [31], there is a growing awareness of the registration of all types of study designs, including observational studies [32].

Almost one-third of the reviews did not report the authors' intention regarding the publishing of either systematic or non-systematic data (narrative), which prevents the reader from understanding the methodological approach that was used. In this group of undefined reviews (n = 9), there was also great variability regarding the methodologies used, which ranged from not reporting any methodology at all to reporting selection strategies. From those reviews reported as narrative (n = 10), three presented no pre-defined methodology, with the remaining seven presenting insufficient methodology which is unlikely to be reproducible.

4.3. Strengths and limitations

To the best of our knowledge, this is the first dental study to critically evaluate the information used to support recommendations from consensus reports from the workshops of major periodontology organisations. Although we included a relatively small sample of documents (n = 29) published in English only, the data might indicate the current practices of these organisations. The strength of our data lies in the importance of the reports from these workshops regarding the periodontology community. As reported, many clinicians, researchers and policymakers can use the data as a reference when developing their works. Therefore, high standards in both research development and reporting are required.

A potential limitation of the present project is the lack of analysis of other review domains. In fact, the original aim was not to evaluate the methodological quality of the sample of reviews with all AMSTAR-2 items, because the focus was on reproducibility and comprehensiveness. We only applied the AMSTAR-2 item 5 as a criterion for evaluating comprehensiveness. Furthermore, the AMSTAR-2 tool would not be applicable to some reviews of the sample that were declared as narrative reviews or did not declare whether they were narrative or systematic.

4.4. Future research directions

Based on the information that is provided in this study, consensus guidelines in periodontology could be methodologically improved if certain measures, such as the following, are taken:

- The information that is used to support recommendations in consensus reports should be based on high-quality systematic reviews, with a focus on comprehensiveness and reproducibility. To achieve these goals, it is recommended that authors follow guidelines for conducting [16,33,34] and reporting [35] on these reviews.
- Organisations overseeing reviews supporting consensus guidelines should consider forming balanced groups of authors consisting of experienced clinicians/experts in the respective fields and also researchers with experience in conducting systematic reviews.
- Information about the rationale and logistics that are used to develop the systematic reviews should be better reported. For example, information about the criteria that are used to select consensus participants or detailed information (i.e. more detailed information on speakers' fees, consulting fees, and/or research grants, etc.) on participants' potential conflicts of interest would not only be of interest to readers but would increase transparency in research.
- The present assessment could be extended to consensus guidelines in

other dental specialties and include also guidelines published in different languages.

5. Conclusions

There is room for improvement in the methodological quality of reviews that support recommendations from consensus guidelines in periodontology. Such improvements would increase confidence in the recommendations' lack of bias and also potentially increase overall trust in research for all parties that are directly involved with these recommendations (clinicians, researchers, patients and policymakers).

Clinical significance

Consensus guidelines in periodontology have a great impact on teaching, research and clinical practice because they are produced by prominent authors from the specialty and endorsed by reputable organisations. Information that supports these guidelines should focus on both comprehensiveness and reproducibility to provide verifiable documents with high methodological standards.

Conflict of interest

The authors declare having no conflicts of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at:https://doi.org/10.1016/j.jdent.2019.05.029.

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