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REVIEW ARTICLE

Involvement of radiographers in the interpretation and reporting of general radiographic images

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ABSTRACT

Globally, radiographers play an important role in the diagnosis and treatment of injuries and diseases. Radiographers have ample opportunities to encounter a wide variety of radiographic images throughout their training and careers. For this reason, radiographers are in a better position to communicate their radiographic observations to the referring clinician. However, there is a lack of clarity on the level of radiographers' involvement in the interpretation and reporting of general radiographic images. Therefore, this educational article has identified and reviewed the three levels of involvement: abnormality detection system (red dot system), preliminary clinical evaluation (commentary reporting),and clinical reporting as identified from the literature. This information is important to the radiography profession and stakeholders in African countries planning to extend the role of a radiographer in image interpretation and reporting on general radiographic images.

INTRODUCTION

The role of a radiographer in medical imaging in Africa is changing due to an increase in demand for medical imaging services, a shortage of radiologists, and positive influence from the United Kingdom (UK). [1-5] This change started in the UK.[6] The shortage of radiologists in Africa continues to negatively affect the delivery of medical imaging services, especially in Southern African countries. This was noticed in a recent survey carried out by Kawooya et al.,[7] on the number of radiologists in a few countries across the continent: Egypt (N=1250), South Africa (N=1200), Nigeria (N=688), Ghana (N=60), Uganda (N=55), Zimbabwe (N=25), Zambia (N=16), Malawi (N=3), and Swaziland (N=1).

Given the above and to fill up this gap created due to the shortage of radiologists, radiographers are taking on roles that were traditionally within the scope of radiologists such as interpretation and reporting of general radiographic images. Uganda is the first African country to have adopted this initiative a decade ago. [2,7] There is also anecdotal evidence that radiographers have started providing commentary reports on general radiographic images in Nigeria[8] and Ghana.[4] In South Africa, the Health Professions

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Council of South Africa (HPCSA) is currently reviewing the regulations to include formal image interpretation and reporting in the professional scope of practice of radiographers.[3,9] In Zambia, discussions are going on about the possible role extension of radiographers in meeting the current medical imaging needs and demand. [7] However, there is a lack of awareness and clarity related to the involvement of radiographers in this new role. The authors, therefore, review the literature on this subject to identify the levels of radiographers' involvement in the interpretation and reporting of general radiographic images. This article aims to raise awareness among stakeholders as radiography is developing and changing rapidly in Africa.

LEVELS OF RADIOGRAPHERS' INVOLVEMENT IN IMAGE

INTERPRETATION AND REPORTING

A literature search identified three levels of radiographers' involvement in the interpretation and reporting of general radiographic images: abnormality detection system (red dot system), preliminary clinical evaluation (commentary reporting), and clinical reporting. [8,10-12]

Abnormality detection system (ADS)

The first level of radiographers' involvement in image interpretation is the abnormality detection system (also known as the red dot system). This can be considered as part of the image evaluation process. Whitley et al.[13] describe image evaluation as the last stage of the medical imaging process where radiographic images are assessed for quality before being sent to the radiologist, reporting radiographer, or referring clinician. To do this effectively, a radiographer performing the examination must be aware of the radiographic appearance of potential pathologies and relevant anatomy that needs to be demonstrated by a particular projection in order to answer the diagnostic question posted by the referring clinician.[13,14] The knowledge of radiographers to undertake this role is gained via their radiography training. In recent years, basic image interpretation has been integrated into the undergraduate radiography curriculum.[10,12,15,16] Radiographers also undertake continuing professional development (CPD) learning activities on this subject.

The involvement of radiographers in image interpretation can be traced back to World War II when the Weber State University in conjunction with the United States of America (USA) Army started teaching radiographic technologists (radiographers) how to comment on the radiographic images and assist medical doctors.[8]This initiative was started due to the increase in the number of casualties and the shortage of radiologists during the war. However, the initiative was only recognised in 1985 after the first pilot study was carried out by Berman and colleagues [17] in the UK. About half of the clinically important abnormalities on trauma radiographic images wrongly interpreted by casualty medical doctors were correctly interpreted by the radiographers. This led to the introduction of the abnormality detection system (red dot system), where a radiographer alerts the referring clinician by marking a radiographic image about the possibility of abnormality.[1,13,18,19]However, a radiographer is not accountable for any action resulting from this imaging practice.[19,20] The responsibility lies on the referring clinician who must assess the radiographic images whether there is a red dot or not.[19]In other words, this is an informal imaging clinical practice.

