Effectiveness of screening and monitoring tests for diabetic retinopathy: a systematic review

Hutchinson A, McIntosh A, Peters J, O'Keeffe C, Khunti K, Baker R, Booth A

Authors' objectives
To determine which screening and monitoring tests for diabetic retinopathy are most effective and in which circumstances.

Searching
A range of bibliographic databases was searched from 1983 to April 1999, as detailed in the report. Trial registers were searched for ongoing and unpublished trials. Conference proceedings and ‘grey literature’ were also sought. Studies were restricted to those in the English language. Full details of the search strategies are available from the authors.

Study selection

Study designs of evaluations included in the review
The studies needed to be prospective in design.

Specific interventions included in the review
Studies were included if they specifically addressed screening for and early management of diabetic retinopathy. The primary studies provided data on two screening tests: ophthalmoscopy, either direct or indirect, and retinal photography using either mydriasis or non-mydriasis.

Reference standard test against which the new test was compared
The studies were required to compare the index test with the reference standard (not specified) in a blinded fashion. All of the patients had to receive the reference standard. The majority of the studies identified used a variety of reference standards. Some studies included a standard of ophthalmologists using ophthalmoscopy, retinal photography, or a combination of both. Others included an assessment by diabetes physicians whose level of experience in screening for retinopathy was unreported, or trained graders of retinal photographs working from reading centres. There was considerable variation in the definitions of retinopathy: any retinopathy, background (or non-proliferative) retinopathy, maculopathy, sight-threatening retinopathy, referable retinopathy, proliferative retinopathy and serious retinopathy.

Participants included in the review
Studies of participants with type 1 and type 2 diabetes were eligible for inclusion.

Outcomes assessed in the review
No outcome measures were specified in the inclusion criteria for the review. Sensitivity and specificity were the main outcomes reported. The British Diabetic Association standard of at least 80% sensitivity and 95% specificity was used as the basis for assessing the effectiveness of the screening or monitoring tests. However, this standard does not define a diagnosis of retinopathy (see Other Publications of Related Interest no.1).

How were decisions on the relevance of primary studies made?
Two authors independently assessed the retrieved papers and resolved any disagreements by discussion.

Assessment of study quality
The papers were graded according to their study design using grading hierarchy of the Agency for Health Care Policy (now known as the Agency for Healthcare Research and Quality). Two authors independently graded the retrieved papers and resolved any disagreements by discussion.

Data extraction
Two authors appear to have independently extracted data from the retrieved papers. Any disagreements were resolved.
Methods of synthesis
How were the studies combined?
A narrative synthesis of the studies was undertaken, with sensitivities for the individual studies presented on forest plots. Although a previous review had pooled studies (see Other Publications of Related Interest no.2), pooling was deemed inappropriate for this review due to the observed heterogeneity of the reference standards and differences in the personnel conducting the tests.

How were differences between studies investigated?
Differences between the studies were discussed within the text.

Results of the review
Twenty-two studies were included in the review.

Retinal photography under mydriasis appears to have been the most effective test, with the majority of studies reporting levels of sensitivity over 80%. However, the effectiveness was compromised when the photographs were ungradable. Ophthalmoscopy can also reach acceptable standards of sensitivity and specificity. In screening for any sight-threatening retinopathy using such outcomes as pre-proliferative, proliferative, serious, referable or sight threatening, the specificities achieved were higher than 91% and in all cases the sensitivity was lower than the specificity.

Authors' conclusions
Based on the available cohort studies, the most effective strategy for testing is the use of mydriatic retinal photography, with the additional use of ophthalmoscopy when the photographs are ungradable. Ophthalmoscopy alone could be used for opportunistic case finding, but there was considerable variation in the effectiveness of this test. There was no clear evidence to show who best performs the screening or which location was best.

CRD commentary
The review addressed a broad question with stated inclusion criteria for the participants, study designs and outcomes. The search was very thorough and attempts were made to find unpublished material. However, foreign language material was not eligible for inclusion in the review. The authors assessed the quality of the studies, but did not specifically examine the effects of study quality on the test results. Two reviewers appear to have been involved in the review process, thus helping to minimise bias.

Basic study details were provided, but the studies were not pooled due to the heterogeneous nature of the data. The presentation of forest plots detailing the sensitivity of individual studies is unhelpful without the associated specificity. The authors acknowledged some methodological limitations of the review: the majority of the studies contained small numbers of cases; potential selection bias could limit any generalisability between the studies; and potential bias of health care professionals performing screening with different training, experience and motivation. Furthermore, the use of studies with unsuitable reference standards means that this review is really more useful as a comparison between the users of a diagnostic tool, rather than as an assessment of the accuracy of the diagnostic technique.

Implications of the review for practice and research
Practice: The authors stated that the most effective strategy for testing is the use of mydriatic retinal photography, with the additional use of ophthalmoscopy when the photographs are ungradable. Ophthalmoscopy alone can be used for opportunistic case finding. Digital imaging photography will have an impact on the choice of location if the potential of this method is realised.

Research: The authors stated that high-quality research studies on effective implementation methods for screening for retinopathy need to be commissioned.
Funding
National Institute of Clinical Excellence; NHS Centre for Reviews and Dissemination.

Bibliographic details

PubMedID
10972578

Other publications of related interest

This additional published commentary may also be of interest. Montori VM. Review: mydriatic retinal photography is the most effective test for detecting diabetic retinopathy. Evid Based Med 2001;6:56.

Indexing Status
Subject indexing assigned by NLM

MeSH
Diabetic Retinopathy /diagnosis /physiopathology /prevention & control; Humans; Mass Screening /methods; Mydriatics; Ophthalmoscopy; Photography; Reproducibility of Results

AccessionNumber
12000001803

Date bibliographic record published
31/08/2004

Date abstract record published
31/08/2004

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.