Patient assessment in general dental practice – risk assessment or clinical monitoring?

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IN BRIEF

- Care pathways are becoming established within dentistry as a method of tailoring delivery of care based on a risk assessment.
- There is little evidence to support or refute such an approach and the ability to reliably predict future disease remains elusive.
- More weight should be given to the general practitioner's ability to longitudinally monitor their patients' clinical condition rather than the prediction of risk at one point in time.

OPINION

Risk assessment in general dental practice is becoming increasingly common and has led to the development of care protocols, which aim to act as a framework for decision making to produce an optimum level of care. However, many models of risk have been informed by research undertaken in academia and are based upon summary statistics of populations. In practice, a significant proportion of patients attend on a non-symptomatic, continuous and regular basis, often over long periods of time. This provides general dental practitioners with a wealth of knowledge about their patients to inform clinical decision making on an individual basis. The purpose of this paper is to highlight the important differences between an academic assessment of risk and one that is relevant to practice, before introducing a simple tool to screen out patients who are considered to be 'low risk'. The relevance of this tool is discussed, along with its potential uses and limitations as a means to promote discussion during the development of the pilots for the new dental contract to be introduced by the coalition government.

BACKGROUND

In 2002, following the publication of *Options for change*,[1] an Oral Health Assessment (OHA) was introduced.[2,3] Based on a review of the available evidence, patients underwent a risk assessment and were allocated to a care pathway, 'a documented sequence of clinical interventions placed in an appropriate timeframe'.[1] Care pathways, or more accurately care protocols, act as a framework for decision making and enable the incorporation of evidence-based clinical guidelines into practice to produce an optimum level of care, based on an assessed level of risk.[2,4,5] However, this is based on the premise that the available evidence enables risk to be accurately determined and that the results of the studies in the literature that inform this process are relevant to a general dental practice population. The purpose of this paper is to highlight the important differences between an academic assessment of risk and what is possible in general practice, where dentists have a continuing care relationship with their patients and can clinically monitor the health status of patients longitudinally. We then set out a simple approach to the assessment of risk in practice, which is potentially more relevant to the needs of general practitioners and their patients.

RISK ASSESSMENT: EVIDENCE BASE

Based on figures from the Department of Health, approximately a quarter of the UDAs generated in England in the 2008/09 period were associated with Band 1 courses of treatment,[6] where no active treatment was required. This highlights the unique nature of dental service provision, where a significant proportion of patients attend on a non-symptomatic, continuous and regular basis, often over long periods of time. This long-term relationship provides general dental practitioners (GDPs) with a wealth of knowledge about their patients to inform clinical decision making on a case-by-case basis. In contrast, many of the current guidelines are informed by research undertaken in academia and are based upon summary statistics of populations.[7,8] Ideally, such guidelines should be informed by randomised clinical trials, but more often, approaches to risk assessment rely on studies that can only identify an association between risk factors and the disease process, not a causal relationship.[9,10] These studies usually present the results of multivariate analyses as a series of odds ratios to identify significant associations between the presence of disease and known risk factors. However, this approach does not help dentists categorise their patients according to risk with any degree of confidence. In addition, as many of the epidemiological studies used to inform this approach draw upon a broad population base, the associated risk factors identified may not be as relevant for decision making in dental practice, where GDPs are concerned with the needs of individual patients who attend on a regular basis. Overall, it has been recognised that there is a 'dearth of good research evidence in most areas of oral healthcare'[4] and the premise of this paper is that risk assessment may not accurately reflect the behaviour of the common dental diseases in a general practice environment. In addition, reliance is often placed upon expert opinion that is principally informed by the academic or secondary care environment. This means that any guidelines produced reflect a particular perspective (Table 1)

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and may not reflect individual risk behaviour in practice.[5]

