Accident and emergency radiography: A comparison of radiographer commenting and 'red dotting'☆

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Received 24 June 2005; accepted 7 September 2005
Available online 27 December 2005

KEYWORDS
Red dot; Radiographer comment; Accident and emergency

Abstract Purpose The College of Radiographers has called for 'Red Dot' schemes to evolve and has recommended the development of radiographer commenting. The implementation of a radiographer comment scheme assumes that radiographers previously participating in 'red dot' schemes have been accurately recognising radiographic abnormalities and are, therefore, able to comment upon, and describe, such radiographic appearances. Research evidence to support such an assumption is sparse. This study compares the ability of radiographers attending a short course on musculoskeletal trauma to 'red dot' and comment on A&E radiographic appearances.

Methods This study adopted a pre-test, post-test approach. One hundred and twenty one radiographers attending a short course on musculoskeletal trauma (Bradford Red Dot Course) were invited to undertake an assessment of their ability to recognise ('red dot') and describe (comment upon) radiographic abnormalities at the start and end of the short course.

Results One hundred and fifteen radiographers (n = 115/121; 95.0%) completed both the pre- and post-training assessments. Post-training mean scores per case improved on average by 9.8% [p = 0.012; 95% CI: 2.4, 17.1] for 'red dots' and 12.7% [p = 0.007; 95% CI: 3.8, 21.5] for commenting. However, the difference between mean 'red dot' and commenting scores remained similar with mean radiographer comment scores being 13.7% less than mean 'red dot' scores pre-training and 10.8% less post-training.

☆ Since completion of this project, the Bradford Red Dot course has expanded and evolved to meet the needs of radiographers wanting to develop their commenting abilities as well as those interested in expanding their trauma recognition skills. The course is now aptly named Beyond Red Dot...!

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Conclusions

The results of this study indicate that the accuracy of radiographer comments was significantly reduced when compared to the accuracy of 'red dots' for the same radiographic images. The clinical significance of these findings for departments wanting to move from a 'red dot' system to a radiographer commenting scheme is that without appropriate training and audit, the quality of service and assistance to the A&E department could be significantly reduced.

Introduction

'Red dotting' by radiographers was first introduced in the United Kingdom (UK) in the early 1980s as a method by which the radiographer could communicate to a member of the accident and emergency (A&E) team the presence of a suspected abnormality on a radiographic image. Since then, multiple audits, often locally initiated, have evidenced the success of the 'red dot' system and today it is operated within 89% of UK hospitals. Yet despite the popularity of 'red dot' schemes in the UK, concern that such systems can cause confusion, particularly with regard to images where no 'red dot' has been placed, still exists.

The absence of a 'red dot' on a trauma image could indicate that, in the opinion of the examining radiographer, no abnormality is demonstrated. However, as participation in a 'red dot' scheme is voluntary and dependent upon the confidence of the individual radiographer, the absence of a 'red dot' could also reflect radiographer non-participation in the scheme. As a result, a radiographic abnormality recognised by a non-participating radiographer may not be flagged to the referring A&E practitioner.

A further concern with the 'red dot' system is that a 'red dot' only suggests to the A&E practitioner that the radiographer believes an abnormality is present. The system does not permit the radiographer to identify or specify the injury and, therefore, leaves the A&E practitioner to play 'hunt the abnormality'!

The restrictive nature of the 'red dot' system reflects in many ways the conservative attitude of radiologists during the 1980s when radiographers were beginning to push forward the boundaries of practice with regard to radiographic interpretation. However, although some radiologists may still have reservations over radiographers reporting radiographic images, the ability and skill of appropriately trained radiographers to accurately interpret A&E images is no longer in doubt and the success and acceptance of radiographer A&E reporting has encouraged the Society and College of Radiographers (SCoR) to revisit the 'red dot' system within a reporting framework.

In 2004, the report of the SCoR Council advocated that:

"the widespread and popular implementation of 'red dot' systems should now be encouraged to evolve into an expectation that a first line interpretation (e.g. radiographer comment) should be a standard expectation of all radiographers......and become accepted as normal practice."

