

IN BRIEF

- An oral health scoring system (the Denplan Oral Health Score) has been used by UK general dental practitioners in the examination of 140,000 patients
- Respondents indicated general satisfaction with the concept of the Oral Health Score (OHS)
- Respondents indicated general agreement with most of the criteria used for the various parts of the examination
- The OHS has also been used as a potential patient motivational tool

Evaluation of an oral health scoring system by dentists in general dental practice

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An Oral Health Index (OHX) has been designed to provide a numerical measure of the overall state of a patient's oral health by means of a series of simple clinical examinations. This has been amended to produce the Oral Health Score (OHS).

Objective To assess, by means of a questionnaire, the ease of use and understanding of the OHS by general dental practitioners.

Methods 350 GDPs were asked to participate in the project, of whom 329 agreed. These dentists were given a lecture of 2 hours' duration on the OHS. The participating dentists were requested to use the OHS for a period of 1 year. At the end of this period, a questionnaire was delivered to them by post, with an explanatory letter and reply-paid envelope.

Results Completed, useable questionnaires were received from 239 GDPs, a 77% response rate. Ninety three percent of respondents considered the OHS instructions to be satisfactory. The respondents' views on the criteria on which the OHS component assessments are based indicated that over 90% of respondents agreed with the criteria for caries, adequacy of restorations, periodontal assessment, mucosal assessment and assessment of dentures. A majority of respondents agreed that the OHS provided a valid representation of oral health.

Conclusion The results of the present study indicate that the OHS is considered to be an easy-to-use measure of a patient's oral health and that it provides a valid representation of a patient's oral health.

Details of an Oral Health Index (OHX) designed to provide a numerical measure of the overall state of a patient's oral health by means of a series of simple clinical examinations were published by Burke and Wilson in 1995.¹ Its principal application was intended to be the assessment of clinical outcome as a proportion of optimum oral health. However, other uses of the index may be envisaged – among these are:

- As a means of patient motivation, by which a patient is provided with a score of their oral health, and, possibly, a score which could be considered optimal.
- For measuring changes with time in a patient's oral health status.
- For assessing the consistency and thoroughness of an individual dentist's diagnostic procedures.
- For service planning and evaluation.
- For measuring cost-effectiveness of treatment.
- As a marketing tool for an individual practice (eg 90% of our patients achieve a score of > 90% following a course of treatment).
- To monitor variation in OHX values achieved by different practices.
- As a caring profession, it should undertake a periodic review of the clinical outcomes of its interventions.
- As an epidemiological tool, if sufficient measures of the index are undertaken.

It could also be envisaged that patients could use the index as a tool for litigation if it was considered that the optimal value of oral health had not been achieved following a course of treatment, or during long-term care. Alternatively, the OHX could be used as a defence against litigation, as patients should have been provided with the reasons for low scores.

The index has been subjected to two studies on reliability, with results of a study comparing two general dental practitioners indicating an acceptable value,¹ and results of a study comparing four dentists (two GDPs and two hospital-based dentists) indicating correlation coefficients between the four examiners of 0.94 to 0.99, demonstrating good correlation between the examiners.² Further studies are ongoing.

It is desirable that indices intended for use at the chairside are user-friendly, and capable of being easily operated by dentists and their nurses in all areas of operation. Since a majority of dentists choose general practice as their career setting, it would appear essential that the index is considered manageable and useful to those dentists operating in general practice. Moreover, it would be ideal if the OHX could be used as a tool for providing patients, as well as dentists, with a readily-understood assessment of their oral health status, and if this were so, the index could serve as a patient motivational tool.

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The OHX has recently been adopted and developed by Denplan (Winchester, UK), a company providing a privately funded dental capitation scheme for patients and dentists. As a result, some changes have been made to the scoring system, but not to the overall concept, with the OHX being renamed the Oral Health Score (OHS). The OHS has been used in everyday clinical practice by dentists who participated in the Denplan Excel pilot scheme during 2001. It is the purpose of this study to assess, by means of a questionnaire, the ease of use and understanding of the Oral Health Score (OHS) by general dental practitioners.

Patients' perceptions of the OHS are the subject of another survey.

