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Accuracy of Radiographers Red Dot System in Clinical Practice: Retrospective Study of Accident and Emergency Radiographs in a Hong Kong Regional Hospital

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Introduction

The Red Dot system is a radiographer-led signalling system to alert clinicians to the presence of an abnormality on radiographs. It was implemented in the Prince of Wales Hospital, Hong Kong, a 1,500-bed regional acute hospital, in February 2014. Radiographers engaging in the red dot system undergo in-house trauma radiology training.

Objectives

This study investigates the accuracy of abnormality detection on musculoskeletal images by radiographers using clinician reports as a reference standard and noting features of missed cases.

Methodology

1,723 musculoskeletal cases were reviewed, which were sampled from 50 weekdays during office hours over a 10 month period in 2015 and 2016 from a total attendance of 4,347. Red dot labelling on images and radiographers' comments in the log record were compared to clinician reports in the electronic patient record as the reference standard. The sensitivity and specificity of abnormality detection according to different anatomical regions was evaluated.

Result

Abnormality prevalence was 9.9%. The positive and negative predictive value of a red dot / absence of a red dot were 95.5% and 94.3% correspondingly. Overall sensitivity and specificity for radiographers was 44.9% and 99.8% respectively. Upper extremity demonstrated the highest sensitivity (55.5%), followed by lower extremity (47.5%) and pelvis (42.6%). The specificity ranged from 99.3% to 100%. There is no significant difference in sensitivity and specificity between 2015 (47.6% & 99.8%) and 2016 (42.9% & 99.7%). Sensitivity was highest in sprain injury (59.1%), followed by fall injury (46.6%). 86.8% of correctly dotted cases had written comments. Among the missed cases, 54.5% were deemed to be obvious fractures and 44.6% were imperceptible fractures, including those later diagnosed by further radiological investigation with relevant clinical correlation. High positive and negative predictive values with high specificity for applying the Red Dot system are encouraging and comparable to overseas studies. Radiographers demonstrated a promising capability for image interpretation and commenting which warrants greater involvement of radiographers in reporting trauma radiographs as role extension. However, the comparatively low sensitivity reflects the voluntary basis of the Red Dot system, and the presence of imperceptible fractures in plain x-ray. Sensitivity (75.4%) would have been similar to the studies in the UK and South Africa when missed obvious fractures were dotted. Radiographers have to take a proactive role in practicing red dot to improve their sensitivity in abnormality detection.