There are several research studies conducted on the ADS (red dot system) globally. The first notable one was carried out in the UK by Berman et al., [17] on 1628 patients. In this historical study, radiographers missed abnormalities in the radiographs in 68 of the cases, while accident and emergency (A&E) medical doctors missed 63 cases. Another research study by Radovanovic and Armfield [21] found that the accuracy of untrained radiographers in image interpretation and emergency department (ED) medical doctors in identifying abnormal

radiographs was comparable: 87% and 89%, respectively. In a South African study by Du Plessis and Pitcher[22], senior radiographers achieved significantly higher accuracy and sensitivity than medical doctors (81.5% vs 67.8%) in the identification of abnormalities on trauma radiographs. A recent study conducted by Ofori-Manteaw and Dzidzornu[23] in Ghana, found similar performance between radiographers and junior medical doctors at abnormality detection of appendicular radiographs. Research shows that the performance of radiographers improves after undertaking training in image interpretation.[23-25]This means that radiographers should receive training before undertaking this new role.

In the early days of this initiative, radiographers used to attend red dot courses to gain competency before being allowed to "red dot" radiographs. [13,18] However, this has changed, and image interpretation is being integrated into the undergraduate radiography curriculum. [10,12,15,16]With any practice, there are always advantages and disadvantages. Table 1 shows the advantages and disadvantages of the ADS.

Table 1: Advantages and disadvantages of the abnormality detection system [1,18,26]

• Increases the level of communication between radiographers and referring clinicians	• It is operated voluntarily(informal imaging practice)
• A radiograph with a red dot seeks greater scrutiny from the referring clinician and overall reduced diagnosed errors	• It does not specify what potential abnormality is being flagged, posing a considerable degree of ambiguity
• Better utilisation of radiographers' knowledge and skills	• The absence of a red dot does not exclude the possibility of an abnormality

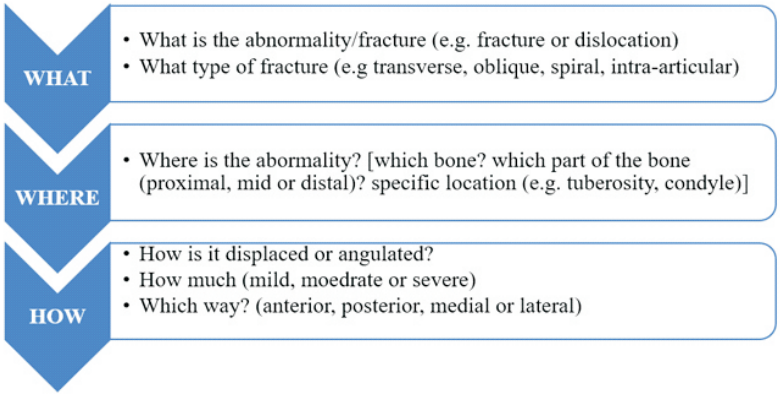
The ADS (red dot system)has been playing a more meaningful part in ED departments in the delivery of quality medical imaging services. However, the practice has major disadvantages (Table 1), which resulted in the College of Radiographers of the UK and other stakeholders introducing preliminary clinical evaluation (also known as commentary reporting) in 2013. [10] This is where a radiographer provides informal comments on the radiographic examination. However, some hospitals in the UK and other countries globally have continued with the red dot system as part of the image evaluation process.

Preliminary clinical evaluation

Preliminary clinical evaluation (PCE) is the second level of radiographers' involvement in the interpretation and reporting of general radiographic images. Preliminary clinical evaluation is sometimes referred to as commentary reporting because radiographers make informal comments on the radiographic images using a standardised template (Appendix 1). Preliminary clinical evaluation is the term used to describe the practice of radiographers whereby, they assess imaging appearance, make informed clinical judgments and decisions, and communicate these in unambiguous written forms to the referring clinician.[5,10] This role is the extension of the image evaluation process undertaken by radiographers after the acquisition of images. [13] This is again an informal role like the Red Dot System. The methodology used is to apply an image assessment process gained via image interpretation subject integrated into radiography courses and experience to comment on images. [10,13] Radiographers also acquire knowledge through continuous professional development (CPD) learning activities.