By adopting a radiographer commenting scheme, radiographers would not only be able to indicate to the A&E practitioner that an abnormality was visible on the radiographic image, they would also be able to describe the location and appearances of the suspected abnormality. Additionally, a radiographer comment scheme would remove the uncertainty of the absent 'red dot' as radiographers would be able to indicate whether they believed an image was normal, abnormal or if they were uncertain of the appearances. No comment would, therefore, indicate to the A&E practitioner that the radiographer had not reviewed the image (i.e. non-participation in the system). Importantly, it should be stressed that although a radiographer comment is associated with a level of responsibility and professional accountability, it is not a definitive radiographic interpretation. Instead, a comment is a description of the appearance and location of any suspected abnormality. Consequently, it remains the role of the A&E practitioner to review each image alongside the radiographers comment and interpret the findings within the context of the clinical history and patient presentation.

However, the implementation of a radiographer comment scheme without assessment of radiographer baseline skills and ability can only be undertaken on the assumption that radiographers previously participating in a 'red dot' scheme have been accurately recognising radiographic abnormalities and are, therefore, able to comment upon, and describe, such radiographic appearances. Currently, despite a range of published
material considering ‘red dot’ systems, research evidence of radiographers’ ability to accurately comment on trauma images is sparse. This study aimed to compare the ability of radiographers attending a short course on musculoskeletal trauma to ‘red dot’ and comment on A&E radiographic appearances.

Method

This study adopted a pre-test, post-test approach. Between August and November 2004, 121 radiographers attended a short course on musculoskeletal trauma (Bradford Red Dot Course). As part of the course learning strategy, all attendees were given the opportunity to undertake an assessment of their ability to recognise ('red dot') and describe (comment upon) radiographic abnormalities at the start and end of the short course. Twenty musculoskeletal cases were presented including both the appendicular (n = 12) and axial (n = 8) skeletons. Eleven cases demonstrated radiographic evidence of injury and nine cases were classified as normal. The images were presented to each cohort of attendees as PowerPoint slides and the time to review each image was limited to approximately 40 s although opportunity was provided to revisit any image at the end of the assessment. The results were analysed using SPSS statistical software. The sensitivity, specificity and accuracy of ‘red dots’ and comments were calculated for the individual radiographer (as evidence of personal achievement) but for the purposes of publication, these have been amalgamated to display mean sample scores. A comparison of the mean accuracy of radiographer ‘red dot’ and commenting skills was undertaken using a paired t-test.

Results

One hundred and fifteen radiographers (n = 115/121; 95.0%) completed both the pre- and post-training assessments. Mean score for ‘red dot’ and commenting accuracy per radiographic case before and after training is indicated in Table 1.

Post-training mean scores per case improved on average by 9.8% [p = 0.012; 95% CI: 2.4, 17.1] for ‘red dots’ and 12.7% [p = 0.007; 95% CI: 3.8, 21.5] for commenting. However, a large standard deviation was noted in the difference between pre- and post-training scores for both ‘red dots’ (SD = 15.8) and commenting (SD = 18.9) indicating wide variability in the individual sample scores.

The mean ‘red dot’ sensitivity score (mean ability to accurately identify abnormalities) was significantly higher than the mean ‘red dot’ specificity score (ability to accurately identify normal appearances) for both pre- [p < 0.001; 95% CI: 17.5, 26.5] and post-training [p < 0.001; 95% CI: 32.1, 39.9] assessments suggesting that radiographers were inclined to over call normal images (Table 2).

A similar pattern was found for radiographer comments with mean post-training sensitivity (74.4%) being significantly higher than specificity (51.4%) [p < 0.001; 95% CI: 1.8, 34.3] although no significant difference was found between the pre-training sensitivity (47.8%) and specificity (50.7%) scores [p = 0.245; 95% CI: −8.0, 2.1].

The difference between mean ‘red dot’ and commenting scores was also found to be significant at both pre-training [p = 0.002; 95% CI: 6.0, 21.5] and post-training [p = 0.004; 95% CI: 3.9, 17.8] with mean radiographer comment scores being 13.7% less than mean ‘red dot’ scores pre-training and 10.8% less post-training. This result suggests that although radiographers correctly red dotted

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<th>Red dot: after (%)</th>
<th>Comment: before (%)</th>
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Table 2  Sensitivity and specificity scores (red dot): pre- and post-test

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<th>Mean sensitivity (%)</th>
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<td>Post-training</td>
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an abnormal image, they may not have correctly identified and commented upon the true abnormality.

Specific cases which were inaccurately commented on by the majority of radiographers within the sample at both pre- and post-training assessments are included below (Figs. 1–6). Specific scores for each case can be seen in Table 1.

