



Radiographer abnormality detection schemes in the trauma environment—An assessment of current practice

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Abstract *Introduction:* Radiographer abnormality detection schemes (RADS) were first introduced in the United Kingdom (UK) in the mid 1980s with the development of the 'red dot scheme'. This article establishes the current position of UK RADS practice and provides insight into specific areas for development.

Method: A postal questionnaire was distributed to 456 sites, including 270 emergency departments and 186 minor injuries units (MIU). Information was sought relating to: the type of emergency department and radiography service provided; details of RADS operated including any education and audit to support radiographer participation; and the mandatory/voluntary nature of the system adopted.

Results: A total of 306 ($n = 306/456$; 74%) responses were received. The large majority of respondents ($n = 284/306$; 92.8%) indicated that a RADS was in operation. Of these, 221 sites operated a red dot scheme, 7 sites operated a radiographer comment system, and a further 54 sites operated both a red dot and comment scheme. Two sites indicated that a RADS other than red dot or radiographer commenting was operated. Twenty-one different methods of highlighting abnormal images were identified and eight different commenting methods. The RADS was considered mandatory at 25% of sites.

Conclusion: This study confirms the continued widespread contribution of radiographers to the trauma diagnostic process through the use of RADS. The informal nature of the systems, inconsistent approaches to audit and education, and variations in the methods employed are issues which require national guidance.

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Introduction

Radiographer abnormality detection schemes (RADS) were first introduced in the United Kingdom (UK) in the 1980s with the introduction of red dot schemes to assist emergency department (ED) doctors in the correct interpretation of radiographic images.¹ Prior to this, radiographers were precluded from expressing an opinion on a radiograph, largely as a result of medical, and later radiological, intervention.^{2,3} However, following publication of the first reported use of red dot,¹ RADS became widely adopted. Indeed, the role extension survey undertaken by Paterson in 1995 identified that over half of UK radiology departments had a red dot scheme in place.⁴ In 2004, when Price and Le Masurier completed the last national survey of extended roles, this number had increased to 81% of Hospital Trusts,⁵ demonstrating that the radiography profession had truly embraced this role development.

Although red dot remains the most widely used radiographer abnormality detection system, the College of Radiographers (CoR) has stated that its aspiration is for all radiographers to be able to make an initial interpretation on a trauma radiograph by 2010.⁶ Such development of the radiographer's role is also supported by the regulatory body, the Health Professions Council,⁷ and the Quality Assurance Agency,⁸ the organisation responsible for setting academic benchmarks. Importantly, the CoR's aspirational statement does not indicate that all radiographers should be able to provide definitive image reports. Instead, it appears to promote radiographer role development into the middle ground between red dot and definitive reporting by encouraging the introduction of radiographer comments, or preliminary opinion. In this way, the radiographer can take a more proactive role in the diagnostic process by indicating verbally, or in writing, the nature of the abnormality identified, rather than just highlighting the radiograph.^{9–11} Little published literature has examined whether this role extension has been embraced by the profession in the same way as red dot and radiographer reporting.¹¹ Further, it is unclear whether the CoR aspiration for all radiographers to be able to provide an initial interpretation on radiographic images is likely to be realised in the projected time frame. This article establishes the current UK practice related to red dot or other RADS through to radiographer commenting and will provide insight into specific areas for development if the profession is to achieve the CoR aspiration.

Methods

Following a critical review of the literature, a cross-sectional survey was undertaken using a postal questionnaire as the data collection tool. This approach permitted the collection of data at a specific point in time¹² and facilitated the optimization of the study breadth.¹³

The questionnaire was designed to elicit factual information relating to: the type of emergency department and radiography service provided; details of RADS operated including any education and audit to support radiographer participation; and the mandatory/voluntary nature of the system adopted.

A pilot study was undertaken to ensure the accuracy, appropriateness and relevance of the questionnaire. As clinical leadership for radiography within the trauma environment is not within the domain of a single clinical role in the UK, the pilot process included both advanced practitioners and superintendent radiographers. The questionnaire was updated following feedback from the pilot study and in February 2007, was distributed to every hospital in the UK (including Northern Ireland, Channel Islands and the Isle of Man) that had both a trauma (ED or minor injury) and radiography service, with a return date within 4 weeks of receipt. A total of 456 sites were identified from the British Association of Emergency Medicine (BAEM) online directory,¹⁴ comprising 59.2% ED ($n = 270/456$) and 40.8% minor injuries units (MIU) ($n = 186/456$). Data analysis was undertaken using SPSS version 14.0 (SPSS Inc., Chicago, IL) and STATA version 9.0 (Stata Corporation, College Station, TX).