METHODS

The Oral Health Score

A modified version of the original OHX,¹ the Oral Health Score (OHS), differing only in the method of calculation of the overall score, was used during the evaluation. However, the criteria used for the various sections of the original OHX, such as for the assessment of restorations and periodontal condition, were also used in the OHS.^{3,4}

Questionnaire design

A questionnaire was designed to provide detailed information concerning the operation of the OHS, whether its criteria are reasonable, and whether the index scores are considered to provide a valid interpretation of the patient's oral health status at the time of the examination. The questionnaire was piloted by three dentists, with no amendments being suggested.

Dentist assessment

A total of 350 GDPs who attended Denplan Excel briefing meetings were asked to participate in the project, of whom 329 agreed. These dentists were given a lecture of 2 hours' duration on the background of the index, the OHS examination and the calculation of the OHS. The participants were also provided with an instruction manual giving details of the operation of the OHS. The participating dentists were requested to use the OHS for a period of 1 year. At the end of this period, a questionnaire was delivered to them by post, with an explanatory letter and reply-paid envelope. Non-responders were sent another questionnaire, explanatory letter and reply-paid envelope after 3 months. Recommendations regarding changes in the design of the OHS and its proforma were made following the collation of the results of the questionnaire. Sections of the questionnaire requested responses to the various component parts of the OHS, namely:

- Patient comfort.
- Assessment of caries, including secondary caries.
- Wear and tear assessment, including assessment of the adequacy of restorations.
- Periodontal assessment.
- Assessment of occlusion.
- Assessment of mucosa.
- Assessment of dentures, if present.

The criteria for these assessments are shown in Table 1.

Comments noted on the questionnaires were also noted and collated.

RESULTS

Demographic data

Completed, useable questionnaires were received from 239 dentists from 329 questionnaires mailed (a 77% response rate). Ten per cent of the respondents were female ($n = 24$). Two hundred and nine responses (87%) were from the first mailing, the remaining 30 from the second mailing. Using Fisher's Exact Test, no significant

Table 1 Criteria for OHX and OHS

Component	Description	Criteria
Patient comfort	Absence of pain or sensitivity	Patient report
Patient aesthetics	Content with appearance	Patient report
Patient functionality	Able to eat unrestricted diet	Patient report
Caries	Presence/absence of active carious lesions; secondary caries around restorations	Presence/absence of lesions
Periodontal assessment	Pocket depth, inflammation and subgingival calculus	BPE (Basic Periodontal Examination)
Wear and tear	Loss by wear of enamel, dentine or cementum; loss of dimension or integrity of restoration	Lesion >2 mm depth cervically: 1/3 of enamel loss on any surface with dentine exposure: loss of incisal enamel with negative dentine contour.
Occlusion	Presence of opposing teeth (natural or prosthetic)	Minimum of ten pairs of articulating teeth
Mucosa	Presence of inflammation, ulceration or other pathology	Operator observation
Dentures, if present	Lack of retention, stability, surface, presence of wear, freeway space (for F/F)	Operator observation

differences in sex, years graduated, practice position, group/single-handed practice or practice location, were noted between early and late responders.

Of the respondents, 61% ($n = 146$) had been graduated more than 20 years, 35% ($n = 83$) between 11 and 20 years, 4% between 6 and 10 years, and none less than 6 years. Ninety-six per cent of respondents ($n = 228$) were practice principals, 4% ($n = 10$) were associates. Seventy-seven per cent ($n = 183$) of respondents practised in a partnership/group arrangement, while 23% ($n = 56$) were single-handed. Regarding practice location, 47% of practices ($n = 111$) were in a city or town centre, 42% ($n = 101$) were suburban and 11% ($n = 26$) rural.

Opinions of OHS

The participants were asked if the general instructions for the OHS were satisfactory: 93% of respondents ($n = 220$) replied in the affirmative. When asked if the instructions were adequate for the completion of the various component parts of the OHS, all scores were above 90%, except for denture assessment (83% satisfactory), occlusal assessment (85% satisfactory) and wear and tear assessment (71% satisfactory). The majority of comments made on the questionnaires in the space provided at the end of this section related to a better definition being required for the wear assessment. Four respondents commented that the wear assessment was too subjective. Three respondents commented that patients often function satisfactorily with fewer than ten opposing teeth.

The criteria (Table 1) for the original OHX and the OHS were based on previously tested indices or acknowledged texts. The respondents' assessments of the appropriateness of these criteria are shown in Figure 1.