CLINICAL CATEGORISATION OF PATIENTS

The development of accurate academic models of risk for caries and periodontal disease based on epidemiological studies has proved to be elusive.[9,10] This is because the risk factors which have been identified only account for a limited proportion of the expression of the developing disease,[10,11] with the majority of an individual's risk being determined by factors which continue to remain unquantified. In addition, in the epidemiological study of periodontal disease, there are significant methodological issues including the definition of the disease and its accurate measurement.[12] Given this, it could be argued that the GDP's experience of their patient's idiosyncrasies and their ability to monitor clinical signs longitudinally is potentially more valuable and important than a 'one-off' assessment of risk, given that GDPs are in a position to utilise more subtle 'contextual cues' to identify the likelihood of future disease occurrence.[13,14]

Although the concept of risk has been used to determine a recall strategy, the 'red', 'amber' and 'green' (RAG) approach to the categorisation of risk has taken this concept a stage further, with different preventive and recall strategies being assigned to form care protocols. However, recent research undertaken with children would suggest that the assumption that underlies this approach is potentially fallible, as 25% of caries-free patients develop the disease, while 75% of patients with any existing disease go on to develop new carious lesions.[15] As a result, the critical transition appears to be the shift from being 'disease-free' to being 'disease active'. Milsom *et al.* also found that once children had developed the disease, its activity tended to progress at approximately the same rate, independent of the number of carious teeth present in the mouth.[15] As a result, a targeted preventive approach based on a stratification of risk according to RAG may mean that not all patients receive the full complement of preventive activities detailed in *Delivering better oral health*[16] and that some interventions might be applied too late. Past caries experience remains the most significant predictor of future caries development in both the mixed and adult dentition,[11,17,18] so the key is stopping the expression of the disease in the first place using a broader population approach,[19] not tailoring the preventive approach according to perceived risk based on stratified categories. This also avoids the ethical dilemma of providing different levels of prevention for different patients.[20]

It appears therefore that RAG categorisation and subsequent care protocols are based on assumptions about risk thresholds for disease, whose evidence is incomplete and reliant on studies that may not be entirely relevant to the management of patients in dental practice. We therefore present a simplified model, which aims to screen out those patients at 'low risk' of disease, enabling the GDP to focus on those patients who are deemed to be 'at risk', while providing both groups of patients with the appropriate level of prevention as detailed in *Delivering better oral health*.[16]

Table 1 Differences between academic and practice approaches to care

Detail	Secondary care	Primary care
Approach	Cross-sectional	Longitudinal
Population	Referred patients	Regular attenders
Data used	Population approach	Individual approach
Decisions based on	Average values	Individual patients
Intervention	One off	Continuous
Emphasis	Treatment of disease	Maintenance of health
Historical knowledge	Minimal	Mostly

Table 2 Ideal properties of a risk assessment tool in practice

Properties of an ideal risk assessment tool in practice
Adequate classification accuracy until next review
Evidence-based
Time-efficient
Low cost
Simple outcomes
Understandable/comprehensible to the patient
Acceptable to the dentist
Acceptable to the patient

SCREENING TO IDENTIFY THE HEALTHY

Screening is formally defined as a process of identifying apparently healthy people who may be at an increased risk of a disease or a condition.[21] It is analytically distinct from an examination as its purpose is to simply determine the presence or absence of disease, not to record or detail the condition to enable a diagnosis to be formulated, pursuant to the skill of a trained dentist.