Literature has identified information required in a preliminary clinical evaluation report. Referring clinicians want information about**"What"** the abnormality is (i.e., the type of the injury), **"Where"** it was (more specific than simply which bone), and **"How"** if it displaced or angulated if present. [27,28] This is called the WHAT, WHERE, HOW model of PCE (Figure 1).

Figure 1: WHAT, WHERE, HOW model of PCE[27,]



During the literature search, two research studies from the UK were found on the accuracy of PCE by radiographers. The research study carried out by Verrier and others[29] was aimed at the evaluation of radiographers' ability to comment on appendicular and axial studies. The findings showed that radiographers without specialised training in image interpretation were able to provide PCE to a high standard: accuracy (92%), sensitivity (80%), and specificity (97%). In another recent research study by Lidgett et al., [25] the local training had an impact on radiographers' PCE participation and accuracy on adult appendicular radiological examinations. This is one area where radiographers working in Africa can conduct more research before adopting the practice. Most of the research studies carried out in Africa on this subject have been on abnormality detection among radiographers [30,31] and comparisons between medical doctors and radiographers.[22,2] There is anecdotal evidence that PCE has been implemented in Nigeria [32]and Ghana.[4]With the critical shortage of radiologists on the African continent, there is a need to adopt this initiative in order to further improve the quality of imaging services.

Clinical reporting

Clinical reporting is the third level of radiographers' involvement in image interpretation identified during the literature review. With clinical reporting, radiographers who have completed formal specialised training in image interpretation and reporting at master's level report on radiographic images.[10]They are normally referred to as reporting radiographers. The postgraduate education and training combine both theory and clinical practice under the supervision of a consultant radiologist. In the UK, the role of a reporting radiographer is at the advanced practitioner level. The College of Radiographers [33] of the UK points out that the advanced practitioner role encompasses the considerable depth and breadth of radiographic practice. It involves four domains of clinical practice, management and leadership, education, and research as well as the demonstration of core and area-specific clinical competencies.[34,35] The advanced practice position has contributed to the expansion of the radiography career pathway in the UK which can be replicated in Africa.

Few research studies in the UK show that reporting radiographers comply with the image interpretation standards equivalent to trainee and consultant radiologists. One of the first research studies conducted by Buskov et al.[36] found similar sensitivity and specificity of reporting radiographers and trainee radiologists reporting on trauma appendicular and axial radiographs (99% and 94%; 97% and 99% respectively). Another study carried out by Woznitza et al.[37] found no difference in agreement between the clinical diagnostic report on chest radiographs by radiologists and reporting radiographers. In a recent study by Cain et al.,[38]reporting radiographers and consultant radiologists demonstrated similar levels of concordance when reporting on musculoskeletal radiographs. These mentioned research studies provide evidence that radiographers with appropriate education and training can interpret and report on general radiographic images at a level comparable to radiologists.

CONCLUSION

Radiographers have been involved in image interpretation since the 1980s when the ADS was introduced in the UK to aid referring clinicians. At this level, radiographers acquire knowledge through attending short courses. The ADC was later upgraded to preliminary clinical evaluation and clinical reporting. To support radiographers in this new role, image interpretation is now integrated into the radiography curriculum as well as the establishment of specialised postgraduate courses. The authorsrecommendstarting with an abnormality detection system and preliminary clinical evaluationbefore clinical reporting to win the confidence of stakeholders such as radiologists and referring clinicians.

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APPENDIX: COMMENTARY REPORTING TEMPLATE

Place Patient ID Sticker here Or Accession No. Label for Exam Or Hand write UR number: Accession number:	The Radiographer comments below are an opinion only and do not replace a formal diagnostic report by a Radiologist

Radiographer's Observations

Anatomical region imaged: _____

☐ No abnormality detected ☐ Unsure

☐ Abnormality detected

☐ Fracture ☐ Soft tissue sign

☐ Joint disruption (e.g. dislocation, subluxation etc.) ☐ Foreign body

☐ Pneumothorax ☐ Pneumoperitoneum

Radiographer comments:_____

_____

_____

_____

_____

☐ Examination escalated to _____

Radiographer's Identifier_____ Date_____

Source: Department of Health, Australia [39]