Weightings have been applied to each section of the OHS, as an arbitrary indication of the potential importance of each section. The respondents' assessments of the appropriateness of these weightings are shown in Table 2. Fifty-one respondents added comments at the end of the question regarding the weightings applied, with 16 commenting on the appropriateness of the peri-

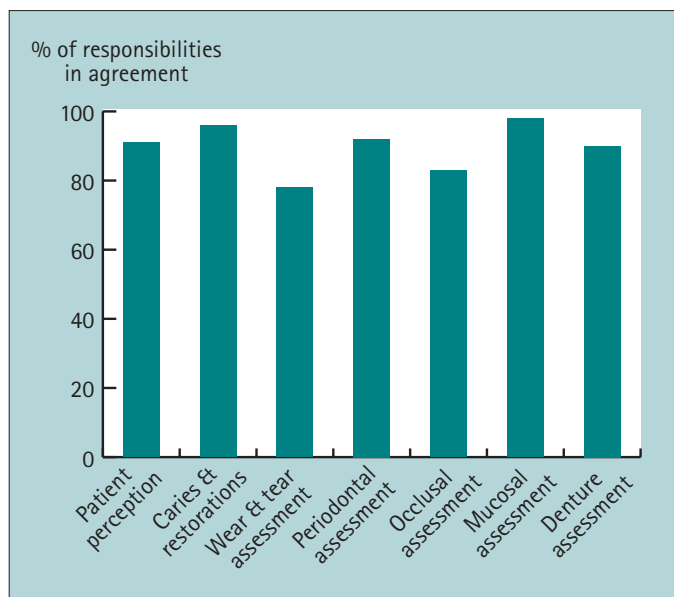


Fig. 1 Respondents' assessment of appropriateness of criteria used in each section of the OHS

Table 2 Correctness of 'weightings' given to each sections of the OHS

Section	Maximum score in OHS	% agreeing with weighting	Range of suggested new weightings	Median of suggested new weighting
Patient perception	24	80	6–30	12
Caries and restorations	24	91	12–40	30
Wear and tear assessment	12	81	6–27	6
Periodontal assessment	24	84	20–50	36
Occlusal assessment	8	85	0–24	5
Mucosal assessment	8	89	2–20	10

odontal scoring, all of whom considered that the periodontal section should have increased weighting. Five respondents calculated that patients with poor periodontal condition could score 76, which represented fair oral health, if all other aspects of the examination were positive.

Validation of OHS

When the participants were asked 'Do you feel that the OHS gives a valid representation of a patient's oral health at the time of examination (eg, that 100% represents ideal oral health and 30% represents poor oral health)', a majority of respondents agreed that the OHS provided a valid representation of oral health (50% agree [$n = 118$], 23% slightly agree [$n = 55$]), while 17% ($n = 40$) slightly disagreed and 10% disagreed ($n = 23$).

Patient comments on OHS

Thirty-seven per cent of respondents stated that one or more patients had made an adverse comment about the OHS. The majority of comments made by respondents at the end of this question related to the increased paperwork and the potential cost of the exercise.

Ease of use of OHS

Ease of operation of the OHS was measured on a 6-point scale, where 6 = easy and 1 = difficult. The results are shown in Figure 2. Regarding time taken to become accustomed to using the OHS, 58% of respondents ($n = 138$) stated that it took 2 weeks or less, 27% ($n=63$) 2 to 4 weeks, with the remaining 15% taking more than 1 month. Eighty-two per cent of respondents' dental nurses experienced no difficulty in using the OHS. The majority of comments made by respondents in this section related to the arithmetic involved in calculating the final score.

Additional uses of the OHS

While the OHS is designed for measuring oral health, the participants were asked to give their opinions of additional potential uses of the OHS: these are shown in Table 3.

DISCUSSION

Previous composite indices of oral health have been developed, such as the Oral Health Status Index,⁵ the Index of Dental Need⁶ and an index devised by Nikias and co-workers,⁷ but there are no published data in respect of the uptake of these measures. This study presents the opinions of dentists participating in the assessment of a recently designed scoring index for oral health, the OHS, which has involved the examination of around 140,000 patients using this measure. This appears to represent the largest, published use of an oral health index. Moreover, it is currently being used in 385 practices in the UK, with 56 dentists undergoing training at the time of writing.

