Accuracy of radiographer plain radiograph reporting in clinical practice: a meta-analysis
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CRD summary
This well-conducted review assessed the accuracy of plain radiograph reporting by radiographers in clinical practice compared with a reference standard. The review found that radiographers can accurately report plain radiographs in clinical practice. The authors’ conclusions are based on an appropriate analysis of the evidence and are likely to be reliable.

Authors’ objectives
To determine the accuracy of radiographer plain radiograph reporting in clinical practice.

Searching
MEDLINE, Science Citation Index Expanded, CINAHL, EMBASE, National Research Register, the Cochrane Library, PsycINFO and SIGLE were searched from inception or 1971 to 2002; some search terms were reported. No language or geographical restrictions were applied. In addition, journals and supplements were hand searched, experts were contacted, and the bibliographies of identified studies were checked.

Study selection
Study designs of evaluations included in the review
Diagnostic studies assessing accuracy against a reference standard were eligible for inclusion. Case studies of radiographer reporting were excluded from the review, as were assessments of visual search behaviour using remote eye movement detection equipment.

Specific interventions included in the review
Studies assessing plain radiograph reporting by radiographers in clinical practice were eligible for inclusion.

Reference standard test against which the new test was compared
A reference standard was required for inclusion in the review, but was not specified in the inclusion criteria. The reference standards included in the review were not reported.

Participants included in the review
Radiographers in a reporting role in clinical practice were eligible for inclusion. Radiographers and radiologists with training and seniority ranging from none to over 30 years and consultant-level were included in the review. They dealt with patients in accident and emergency departments (AED), out-patient and orthopaedic clinics, and assessed the following body areas: appendicular, axial, skeleton, and all body areas.

Outcomes assessed in the review
Accuracy data that permitted the construction of a 2x2 table for plain radiograph reporting by radiographers were eligible for inclusion. The review included plain radiograph reporting by radiographers; the effects of selectively trained radiographers and radiologists of varying seniority; the accuracy of selectively trained radiographers reporting for different types of patient and body areas; and the effect of training on the accuracy of radiographer reporting.

How were decisions on the relevance of primary studies made?
Three reviewers independently assessed the relevance of primary studies, and any disagreements were resolved by discussion.

Assessment of study quality
Study validity was assessed using a checklist of 42 quality criteria developed for the review. A numerical scoring
scheme was used to award a summary quality score. Three reviewers independently assessed the validity of the included studies, and any disagreements were resolved by discussion.

**Data extraction**
One reviewer extracted the data.

**Methods of synthesis**

How were the studies combined?
Summary estimates of sensitivity and specificity with 95% confidence intervals (CIs) were calculated. Publication bias was assessed by plotting the log diagnostic odds ratio (DOR) of studies against precision to provide a funnel plot. The DORs were pooled using the random-effects model of DerSimonian and Laird. The Littenburg-Moses method was employed to fit an asymmetrical receiver operating characteristic (ROC) curve. Both equal-weighted and weighted regression coefficients were employed.

How were differences between studies investigated?
Heterogeneity was assessed using chi-squared tests. Since heterogeneity was detected, the DORs were pooled and ROC curves were used to explore whether the heterogeneity was attributable to the diagnostic threshold employed. The DerSimonian and Laird random-effects model was used to calculate the pooled DOR required to produce a ROC curve reflecting a constant DOR independent of diagnostic threshold. Since heterogeneity between studies was again detected, the Littenburg-Moses method was employed to fit an asymmetrical ROC curve: both equal-weighted and weighted regression coefficients were used. This model was extended to investigate alternative sources of heterogeneity such as quality criteria and study characteristics.

**Results of the review**
Twelve studies were included in the review.

Heterogeneity between the studies was found to result primarily from whether or not the reference standard independently reported radiographs and from the diagnostic threshold employed.

A funnel plot demonstrated no evidence of publication bias in the review.

Accuracy of radiographer plain radiograph reporting.

The summary sensitivity of radiographer reporting was 92.6% (95% CI: 92.0, 93.2), with a specificity of 97.7% (95% CI: 97.5, 97.9). ROC curves indicated that radiographer reporting accuracy in clinical practice was comparable to that of the reference standard.

Heterogeneity was statistically significant (for both sensitivity and specificity; P<0.001). The pooled DOR using the DerSimonian and Laird random-effects model was 540.9 (95% CI: 303.4, 965.3), with a high level of heterogeneity (P<0.00001). An asymmetrical ROC curve fitted using the Littenburg-Moses model gave some indication that the DOR was dependent on the diagnostic threshold.

Accuracy of selectively trained radiographers and radiologists of varying seniority.

Based on two studies, there was no evidence of a difference in the accuracy of reporting of AED radiographs for all body areas compared with a reference standard.

Accuracy of selectively trained radiographers reporting for different types of patient and body areas.

There was no evidence of a difference between how accurately trained radiographers report AED radiographs when reporting radiographs not solely from an AED. There was no difference in the summary estimates of sensitivity for different body areas; however, specificity was higher for the axial than the appendicular skeleton.
The effect of training on the accuracy of radiographer reporting.

There was no significant difference in estimates of sensitivity for AED radiographs between radiographers who had received training and those who had not. However, there was a difference in specificity for all body areas in favour of those who had received training.

Authors' conclusions
Radiographers can accurately report plain radiographs in clinical practice.

CRD commentary
The review question and the inclusion criteria were clear. The search was extensive and the authors took appropriate measures to eliminate language and publication bias from the review. Appropriate measures were also employed to minimise bias and error in the study selection and validity assessment processes, although the authors did not report using such measures for the data extraction. The reference standard employed in the review was not defined. However, the pooling of data and the analysis of sources of heterogeneity appear appropriate, as heterogeneity resulting from the reference standard was adequately explored. This was a well-conducted review and the authors' conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that flexible team working between different professions as to who reports plain radiographs should be promoted.

Research: The authors did not state any implications for future research.

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