Results

A total of 306 ($n = 306/456$; 74%) responses were received within the specified response time frame. Approximately two-thirds of the responses were from hospitals with an ED ($n = 203/306$; 66.3%) and one-third from hospitals with a MIU ($n = 103/306$; 33.7%). A greater proportion of responses were received from hospitals that had an ED rather than a MIU ($z = 1.99$; $p = 0.047$).

Service provision

The majority of ED departments ($n = 199/203$; 98.0%) operated a 24 h patient service. In contrast, the majority of MIU departments ($n = 77/103$; 74.8%) offered a restricted hours patient service. The operational hours of the ED/MIU and radiography service were compared to establish compatibility (see Table 1).

Where the ED/MIU department operated a 24 h patient service, the majority of radiography departments ($n = 204/223$; 91.5%) also offered a 24 h service although at a large number of sites this was through a radiographer 'on call' system ($n = 143/223$; 64.1%). Similarly, where the ED/MIU service operated over restricted hours ($n = 73/79$; 92.4%), radiography services were predominately operated over restricted hours. Radiography service provision was not specified by four respondents ($n = 4/306$; 1.3%).

Information regarding the type of imaging system operated for trauma radiography was provided by 305 respondents ($n = 305/306$; 99.7%). The majority of imaging

Table 1 Radiography service provision related to operational hours of ED/MIU

Trauma department operational hours	Trauma radiography service provision		
	24 h shifts	24 h on call	Restricted hours
ED (24 h)	60	134	3
ED (restricted hours)	—	1	3
MIU (24 h)	1	9	16
MIU (restricted hours)	1	4	70

Table 2 Radiographer abnormality detection schemes operated

Type of trauma department	RADS operated	
	Red dot <i>n</i> (%)	Radiographer commenting <i>n</i> (%)
ED	188 (92.6)	42 (20.7)
MIU	87 (83.5)	19 (18.5)

departments operated a filmless digital radiography system (*n* = 190/305; 62.3%) with a further 55 sites (*n* = 55/305; 18.0%) having digital imaging systems but were printing images for ED review. Only 60 trauma radiography departments (*n* = 60/305; 19.7%) were operating with conventional film and processing facilities.

Radiographer role in trauma image review

The large majority of respondents (*n* = 284/306; 92.8%) indicated that a RADS was in operation. Of these, 221 sites (*n* = 221/284; 77.8%) operated a red dot scheme; seven sites (*n* = 7/284; 2.5%) operated a radiographer comment system; and a further 54 sites (*n* = 54/284; 19.0%) operated both a red dot and comment scheme. Two sites (*n* = 2/284; 0.7%) indicated that a RADS other than red dot or radiographer commenting was operated, although further information was not supplied. A greater number of RADS operated in hospitals with an ED compared to those with an MIU (see Table 2).

Further exploration of the 275 sites operating a red dot scheme (including those that concurrently operated a radiographer commenting system) identified 21 different methods of signalling a radiographic abnormality to the referring trauma clinician. These included in order of popularity; the phrase red dot annotated on the CR image (*n* = 83/275; 30.2%); a red dot sticker affixed to the radiograph (*n* = 71/275; 25.8%); and an asterisk (*) annotated on the CR image (*n* = 43/275; 15.6%). Other methods included a variety of different coloured stickers, packets and other CR image annotations.

Of the 61 sites providing a written comment on the radiographs (including those sites also operating a red dot system), eight different methods of communicating radiographer findings were identified. These included: the use of a radiographer comment proforma (*n* = 24/61; 41.4%); space for radiographers to communicate findings on the imaging request card (*n* = 12/61; 20.7%); and verbal communication (*n* = 7/61; 12.1%). Other methods identified were: a note on the PACS system or the Radiology Information

system (RIS); a hand written post-it note; and a stamp on the request card. Where only a radiographer comment system was operated (seven sites), a radiographer comment proforma was most commonly used (*n* = 5/7; 71.4%).

