Commentary

Core Oral Health Outcomes for Sports Dentistry Research

Introduction and background

Core outcome sets (COS) are agreed, standardised sets of outcomes for research of a particular condition or intervention and are normally developed by consensus amongst the research stakeholders. They represent the minimum collection of measures that should be recorded and reported.[1] The aim is to standardise both *what* is assessed (outcome) and *how* it is assessed (outcome measure) to enable synthesis of multiple studies, for instance, in systematic reviews.[2] The premise is to use research data more efficiently and effectively. Ethically, it is our responsibility that research involving human participants has the greatest likelihood of informing on improvements to health and well-being. It is also worth emphasising that screening for oral conditions is recommended as beneficial for health for both the general population and for athletes.[3]

High-quality data on the prevalence and impact of health-related incidents are important to establish the burden of health problems and inform appropriate preventive and health promotion strategies, and the International Olympic Committee has called for more accurate data on oral health.[4]

Sports dentistry has traditionally focussed on epidemiology and prevention of orofacial trauma; however, there is increasing evidence that exercise training and competition, particularly at the elite level, may significantly increase the risk to oral health of athletes.[5] Elite athletes tend to be in the age group most commonly associated with eruption of third molars and related problems. Tooth decay, erosive tooth wear, and trauma to the teeth all cause irreversible damage, as does the dental treatment required to manage these conditions, which also carries a lifetime cost. The feelings that people perceive from their body can provide a summation of their physical condition, underlying mood, and emotional state; therefore, athlete self-reports of symptoms/performance impacts should be included as an essential part of data collection frameworks.[6] There is a wealth of literature demonstrating impacts of oral diseases, including caries, periodontal diseases, and pericoronitis, on the quality of life. With clear psychosocial impacts of oral health, it would be surprising if training and performance were not affected in those athletes with poor oral health.[7] It is also important for athletes to understand possible risks of an athletic lifestyle and strategies to mitigate those risks.

Ideally, the indices used to collect clinical data should be easy to use, evidence-based, and applicable in a wide variety of settings and enable comparability with epidemiologic data. The Adult Dental Health Surveys (ADHS) have been carried out in the UK every 10 years since 1968 and provide an established model for clinical outcomes, self-reported psychosocial impacts, oral health behaviours, and risks to oral health.[6] A systematic review identified an athlete-reported outcome measure of impact on performance with validity for use in sport, which could be adapted for oral health problems.[8]

The aim of this paper is to propose a core outcome set for sports dentistry research, based on those that we have developed over several years, to initiate debate and discussion leading to a consensus (Table).

Clinical outcomes

The most basic measure of oral health is the number of teeth, including number of sound and unrestored teeth. Clinical oral disease outcomes include dental caries, oral sepsis, erosive tooth wear, periodontal diseases, and pericoronitis.

Dental caries

The International Caries Detection and Assessment System (ICDAS) is a simple, logical, evidence-based system for detection and classification of caries in dental education, clinical practice, dental research, and dental public health.[9] It is a 2-digit system where the first digit records the restorative status and the second digit caries status. It provides 3 levels of caries diagnosis to allow flexibility in implementation: full ICDAS, modified ICDAS, and merged ICDAS. Each tooth is examined, and a restoration code and caries code recorded for each surface. This can be totalled to report at tooth level. There are special codes to record missing teeth; therefore, decayed, missing, and filled teeth can be calculated. To support a shift towards a more preventive and outcomes-focussed philosophy, the ICCMS group developed a framework that synthesises risk assessment data with caries classifications.

Oral sepsis

The Pulp, Ulcer, Fistula, Abscess Index (PUFA) records symptoms of sepsis in permanent dentition using a simple 3-point scoring system[10] and is an additional measure of the consequences of caries. It can also be extended to record other soft tissue pathologies.

Erosive tooth wear

The Basic Erosive Wear Examination (BEWE) is an internationally agreed classification of tooth wear that links the

Table – Outcomes and outcome measures.

Outcome	Outcome measure
Clinical	
Function and health	Number of teeth
	Number of sound and untreated teeth
Dental caries	ICDAS staging
Erosive tooth wear	BEWE staging
Periodontal health	BPE staging
Mucosal health	PUFA
	Pericoronitis
Athlete-reported	
Psychosocial impacts	Items from OIDP: eating, relaxing, smiling
Impact on performance in sport	OSTRC modified for oral health problems
Oral health behaviour	
	Frequency of toothbrushing
	Frequency of interdental cleaning
	Use of fluoride
	Utilisation of health service resources
	Mouthguard use
Risks to oral health	
	Frequency of consumption of sugar in regular diet
	Frequency of consumption of sports nutrition products
	Contact sport
	Frequency of use of tobacco/vaping
	Frequency of consumption of alcohol

ICDAS, International Caries Detection and Assessment System; BEWE, Basic Erosive Wear Examination; PUFA, Pulp, Ulcer, Fistula, Abscess Index; OIDP, Oral Impacts on Daily Performance tool; OSTRC, Oslo Sport Trauma Research Centre overuse injuries tool.