The ideal properties of such a screening tool in practice are highlighted in Table 2 and our proposal is represented diagrammatically in Figure 1. It essentially combines an assessment of the two most common dental diseases encountered by general dental practitioners, enabling a simple, rapid and preliminary classification to be undertaken. The key element to this approach is that those patients identified as 'low risk' by the tool do not require any further management other than evidence-based preventive care and advice in accordance with *Delivering better oral health* along with an appropriate recall.[16] In contrast, those deemed to be 'at risk' receive a tailored treatment plan prescribed by a general dental practitioner following a more detailed assessment of the patient. However, both groups benefit from the range of strategies detailed in *Delivering better oral health*, in order to deliver a population approach to prevention.[19]

As critiqued above, delineating and stratifying risk is a difficult exercise given the multifactorial nature of the common dental diseases. However, this process is made simpler and more accurate when the decision is binary in nature. For caries, there is a strong body of evidence that past experience of caries is the best predictor of risk.[11,17,18] In this model 'at risk' could be defined as a change in clinically or radiographically detected caries status since the last screening examination.[22] For periodontal disease, the currently accepted screening tool is the Basic

Periodontal Examination (BPE) and our suggested threshold is set at the BPE score of 3, that is, where the presence of pocketing may begin to interfere with the ability of the patient to maintain their health. This is in line with the current guidance from the British Periodontology Society,[23] where further measurements are recommended for score 3 and above, given its clinical significance. While it is recognised that a range of indices are used for periodontal disease reflecting both current pathology and cumulative tissue destruction,[12] there is agreement in Europe that clinical attachment loss greater than 3 mm and pocket depths exceeding 5 mm are useful in the surveillance of moderate and severe periodontal disease.[24,25] Both of these clinical parameters are described by Code 3 of the BPE.

While the principal philosophy of the current NICE guidelines is based on sensitivity,[26] the approach taken by this model is based on specificity. This means that those patients identified to be healthy are screened out, while ensuring individuals identified to be 'at risk' receive a more detailed assessment taking into account factors such as age, smoking behaviour, concomitant systemic disease or conditions to produce an individualised treatment plan in accordance with the principle highlighted in the NICE guidelines.[26] This model therefore does not advocate a standardised 'tick box' assessment but enables clinicians to screen out those at 'low risk' and apply their clinical experience and judgment to identify those patients deemed to be 'at risk', that is, those with the greatest need to access the treatment planning skills of the clinician. The model also acknowledges that the population with identified risk factors will exhibit a distribution of disease severity, so not all smokers will have advanced periodontal disease and not all children from a disadvantaged background will have the same risk of caries.[27] However, to undertake this appropriately, an important underlying assumption is that regular clinical monitoring is undertaken, where GDPs can repeatedly undertake the screen.

One key difference between the primary care environment and academic assessment of risk is that dentists have the luxury of making longitudinal measurements of clinical findings. Both 'low risk' and 'at risk' patients are seen longitudinally and regularly (but the former not necessarily as frequently) under a continuing care arrangement. Dentists can therefore vary the frequency of recall by comparing clinical measurements taken at the latest check-up with historically collected empirical data for each patient. Similarly to medicine, the model recognises the tacit and experiential knowledge gained from dentists' knowing the idiosyncrasies of their patients and the behaviour of the common dental diseases.[28]

Frequency intervals for recall should be informed by studies of the natural history of disease, which have demonstrated that both diseases do not undergo rapid change but rather undergo a more measured expression.[29,30] In accordance with the principle of the NICE guidelines, the time between recall of the 'low risk' patients would more likely fall into the one- to two-year range, while those 'at risk' would be recalled every three months to one year.[26] However, these intervals would be adjusted by the clinician based on their findings of the screening assessment at each visit. If the disease thresholds are breached and patients move from 'low risk' to 'at risk', a more detailed assessment and appropriate care protocol would be required with a shorter recall interval. Likewise if a patient moves from 'at risk' into the 'low risk' category their recall interval would be lengthened within the 12- to 24-month category.