RADS: mandatory or voluntary

Respondents were asked whether participation in the RADS (red dot or comment) was mandatory or voluntary. Seventy-one sites indicated that participation was mandatory (*n* = 71/284; 25%) whereas 210 indicated it was a voluntary system (*n* = 210/284; 73.9%). One site indicated that the RADS was considered voluntary for AfC Band 5 radiographers and mandatory for staff graded Band 6 and above. The nature of the service was not specified by three respondents (*n* = 3/284; 1.1%).

RADS education

All sites operating a RADS were asked to describe the education provided for staff prior to participating in the scheme and as part of ongoing continuing professional development (CPD) to support continued radiographer participation (see Table 3). This information was then cross-tabulated with the voluntary/mandatory status of the RADS.

Sites were asked whether they employed plain film reporting radiographers to assess whether this influenced the implementation of radiographer comment schemes. Where red dot only is undertaken, 57.0% of sites (*n* = 126/221) have reporting radiographers. In contrast, 63.9% (*n* = 39/61) of sites where radiographer commenting has been implemented employed reporting radiographers. This difference in the proportion of sites employing reporting radiographers was not statistically significant (*z* = 0.971; *p* = 0.331).

Audit

All sites operating RADS were asked whether regular audit of practice was undertaken. Six sites (*n* = 6/284; 2.1%) did not respond to this question. Of the remaining 278 sites, only 87 audited the RADS (*n* = 87/278; 31.3%). Cross tabulation of audit with mandatory/voluntary status of service was undertaken (see Table 4).

Seventy seven sites (*n* = 77/87; 88.5%) that audited the RADS provided information regarding the regularity of the audit process. The majority of sites operated an ongoing/monthly audit of the RADS (*n* = 25/77; 32.5%) or annual audit of service (*n* = 21/77; 27.3%). However, various audit time frames were reported, including: six-monthly audit (*n* = 4/77; 5.2%); audit review every 2/3 years

Table 3 Radiographer education to support participation in RADS

Level of RADS education provided	Mandatory RADS participation		Voluntary RADS participation	
	Red dot <i>n</i> (%)	Comment <i>n</i> (%)	Red dot <i>n</i> (%)	Comment <i>n</i> (%)
Prior to participation	57 (82.6)	13 (100)	116 (57.1)	25 (42.3)
Ongoing education	47 (68.1)	13 (100)	107 (52.7)	26 (44.1)
No education provided	7 (10.1)	—	55 (27.1)	14 (23.7)

Table 4 RADS audit

Audit undertaken	Mandatory RADS participation <i>n</i> (%)	Voluntary RADS participation <i>n</i> (%)
Yes	33 (47.8)	54 (25.8)
No	36 (52.2)	155 (74.2)

(*n* = 11/77; 14.3%); and ad hoc audit (*n* = 9/77; 11.7%). A number of sites (*n* = 7/77; 9.1%) indicated that practice audit was undertaken on an individual basis, although this was not a formal expectation of RADS participation or employment.

Technological issues

Respondents were invited to comment on important issues related to RADS not directly included within the questionnaire. While the majority of respondents did not expand on any issues, a small number of respondents indicated that the implementation of PACS had limited the functionality of the RADS due to incompatibility of new technology with standard RADS practice or the perception that monitor quality was hindering the radiographers' ability to detect abnormalities.

Geography

In order to determine any geographic trends in the implementation of RADS, analysis of responses was grouped by country (see Table 5).

Discussion

The results of this study support earlier research and confirm the continued widespread contribution of radiographers to the trauma diagnostic process through the use of RADS.^{4,5}

The inclusion criteria for this study were all hospitals in the UK with both trauma and radiography services. This study differed from others studies in this field^{4,5,15} as it actively sought feedback from small hospitals with MIU facilities and did not presume similar radiographic practices across all sites of a single hospital Trust. This additional information has demonstrated that RADS (red dot and commenting) are more likely to be used in hospitals with EDs rather than MIUs. Although no literature is evident to support this apparent difference, reasons may include the greater number of staff or education opportunities in centres with senior radiographic or radiologist input. However,

Table 5 RADS practice across UK

RADS across UK	Red dot sites (<i>n</i> ; %)	Radiographer commenting (<i>n</i> ; %)
England	210 (210/237; 88.6)	54 (54/237; 22.8)
Wales	23 (23/25; 92.0)	3 (3/25; 12)
Scotland	29 (29/30; 96.7)	3 (3/30; 10)
Northern Ireland	10 (10/10; 100)	0 (0/10; 0)

this does have service implications when one considers the primary purpose of RADS, which are to assist the clinician managing the patient by highlighting, or describing, abnormal image appearances.^{1,9–11,16} EDs usually have a high level of medical expertise available and within the department and access to radiologists and reporting radiographers to review images that are causing concern. In contrast, MIUs are often staffed by nurse practitioners with limited medical support and who have recognised the valuable input radiographers make to the diagnostic process.¹⁵ Consequently, the value of RADS is perhaps greater in the smaller centres where radiographers may make a greater contribution to patient management as a result of the collaborative nature of small site working and the implementation of RADS at these sites should be encouraged.

