The clinical effectiveness and cost-effectiveness of routine dental checks: a systematic review and economic evaluation

C Davenport1*
K Elley2
C Salas3
CL Taylor-Weetman4
A Fry-Smith1
S Bryan5
R Taylor1

1 Department of Public Health and Epidemiology, University of Birmingham, UK
2 Rowley Regis and Tipton PCT, West Bromwich, UK
3 Education Service, Birmingham City Council, UK
4 North Stoke PCT, Stoke on Trent, UK
5 Health Services Management Centre, University of Birmingham, UK

* Corresponding author

Executive summary

Health Technology Assessment 2003; Vol. 7: No. 7
How to obtain copies of this and other HTA Programme reports

An electronic version of this publication, in Adobe Acrobat format, is available for downloading free of charge for personal use from the HTA website (http://www.ncchta.org).

Also, a fully searchable CD-ROM containing the full text of all HTA monographs is available from the NCCHTA offices or via the HTA website. The CD-ROM is updated with the most recently published monographs every 6 months and is available free of charge to postal addresses in the UK.

In addition, printed paper copies of this report may be obtained by writing to:

The National Coordinating Centre for Health Technology Assessment, Mailpoint 728, Boldrewood, University of Southampton, Southampton, SO16 7PX, UK.

Or by faxing us at: +44 (0) 23 8059 5639
Or by emailing us at: hta@soton.ac.uk
Or by ordering from our website: http://www.ncchta.org

NHSnet: http://nww.hta.nhsweb.nhs.uk

The website also provides information about the HTA Programme and lists the membership of the various committees.
Background

Oral health can be defined as a general state of well-being as a result of healthy and functioning mucosae, gingivae and dentition. Despite an increasing incidence of oral cancer in adults and static levels of periodontal disease in children, a marked improvement has been observed in general oral health (experience of periodontal disease, caries and tooth loss in adults, and caries in children) over the last three decades.

Six-monthly dental checks have been customary in the General Dental Service in the UK since the inception of the NHS and NHS regulations recognise this practice. Dental practitioners can be remunerated for performing 6-monthly checks and registration with an NHS dentist lapses with a longer than 15-month gap between visits. However, the NHS does not explicitly recommend a specific dental check recall frequency.

Despite the general improvement in oral health, important inequalities in dental health remain, particularly across socio-economic groups and between geographical areas with and without a fluoridated water supply. This has raised questions over the current lack of an explicit dental check recall policy and, in particular, whether dental check recall intervals should be adjusted to reflect oral health needs more closely in order to optimise their clinical effectiveness and cost-effectiveness.

Questions addressed by this review

• How effective are routine dental checks of different recall frequencies in improving quality of life and reducing the morbidity associated with dental caries and periodontal disease in children?
• What is the cost-effectiveness of routine dental checks of different recall frequencies in improving quality of life, reducing the morbidity associated with dental caries, periodontal disease and oral cancer, and reducing the mortality associated with oral cancer in adults?

Methods

A systematic review of the clinical effectiveness and cost-effectiveness of routine dental checks of different recall frequencies was undertaken.

After an informal scoping search to identify existing reviews, the search strategy for primary studies was designed to identify controlled trials and observational studies, with no language restrictions. Primary studies were identified from the following sources: electronic bibliographic databases, internet sites, contact with experts, citation checks, and a search of the Cochrane Oral Health Group specialised register of controlled trials.

The selection of studies for inclusion, and the subsequent quality assessment and data extraction were undertaken by at least two reviewers working independently, using explicit predefined criteria and proformas. A limited sensitivity analysis was performed in order to assess the impact of study quality on the clinical effectiveness findings.

A Markov decision analysis modelling exercise based on current available UK data was undertaken in order to address deficiencies in the existing literature and perform an incremental cost-effectiveness analysis of different dental check recall policies on decay experience in deciduous and permanent dentition. The cost-effectiveness of 3-, 6-, 12-, 18-, 24- and 36-month dental check recall policies was examined using transition probabilities for the progression of caries and incorporating two key risk factors: socio-economic background (manual versus non-manual) and water fluoridation.
Results

Effectiveness
Information from 25 articles reporting the results of 29 studies are included in this review. Twenty-four studies addressed the effectiveness of dental checks on caries; nine concerned periodontal disease, two oral cancer and one quality of life.

The studies included in the effectiveness review were poorly reported, which limited internal comparison (between studies) and also external comparison with the current UK situation. Heterogeneity across studies with regard to the intervention under study further limited external comparison with the current UK situation. Only four studies addressing caries in permanent or deciduous teeth included 6 months as a comparison frequency and thus addressed the review question from a UK perspective. A sensitivity analysis conducted on the outcome of dental caries indicated that the findings presented below were robust to the methodological quality of the studies.

Caries
There was little consistency in the direction of effect of different dental check frequencies between studies for outcome measures in deciduous, mixed or permanent dentition. Two separate studies demonstrated no significant difference between dental check frequency and decayed, missing and filled teeth in deciduous or mixed dentition. One study reported a significant reduction in the number of fillings with individualised dental check frequencies compared with a blanket recall policy of 12 months or longer in mixed dentition. There was a preponderance of studies reporting an increase in decay, a decrease in the number of teeth, and a decrease in fillings, with less frequent dental checks in permanent dentition.