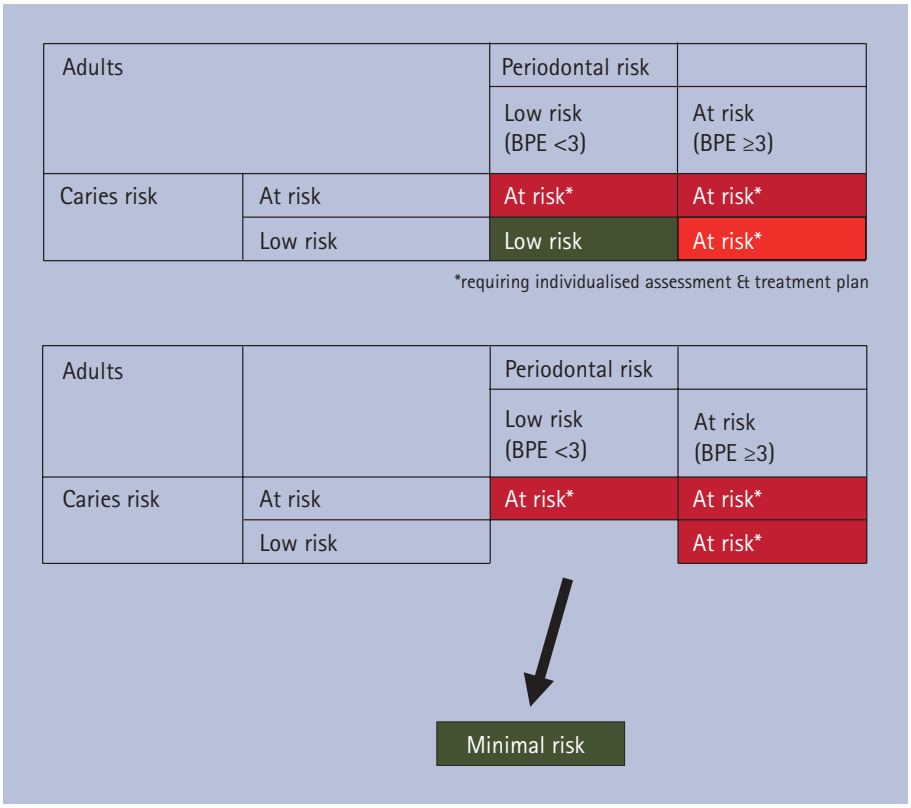

Fig. 1 The proposed tool

As highlighted above, a further critical component of the approach is that both 'low risk' and 'at risk' patients are provided with the same minimum level of preventive treatment following the assessment in accordance with *Delivering better oral health*,[16] in an attempt to prevent the transition from 'disease-free' to 'disease active'.[19]

A TOOL FOR SKILL MIX?

The screening tool has the potential to be utilised in dental teams who make greater use of skill mix and enable dental care professionals (DCPs) to screen out patients who are deemed healthy by the screening tool. Under current General Dental Council regulations,[31] DCPs cannot examine patients, but as identified above the process of screening is distinct from an examination and the formation of a treatment plan. If DCPs were to screen between inspections by the GDP, the model has the potential to extend the current recall interval between dental examinations while ensuring the continual monitoring of patients at predetermined intervals. In the unpublished systematic review of skill mix in dentistry,[32] a number of included studies found that DCPs were more than able to identify the common dental diseases. This would make the active

screening for disease analogous to the use of physician assistants in the United States[33] and role substitution and supplementation in the UK in medicine.[34]

LIMITATIONS OF THE MODEL

A fundamental limitation of the model is that while past disease is the most reliable predictor of future caries experience,[11] such a record may not exist for new or young patients or irregular attenders. Consequently, it would be prudent to have the option to categorise new, irregular attenders and young patients as 'at risk' and provide enhanced prevention until the dentist builds up a better picture of their disease risk, that is, to treat as 'at risk' until proven otherwise.

Any primary care-based assessment of risk has its limitations and should not be used for reasons other than to help GDPs to manage their patients. For example, there could be a desire on behalf of commissioning organisations or central government to monitor movement of patients between risk categories as a population health surveillance tool, as a means of performance management of existing NHS contracts or as an outcome measure in a new NHS contract.[35,36] Such an approach would not be sensible due to the inability to predict risk accurately and because of the problems of inter- and intra-examiner reliability and the likelihood of examiner bias, especially if outcomes are linked to remuneration.