One factor which will influence the contribution of radiographers to the trauma image review process is the rapid technological evolution that is occurring with radiographers and other health professionals increasingly reviewing soft copy images on a computer monitor rather than on radiographic film (hard copy).^{17,18} The results of this study suggest that the introduction of computerised filmless systems has reduced the use of the traditional red dot sticker to highlight abnormal images and has, in turn, created uncertainty among the radiographic profession as to how best adapt traditional RADS in the light of new technology.¹⁹ The great variety of methods identified in the study to highlight abnormal images suggests that the introduction of CR and PACS has exacerbated this inconsistency and more work is required to determine best practice for radiographers to effectively communicate radiographic findings to trauma care staff.

Despite the long term and widespread use of RADS in the UK, participation is still considered to be voluntary in the majority (73.9%) of hospitals. As a result, it appears that the issues pertaining to the consistency and level of reliance ED/MIU staff may place on RADS, as raised by Dimond, persist.^{20,21} Hampshire also identified confusion surrounding the voluntary nature of RADS with respect to employment and job descriptions.²² A survey of radiographer vacancies in England and Wales in 2006 showed that where participation in the RADS was explicitly mentioned as part of the radiographer role in the vacancy job description, 61.5% of radiography managers identified participation to be voluntary. In contrast, participation in RADS was not mentioned in 58.1% of vacancy job descriptions, yet participation in RADS was considered mandatory and a fundamental part of the radiographer's role at 11.1% of sites. Consequently, work needs to be undertaken to alleviate confusion as to the voluntary/mandatory status of RADS at a local level in order that best practice standards can be achieved and the expectations of radiographers working in the trauma environment can be made explicit. However, acceptance and formalisation of RADS requires hospitals to address issues of radiographer training, education and practice audit, in order to ensure that RADS service delivery is optimised.

This study demonstrated great variability in the provision of RADS education and the application of service audit, both in centres where it is considered voluntary and where participation is an expectation of radiographer employment. The CoR state that image interpretation

activity must be supported by continuous professional development (CPD) and regular audit of practice.⁶ However, this study identified limited progress in this area, echoes the findings of Snaith.²³ Although this earlier study surveyed only a limited number of hospital trusts with respect to the implementation of radiographer comment schemes, the results identified a significant lack of clinical governance arrangements to support such extension in scope of practice.

Published research illustrates that the ability of radiographers to accurately highlight radiographic abnormalities improves with education and training, regardless of whether the context of the abnormality detection is red dot participation, radiographer commenting or definitive reporting.^{10,24–26} However, in order for the CoR aspiration to become a reality, appropriate education and training to support RADS participation would need to be available on a large scale. Such education has already been introduced into radiography pre-registration programmes in the UK and it is now an expectation of pre-registration training.⁸ However, with over 17 000 radiographers currently employed in the UK, alternative education solutions will need to be sought if radiographer participation in RADS, and more importantly commenting systems, is to become an expectation of their role.

Conclusion

This study has provided an insight into current practice with respect to radiographer abnormality detection schemes and has demonstrated that radiographers are making a significant contribution to the decision making process for patients attending an ED or MIU. However, the findings of this study have raised a number of issues related to the perceived informal nature of radiographer participation in RADS and the varied perception as to whether such participation is part of the normal scope of practice.

It is clear from the results of this study that national guidance is required regarding the development and implementation of RADS, particularly with the rapid introduction of computerised filmless imaging environments. If participation in RADS is to be an expectation of the radiographer's role within the next decade, as hoped by the CoR, then professional leadership is required to define the scope of practice, educational requirements and governance arrangements to underpin such developments. More specifically, as the radiography profession embraces hi-tech imaging solutions, the adoption of new technology must be seen as an aide to the development and utilisation of radiographer skills, rather than a hindrance.

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