Discussion

Radiographer comment schemes are being promoted by the SCoR as the next and natural evolutionary step in promoting first line interpretations of A&E radiographs.\textsuperscript{10} However, unlike when ‘red dot’ schemes were first introduced, there has been very little discussion around education to support radiographer commenting systems.

The SCoR in its Council report,\textsuperscript{11} and more recently in its document “Medical Image Interpretation & Clinical Reporting by Non-Radiologists: The Role of the Radiographer”\textsuperscript{10} has suggested that such education can be ‘incorporated into pre-registration training’ and with this is an assumption that radiographers upon qualifying will be able to comment appropriately and accurately on A&E images.

However, although basic image interpretation skills are included within most, if not all, undergraduate diagnostic radiography programmes in the UK, there is no evidence currently to support that this education is sufficient to assume competency in recognising and describing musculoskeletal trauma. Indeed, anecdotal evidence suggests that clinical and academic radiographers may believe this to be an unrealistic expectation of a newly qualified radiographer. Consequently, it is likely that most imaging departments looking to introduce a radiographer commenting system will rely on experienced A&E radiographers to take a lead.

The radiographers within the study sample varied in post-qualification experience between

Figure 1  Case 4 — acromio-clavicular joint dislocation.

Figure 2  Case 10 — supracondylar fracture.
1 and 25+ years and all were employed either full time or part time within hospitals that operated an A&E or minor injuries unit. Post-qualification training among the cohort varied but all were motivated to improve their interpretation and commenting skills by voluntary attendance on the short training course.

The results of this study indicate that the accuracy of radiographer comments is significantly reduced when compared to the accuracy of the ‘red dot’ system for the same radiographic images. Importantly, radiographer commenting errors were not limited to the over calling of normal radiographic examinations through the misinterpretation of normal variations (i.e. low specificity). Instead, commenting errors were also noted to occur as the incorrect identification of true abnormalities on abnormal images. This resulted in a reduced overall commenting sensitivity when compared with ‘red dotting’.

The significance of these findings for departments wanting to move from a ‘red dot’ system to a radiographer commenting scheme is that without appropriate training and audit, the quality of service and assistance to the A&E department could be significantly reduced. For example, radiographers within this study were accurately ‘red dotting’ 88.5% of abnormal cases post-training but associated comments were accurate in only 74.4% of cases. Consequently, if applied to practice, 25% of abnormal examinations could be returned to the A&E department with incorrect radiographer comments. Similarly, of the normal cases within this study, the specificity scores of both ‘red dots’ and comments post-training were low (52.4% and 51.4%, respectively). However, with a ‘red dot’ scheme, the absence of a ‘red dot’ may not be unusual as it could mean that the examining radiographer is not willing or confident enough to participate in the ‘red dot’ system. In contrast, with a commenting scheme, the opinion

Figure 3  Case 18 — fracture base fifth metatarsal (lateral ankle).

Figure 4  Case 9 — pelvis: OA right hip confused with subcapital fracture.
of the radiographer becomes more explicit and, if we apply these study findings to practice, up to 50% of normal images may be returned to the A&E department incorrectly commented upon. Consequently, it becomes apparent that the value of a radiographer commenting scheme, and ultimately the status of the radiography team, could very quickly decrease if increasing errors are noted by the A&E practitioners. Conversely, if commenting errors are not recognised by the A&E practitioner but instead, inaccurate radiographer comments influence patient diagnosis and treatment then this could reduce service quality and patient care.

Limitations and conclusions

The findings above relate to only a small sample of radiographers who may not be representative of radiographers nationally. Additionally, it is unrealistic to believe that radiographic images projected by PowerPoint are equal in quality to hard copy radiographs or those displayed on a soft copy reporting screen. Finally it should be noted that the training course undertaken was not, at the time, aimed at developing radiographer commenting skills but was intended to improve ability in ‘red dotting’. However, accepting all of these limitations, this study has highlighted some important points for the profession to debate and individual departments to consider prior to introducing a radiographer comment scheme.

It is the belief of the authors that radiographers are well placed to provide A&E staff with first line interpretations on radiographic images however; there is, as yet, no published evidence to support the assumption that radiographers who are successfully participating in a ‘red dot’ scheme are able to produce accurate and coherent comments on radiographic images without appropriate training. Participation in a radiographer commenting scheme does have associated professional responsibility and accountability and it is essential that this role extension is supported by appropriate research, training and audit to ensure that the status of the individual radiographer and the profession are not compromised. Only in this way we can as a profession provide evidence of ability and quality of clinical practice that will assist in moving the profession forward.

References