The model of care highlighted above is introduced as one possible approach that simplifies the initial assessment and values the relationship between the dentist and the patient in a stable practice environment. While not recognised in the current contract, the importance of continuing care does appear to fit with the proposed contract's emphasis on capitation, registration and quality.[35,36] However, similarly to the RAG model, it would require rigorous and careful scrutiny to determine its efficacy. Evaluation of any risk assessment tool on an individual basis is ethically difficult because once an assessment of risk is made, it would not be ethical to withhold currently accepted treatment regimes from patients identified as being 'at risk' and therefore a system or service evaluation approach is more appropriate.

Any new model of care needs to be evaluated on the basis of its efficacy (can it work), effectiveness (does it work) and efficiency (resources to enable it to work). The views of patients would also be important to collect; policy makers and clinicians would need to understand the views of regularly attending 'healthy' patients on the acceptability, including value for money, of a limited screening examination.

Given the lack of empirical evidence for the existing RAG approach, both could be investigated as part of the piloting process of the new dental contract to determine the suitability of both models in practice.[35,36]

CONCLUSIONS

A significant proportion of patients who regularly attend general dental practices have repeat inspections without any need for treatment. For NHS dental services to work more efficiently and for dentists' skills to be used to their maximum benefit, it is desirable to screen out these patients and concentrate resources on those patients with greatest need. The tool and model suggested is one method of undertaking this, but requires comparison with other means of assessing risk within a general dental practice environment to determine its efficacy, effectiveness and efficiency.