The response rate of 77%, may be considered good as it is substantially greater than the response rate often obtained for questionnaires to dentists.⁸ Non-responders may have failed to reply because they were satisfied with the operation of the OHS, as it could be considered that those who were dissatisfied with the OHS may have been keen to voice their views. In this respect, no differences were found between late and early responders. The respondents were not typical of UK dentists as a whole, given that 96% were practice principals, 61% had been graduated for more than 20 years and 90% were male. Indeed, the results appear to indicate that this study surveyed a mature group of practice-owners who had opted to treat patients under the auspices of a private capitation scheme, namely Denplan. This group could therefore be considered to present a relatively robust test to the measure under investigation.

The results indicate general satisfaction of the OHS users with its concept, although a small proportion of dentists and nurses found difficulty in becoming accustomed to using the index. The OHS users were generally satisfied with the instructions for use of the OHS, with the 'definitions' for wear and tear, occlusal condition and denture condition being those which were not endorsed by over 90% of the respondents. Further work is therefore indicated to improve the clarity of these instructions.

The criteria for each aspect of the scoring system were derived from previously published indices such as CPITN and the Tooth Wear Index of Smith and Knight⁹ and acknowledged texts. The majority of these criteria gained widespread acceptance, although 22% of respondents considered the wear criteria to be inappropriate and 17% considered the criteria for occlusal assessment to be inappropriate. The wear criteria were based on the work of Smith and Knight in 1984:⁹ the results of the present study appear to indicate that a proportion of dentists do not agree with these crite-

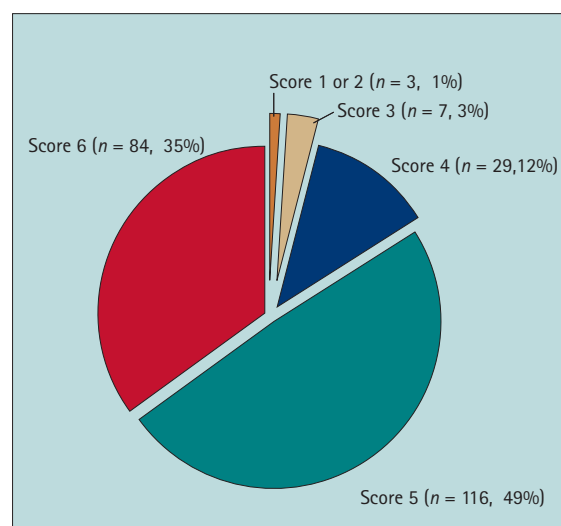


Fig. 2 Ease of use of OHS (6-point scale where 1=difficult and 6=easy)

Table 3 Suitability of OHS for other potential uses

	% of positive responses	Number giving positive response
For measuring changes over time in patient's oral health status	85	200
In clinical audit	84	195
As a patient motivational tool	83	194
For assessing consistency of dentist's diagnostic procedures	69	163
For practice value	59	134
As an epidemiological tool	55	126
As a marketing tool for an individual practice	49	114
As a means of monitoring variations in OHS scores in different practices	38	89
For measuring cost effectiveness of treatment	19	43

ria for severity of wear. The criteria for occlusal assessment are based on the Shortened Dental Arch concept.^{10,11} It would also appear that a proportion of respondents is either not in agreement with this concept, or not aware of it.

The scoring system in the original OHX was arbitrarily chosen by the clinicians who designed it, following discussions with specialists in the various component parts of the index. The weightings were designed to reflect the importance of the various aspects of the index. The respondents to the present survey were in general agreement with the 'impact' of caries and restorations and mucosal assessment, but around 20% considered that the weightings applied to patient perception and wear were incorrect, with suggestions that wear should be given an increased weighting and patient perception a reduced weighting. Comments made by respondents indicated a general view that the impact of the periodontal score should be raised. This is of particular relevance in light of the suggestion by five respondents that a patient with mobile teeth and very poor periodontal condition could achieve a 'respectable' score of 76%.

A majority (73%) of respondents considered the index to provide a valid representation of oral health, namely that 100% represented good oral health and 30% poor oral health. The scoring structure makes scoring less than 30% difficult, because it could be considered that, even in mouths affected by gross caries and periodontal disease, there are generally aspects of the mouth which are healthy. More regular achievement of a full range of scores from 0 to 100 could be achieved, but at the expense of a more complex calculation of the score, which could detract from the user friendliness of the system, which was considered good.