Periodontal disease
A single study demonstrated a decrease in attachment level with a decrease in dental check frequency, which was of uncertain statistical significance. There was no consistency in the direction of effect of different dental check frequencies in permanent dentition between studies for: bleeding, probing depth/pockets, presence of plaque/calculus, bone score, gingivitis and periodontal health.

Oral cancer
One study suggests that dental check recall intervals of less than 12 months do not impact on tumour size at diagnosis. One study reports that decreasing dental check frequencies (more than 12 months) may significantly increase the stage and size of tumours at diagnosis.

Quality of life
One study demonstrated a significant association between increasing dental check frequency and the perception that oral health affects quality of life.

Cost-effectiveness
There was much uncertainty in the analyses reported in the literature (concerning data sources used, extrapolation of results, and variable modelling approaches) with no employment of sensitivity analysis techniques to address the problems. There were no published cost-effectiveness studies based on UK data and current UK practice (i.e. comparisons of dental checks performed at 6-monthly intervals compared with other frequencies). Economic studies that have considered the frequency of routine dental checks have focused on children rather than adults.

Only one formal cost-effectiveness study was identified, which reported an incremental cost of US$73 per carious surface averted when comparing 12-monthly dental assessment to no assessment.

The results of five resource impact studies appeared to be consistent; less frequent dental checks (range 7–24 months) were associated with reduced assessment and treatment, with little evidence of an adverse impact on dental health.

Decision analysis
Moving from a policy option of 6-monthly to 3-monthly dental checks was associated with a relatively small reduction in the experience of decay over 6 years in deciduous and 68 years in permanent dentition (an average of between 0.04 deciduous and 0.41 permanent teeth (non-manual, fluoridated water) and 0.12 deciduous and 0.22 permanent teeth (manual, non-fluoridated water), and a sharp increase in costs (around £64 per patient over 6 years in deciduous dentition and about £202 per patient over 68 years in permanent dentition). Moving from the policy option of 6-monthly dental checks for both deciduous and permanent dentition to longer frequency policies (i.e. 12, 18, 24 and 36 months) demonstrated a consistent trend of an increase in dental decay experience relative to a saving in cost. This finding holds for both deciduous and permanent dentition and across all risk
groups studied. The magnitude of the increase in decay experience is greatest in non-manual and non-fluoridated groups for both deciduous and permanent dentition.

For deciduous teeth, modelling indicates that, by moving from 6-monthly to 12-monthly dental checks, an average of between 0.2 (manual, non-fluoridated water) and 0.07 (non-manual, fluoridated water) teeth would be affected by decay experience, with a reduction in cost of around £30 per patient over 6 years. In permanent dentition, modelling indicates that, by moving from a 6-month to a 12-month recall policy, an average of between 0.14 (manual, non-fluoridated water) and 0.21 (non-manual, fluoridated water) teeth would be affected by decay experience, with a reduction in cost of between £75 and £95 respectively per patient over 68 years. The results of the economic modelling exercise appear robust to sensitivity analyses.

Conclusions

There is little existing evidence to support or refute the practice of encouraging 6-monthly dental checks in adults and children. Decision analysis modelling using current UK data to investigate further the cost-effectiveness of different dental check recall frequencies on the experience of dental decay in deciduous and permanent dentition suggests that moving to longer (more than 6-monthly) dental check frequencies, rather than shortening the currently practised recall interval, would be more cost-effective. However, the model demonstrates that cost-effectiveness varies across risk groups and therefore consideration should be given to whether a population recall policy or a recall policy based on individual risk would be more appropriate.

Given the limitations of existing UK epidemiological data, it was not possible to undertake a modelling exercise to investigate the cost-effectiveness of different frequencies of dental checks on the experience of periodontal disease or on the morbidity and mortality associated with oral cancer.

There is a need for further primary research addressing the role of the dental check and its effectiveness in different oral diseases.

Publication

The NHS R&D Health Technology Assessment (HTA) Programme was set up in 1993 to ensure that high-quality research information on the costs, effectiveness and broader impact of health technologies is produced in the most efficient way for those who use, manage and provide care in the NHS.

The research reported in this monograph was commissioned by the HTA Programme on behalf of the Chief Dental Officer. Technology assessment reports are completed in a limited time to inform policy development by the Chief Dental Officer. The review brings together evidence on key aspects of the use of the technology concerned.

The research reported in this monograph was funded as project number 00/25/01.

The views expressed in this publication are those of the authors and not necessarily those of the HTA Programme, the Chief Dental Officer or the Department of Health. The editors wish to emphasise that funding and publication of this research by the NHS should not be taken as implicit support for any recommendations made by the authors.

Criteria for inclusion in the HTA monograph series
Reports are published in the HTA monograph series if (1) they have resulted from work commissioned for the HTA Programme, and (2) they are of a sufficiently high scientific quality as assessed by the referees and editors.

Reviews in Health Technology Assessment are termed ‘systematic’ when the account of the search, appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

HTA Programme Director: Professor Kent Woods
Series Editors: Professor Andrew Stevens, Dr Ken Stein, Professor John Gabbay, Dr Ruairidh Milne and Dr Chris Hyde
Managing Editors: Sally Bailey and Sarah Llewellyn Lloyd

The editors and publisher have tried to ensure the accuracy of this report but do not accept liability for damages or losses arising from material published in this report.