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1. Department of Health. *NHS dentistry: options for change*. London: Stationery Office, 2002.
2. Hally J D, Pitts N B. Developing the first dental care pathway: the oral health assessment. *Prim Dent Care* 2004; **12:** 117–121.
3. Pitts N, University of Dundee Dental Health Services Research Unit. *Clinical pathways project – DHSRU Dundee. The NHS oral health assessment final report April 2006*. London: Department of Health, 2006.
4. Eaton K A (ed). *Standards in dentistry*. London: Faculty of General Dental Practice (UK), 2006.
5. Miller M, Kearney N. Guidelines for clinical practice: development, dissemination and implementation. *Int J Nurs Stud* 2004; **41:** 813–821.
6. The NHS Information Centre, Dental and Eye Care Team. NHS dental statistics for England: 2008/09. http://www.ic.nhs.uk/pubs/dentalstats0809. Accessed 19 February 2010.
7. Mead P. Clinical guidelines: promoting clinical effectiveness or a professional minefield? *J Adv Nurs* 2000; **31:** 110–116.
8. Yoos H, Malone K, McMullen A, Richards K, Rideout K, Schultz J. Standards and practice guidelines as the foundation for clinical practice. *J Nurs Care Qual* 1997; **11:** 48–54.
9. International Caries Detection and Assessment System (ICDAS) Coordinating Committee. The rationale and evidence for the international caries detection and assessment system (ICDAS II). Available at: http://192.38.25.16/icdas. Accessed 29 January 2010.
10. Cronin A J, Claffey N, Stassen L F. Who is at risk? Periodontal disease risk analysis made accessible for the general dental practitioner. *Br Dent J* 2008; **205:** 131–137.
11. Twetman S, Fontana M. Patient caries risk assessment. *In* Pitts N B (ed). Detection, assessment, diagnosis and monitoring of caries. *Monogr Oral Sci* 2009; **21:** 102–112.
12. Leroy R, Eaton K A, Savage A. Methodological issues in epidemiological studies of periodontitis - how can it be improved? *BMC Oral Health* 2010; **10:** 8.
13. Hobus P P, Schmidt H G, Boshuizen H P, Patel V L. Contextual factors in the activation of first diagnostic hypotheses: expert-novice differences. *Med Educ* 1987; **21:** 471–476.
14. Schmidt H G, Norman G R, Boshuizen H P. A cognitive perspective on medical expertise: theory and implication. *Acad Med* 1990; **65:** 611–621.
15. Milsom K M, Blinkhorn A S, Tickle M. The incidence of dental caries in the primary molar teeth of young children receiving National Health Service funded dental care in practices in the North West of England. *Br Dent J* 2008; **205:** E14.
16. Department of Health and the British Association for the Study of Community Dentistry. *Delivering better oral health: an evidence-based toolkit for prevention – second edition*. London: The Stationery Office, 2009.
17. Skeie M S, Raadal M, Strand G V, Espelid I. The relationship between caries in the primary dentition at 5 years of age and permanent dentition at 10 years of age - a longitudinal study. *Int J Paediatr Dent* 2006; **16:** 152–160.
18. Powell L V. Caries prediction: a review of the literature. *Community Dent Oral Epidemiol* 1998; **26:** 361–371.
19. Milsom K M, Tickle M. Preventing decay in children: dare we risk the 'risk assessment' model in practice? *Br Dent J* 2010; **209:** 159–160.
20. Tickle M, Milsom K. The whole population approach to caries prevention in general dental practice. *Br Dent J* 2008; **205:** 521.
21. UK National Screening Committee. UK Screening Portal. http://www.screening.nhs.uk/screening. Accessed 21 June 2010.
22. Pendlebury M E, Horner K, Eaton K A. *Selection criteria for dental radiography*. 2nd ed. London: Faculty of General Dental Practice, 2004.
23. British Periodontology Society. Periodontology in general dental practice in the United Kingdom. http://www.bsperio.org.uk/members/policy.pdf. Accessed 18 February 2010.
24. Page R C, Eke P I. Case definitions for use in population-based surveillance of periodontitis. *J Periodontol* 2007; **78:** 1387–1399.
25. Tonetti M S, Claffey N. Advances in the progression of periodontitis and proposal of definitions of a periodontitis case and disease progression for use in risk factor research. Group C consensus report of the 5th European Workshop in Periodontology. *J Clin Periodontol* 2005: **32(Suppl 6):** 210–213.
26. National Institute for Clinical Excellence. *Dental recall: recall interval between routine dental examination*. London: National Institute for Clinical Excellence, 2004.
27. Tickle M, Milsom K, Blinkhorn A. Inequalities in the dental treatment provided to children: an example from the UK. *Community Dent Oral Epidemiol* 2002; **30:** 335–341.
28. Hewitt-Taylor J, Melling S. Care protocols: rigid rules or useful tools? *Paed Nursing* 2004; **16:** 38–42.
29. Löe H, Anerud A, Boysen H, Smith M. The natural history of periodontal disease in man. The rate of periodontal destruction before 40 years of age. *J Periodontol* 1978; **49:** 607–620.
30. van Gemert-Schriks M C, van Amerongen W E, ten Cate J M, Aartman I H. The effect of different dental treatment strategies on the oral health of children: a longitudinal randomised controlled trial. *Clin Oral Investig* 2008; **12:** 361–368.
31. General Dental Council. *Scope of practice*. London: General Dental Council, 2009.
32. Galloway J, Gorham J, Lambert M *et al. The professionals complementary to dentistry: systematic review and synthesis*. London: Eastman Dental Hospital, Dental Team Studies Unit, 2003.
33. Buchan J, O'May F, Ball J. New role, new country: introducing US physician assistants to Scotland. *Hum Resour Health* 2007; **5:** 13.
34. Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B. Substitution of doctors by nurses in primary care. *Cochrane Database Syst Rev* 2005; **2:** CD001271.
35. Department of Health. *Equity and excellence: liberating the NHS*. London: Department of Health, 2010.
36. HM Government. *Freedom, fairness, responsibility. The Coalition: our programme for government*. London: Cabinet Office, 2010.