grading of lesions with clinical management.[11] The worst score in each sextant is recorded and a total calculated for the whole mouth. This total is then linked to severity and treatment need. Historically, scores 0 to 2 are no risk, scores 3 to 8 are low risk, scores 9 to 13 are medium risk, and scores 14 to 18 are high risk. However, these are arbitrary boundaries and it is recognised that they may need to be reconsidered.[11] In younger groups, such as elite athletes, we have considered a score of 7 or more to indicate increased risk.[5]

Periodontal diseases

The Basic Periodontal Examination (BPE) is a simple and rapid screening tool used to indicate the level of further examination needed and provide basic guidance on treatment needed.[12] It was modified from the widely used Community Periodontal Index developed by the World Health Organisation for global surveys. However, the BPE should be used for screening only and not for diagnosis. All teeth in each sextant should be examined, with the exception of third molars. The worst score for each sextant is recorded, giving an indication of severity of disease. It is not common practice to total the scores from each sextant; however, this may become a useful measure in the future.

Pericoronitis

Pericoronitis can be assessed as presence or absence of clinical features including swelling and inflammation associated with a partially erupted third molar.

Athlete-reported outcomes and outcome measures

Three items taken from the Oral Impacts on Daily Performance (OIDP) outcome measure used in the Adult Dental Health Survey of 2009 can be included to assess psychosocial impacts: difficulty eating/drinking; difficulty relaxing, including sleeping; and difficulty smiling, laughing, or showing teeth without embarrassment.[13] The reference time frame should be no longer than 12 months.

Despite some limitations, as a potential tool to measure athlete-reported impact on performance across a variety of sports, the Oslo Sport Trauma Research Centre overuse injuries tool (OSTRC) questionnaire on overuse injuries forms a model which could be adapted to evaluate the impact of any pre-defined health problem on athletic performance.[8] The reference time frame should be limited to not more than previous 12 months.

Oral health behaviours and risks to oral health

Nutritional intake, including usual diet, sports drinks, and supplements, is a major determinant of oral health. Regarding risk mitigation, the most important behavioural factor affecting both dental caries and periodontal diseases is routinely performed plaque removal with a fluoride toothpaste.[14] Use of a custom-made mouthguard is recommended for athletes participating in contact sports; therefore, this should be recorded. Tobacco use, vaping, and alcohol consumption should also be recorded.

Data collection

Examiners and recorders should undertake training in the use of all indices including a calibration exercise to avoid systemic bias. Intra-examiner calibration should be included where more than one examiner is collecting data.

If data collection is not undertaken in the dental surgery, athletes should be examined supine on a portable examination couch, under appropriate illumination from a mobile examination lamp (eg, DARAY X100LED) or head torch. Compressed air from a portable dental unit can be used to dry the teeth (eg, PDU II Standard, QDent). If compressed air is not available, the teeth should be dried with cotton wool rolls. Examiners should observe appropriate infection control procedures including single-use masks and gloves. A new set of sterile single-use instruments should be used for each athlete. Protective eyewear should be provided for the athletes during examination.

A personalised oral health report should be provided for each study participant, with links to appropriate preventive actions. Our research has demonstrated that oral health behaviours can be enhanced following brief interventions.[15]

Discussion

The clinical indices presented in this paper are standardised indices taught widely to dental undergraduates in training and advocated for epidemiologic surveys. They are also recommended for use in routine clinical practice. They are therefore easy to implement in epidemiologic practice. Furthermore, they align to the principles of minimal intervention, including identification of risk of disease at an early stage of disease and associated preventive measures. Use of consistent outcome measures has allowed us to pool the data from our group's research, thereby strengthening the evidence base.

There is a suggested composite measure of excellent oral health[7] that could be used in future research:

- 21 or more natural teeth
- 18 or more sound and untreated teeth
- No decay detected at any site
- No periodontal pocketing of 4 mm or more and no loss of attachment of 4 mm or more
- No calculus or gingival bleeding

This would provide a high bar to aim for but could well be achievable with adoption of effective oral health behaviours by athletes.

Having opened the debate, the next step for COS development would be the involvement of key stakeholders in the process. These would include athletes, oral health researchers and clinicians, sport science researchers and clinicians, as well as athlete support teams initially to identify a long list of possible outcomes. These would be refined though a Delphi survey process before a consensus meeting to finalise the core set as recommended by the COMET initiative.[1]

Conclusions

Participation in research should have a benefit for the study participants, and it is well recognised that prevention is better than cure. All oral conditions can be detected at an early stage during a routine dental check; therefore, a minimal intervention approach should be considered where the athlete/person is enabled to take responsibility for their own health. This paper has presented a core set of clinical and associated self-reported outcome measures that have been used by our group. All clinical indices employed should use a clear numeric system that is easy to record and align with a risk assessment. Further details regarding scoring of responses are available from the publications in the reference list. To facilitate future research, the development and application of a COS would be beneficial.

Conflict of interest

None disclosed.

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