The ideal criteria for an index of oral health have previously been considered to be:¹

- Reproducible and of proven validity,
- Readily understood by dentists with minimal training,
- Simple and quick to determine,
- Suitable for pre- and post-operative assessments,
- Appropriate for epidemiological purposes,
- Capable of having different weightings applied,
- Computer compatible,
- Affordable,
- Acceptable to practitioners and all interested parties.

The results of the present study indicate that the OHS fulfils these criteria, including computer compatibility, given that computer software has been developed for its recording. In this respect, the authors are aware of at least one dentist with an interest in software technology who has adapted the OHX for successful recording by computer in his practice (A. Johnston, personal communication, Jan. 2002).

The OHS was designed for use as a 'composite' index of oral health in general dental practice rather than as an actual measure of treatment need, although health and need are necessarily linked. In this respect it could be considered to fulfil a different function from the Index of Restorative Dental Treatment Need recently described by Falcon and colleagues.¹² As their index lists complexities for restorative procedures, (with code 1 being appropriate to any dental graduate, code 2 to the experienced dentist, and code 3 to the dentist with specialist training) it is apparent that its function is as a screening tool rather than as an index for general measurement of oral health in general dental practice. No details are presently available regarding the uptake of this index.

Lastly, other measures of oral health have been suggested in which the patient is not examined, but, which concentrate on the patient's perception of discomfort, physical, psychological and social wellbeing.¹³ In the Oral Health Impact Profile (OHIP), Slade and Spencer describe the use of an instrument of 49 questions to determine the social impact of oral disorders.¹⁴ The relationship of such a measure to the OHS has still to be determined, but it would seem that the OHS provides a valid and relatively quick method of assessing oral health and that it includes in its scoring system, three relevant questions on patient comfort. The results of the present study, which amount to a ratification of the OHS by a large majority of its users, appear to indicate that clinical examination of patients is still considered necessary to provide an estimate of oral health.

Further development of the OHS and OHX is now indicated, in particular to fine tune the appropriateness of the weightings in the component sections of the OHS in accordance with the users' views expressed in the results of the present work. The current climate of clinical governance makes the use of a scoring system such as the OHS or OHX essential in clinical practice.

CONCLUSION

The OHS has been subjected to assessment by its users during use in about 140,000 patient examinations. The results of the present study indicate that the OHS is considered to be an easy-to-use measure of a patient's oral health, and that it is considered by a majority of respondents to provide a valid representation of a patient's oral health.

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1. Burke F J T, Wilson N H F. Measuring oral health: an historical view and details of a contemporary oral health index (OHX). *Int Dent J* 1995; **45**: 358-370.
2. Burke F J T, Greene P R, Roberts C. Reproducibility studies on a newly designed Index of Oral Health. *J Dent Res* 1994; **73**: 842.
3. Advisory Board in General Dental Practice. *Self Assessment Manual and Standards*. London, Royal College of Surgeons, 1991.
4. Ainamo J, Barmes D, Beagrie G, Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organisation (WHO) Community Periodontal Index of Treatment Needs (CPITN). *Int Dent J* 1982; **32**: 281-291.
5. Marcus M, Koch A L, Gershen J A. An empirically derived measure of oral health status for adult populations. *J Pub Health Dent* 1980; **40**: 334-343.
6. British Association for the Study of Community Dentistry. *Measures of Oral Health*. Information document.
7. Nikias M K, Sollecito W A, Fink R. An oral health index based on ranking of oral status profiles by panels of dental professionals. *J Pub Health Dent* 1979; **39**: 16-26.
8. Tan R T, Burke F J T. Response rates to mailed questionnaires. A review of 77 publications. *Int Dent J* 1997; **47**: 349-354.
9. Smith B G N, Knight J K. An index for measuring the wear of teeth. *Br Dent J* 1984; **156**: 435-438.
10. Witter D J, Cramwinckel A B, van Rossum G M J M., Kayser A F. Shortened dental arches and masticatory efficiency. *J Dent* 1990; **18**: 185-189.
11. Witter D J, van Elteren P, Kayser A F, van Rossum G M J M. Oral comfort in shortened dental arches. *J Oral Rehabil* 1990; **17**: 137-143.
12. Falcon H C, Richardson P, Shaw M J, Bulman J S, Smith B G N. Developing an index of restorative dental treatment need. *Br Dent J* 2001; **190**: 479-486.
13. Locker D. Measuring oral health: A conceptual framework. *Community Dent Health* 1988; **5**: 3-18.
14. Slade G D, Spencer A J. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 1994; **11**: 3-11.