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Image interpretation: Experiences from a Singapore in-house education program

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ABSTRACT

Introduction: The aim of this study is to take a longitudinal approach to assess the value of an in-house program developed in a Singapore hospital over a two year period.
Methods: Radiographers (n = 48) consented to take part in the study. The control group (CG: n = 40) continued with normal working practice whilst the remaining 'additional training group' (ATG: n = 8) participated in the hospital's in-house image interpretation program. Upon completion, all participants were assessed using a RadBench® test bank. All participants then continued to work in their normal clinical practice; however the ATG received regular peer support to reinforce learning and aid further development. One year later, the same populations were invited to sit another RadBench® assessment.
Results: The mean accuracy of both groups was very similar at phase one (70v71%). The ATG demonstrated higher mean sensitivity (83v72%) but the CG higher mean specificity (68v56%). One year later, with continued mentor support, the ATG demonstrated a marked improvement in mean accuracy over CG (86v70%) largely driven by a marked increase in mean specificity from 56 to 87%. 43% of the ATG could deliver exceptional standards for accuracy, sensitivity and specificity, ready and able to provide reliable preliminary clinical evaluation, versus none of the CG.
Conclusion: In-house programmes could be a cost effective approach to skills development and ideally suited to preceptorship and new employee orientation in order to assess, develop and monitor image interpretation performance.

Introduction

Singapore was established as a British colony in 1824, gained independence in 1965 and has become one of the world's most prosperous nations. Whilst an in-country degree is now validated and active, a large number of radiographers have traditionally been educated through programs linked to the UK and Ireland. The Allied Health Professions Council (AHPC)[1] was formed in Singapore in April 2013 with Occupational Therapists, Physiotherapists and Speech-Language Therapists registered in the first wave. Mandatory registration for practice for Diagnostic Radiographers (1584) and Radiation Therapists (161) was is April 2017. The Singapore Council maintains the Registers of Allied Health Professionals and renews practising certificates, issues certificates of good standing and regulates the conduct and practice; specifies pre-registration requisites, approves pre-registration training centres and directs continuing education.

Image interpretation has been identified as one of the core radiographer competences,[2] particularly within the acute musculoskeletal environment and as such incorporated into all UK degree programs,[3] mirrored in the new undergraduate degree program offered in Singapore. Whilst reporting is currently outside the scope of radiographers in Singapore, 'red dot' is widely practiced with an aspiration to develop preliminary clinical evaluation skills. Similar to the Health and Care Professions (HCPC)[4] standards in the UK, the Second Schedule of the Allied Health Professions Act 2011[5] which prescribes the roles of the diagnostic radiographer in Singapore currently does not specifically identify image interpretation as a core competence.

Achieving competence in decision making and preliminary clinical evaluation is challenging and qualified radiographers and new graduates may not necessarily possess the skills to competently participate in abnormality detection schemes.[6] This finding

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is echoed in a benchmarking study to compare image interpretation competencies of radiography students from nine UK universities.[7] With two errors in ten, the traditional accuracy of 80%[8] was outdated and inconsistent with clinical governance standards and so an updated minimum standard of 90% accuracy[6] has been suggested in-line with the Fellowship of the Royal College of Radiologists (FRCR) Part 2B rapid reporting test[9] to provide a standardised benchmark regardless of profession. The professional route to Radiography and Radiology is different but common to both UK and Singapore. Radiography is a developing profession and consistent with medical education the undergraduate degree should be seen as the first stage in the continuum of learning that extends throughout professional life.[10] Innovations in 'medical' curricula across the world aim to produce professionals that can meet the future healthcare needs of society, both locally and on a global scale.[11] The first step in scaffolding the transition to preliminary clinical evaluation is developing the ability of radiographers to make the correct image interpretation decision.[12] Without this any written commentary is of little value and could in fact be detrimental.

Routine practice in Singapore is that most images, certainly from acute referral, receive a hot radiologists report, although sometimes there is the inevitable delay. There are no reporting radiographers as yet however the notion is still evident that radiographers providing reliable decisions at the point of imaging could provide the referrer with useful information to reduce radiologists' workload for hot reporting, aid triage and reduce patient waiting time. Whilst a plethora of image interpretation and reporting courses are available across the world, many are integrated into post graduate programmes and carry a cost beyond the means of many organisations and self-funding radiographers. In contrast, in-house courses have no impact on the training budget and can be tailored to the requirements of meet local requirements. At the same time, with the lead radiologists and lead radiographers working as in constructive partnership to develop appropriate training, this is a true representation of team working at the heart of today's clinical practice.

This aim of this study is to take a longitudinal approach to assess the value of the in-house program developed in a Singapore hospital over a two year period.

Materials and method

Radiographers employed in the study hospital and were considered eligible for inclusion if they were working in the general radiography specialty (n = 60) to include General, Emergency, and Inpatient Imaging Centres. They displayed a diverse educational profile. Some had diploma, whilst others had degrees from UK, Singapore, Australia, Philippines, Taiwan, and Myanmar. The demand for radiographers has created a culture of rapid development towards the specialist modalities which has resulted in a population of generalists with experience typically ranging from new qualified to five years.

Ethical approval granted by the Centralised Institutional Review Board (CIRB/2015/2916:2016/2943). A requirement of the approval was participant self-selection, which introduces the potential for bias, however demonstrates fair and equal opportunities for all.

To ensure that the prospective participants had enough information to make informed decisions about their participation in the study, an open invitation email was sent out through the department clinical managers. The email outlined the research plan and included a sample of the written information sheet. Candidates were encouraged to ask questions to confirm their understanding of the information provided both through the email triggered and afterwards in private consultation. Participation in the study was entirely voluntary and radiographers were given the option to be excluded from the study (n = 12), included in the 'additional training group' (ATG) (n = 8) or without additional training 'control group' (CG) (n = 40); the total study population was 48. Participants read and gave written consent to take part with the knowledge that they had the option to retract at any point in the process.

A secure electronic investigator site file was created to enable the researchers to create, manage, share and archive research documents within a fully encrypted cloud repository.

Phase one

Whilst radiography and radiology are different professions, the image interpretation is common to both and so assessment of performance should ideally use a similar approach,[12] hence this research aligns closely with the FRCR Part 2B rapid reporting assessment. *RadBench*®[13] provides a large number of images of difficulty determined by item response theory from thousands of responses to previous tests, and includes clinical details, reports confirmed by blind double reporting with triple review of equivocal cases and a pre-formed test template, which is ideally suited to this project and available free of charge for research purposes. A test bank was constructed to contain thirty musculo-skeletal images, presenting typical cases to those commonly seen in the accident and emergency environment, with fifty per cent incidence of abnormality consistent with FRCR 2B; Hand (n = 4), Wrist (n = 4), Forearm (n = 2), Elbow (n = 4), Shoulder (n = 2), Foot (n = 6), Ankle (n = 6), Knee (n = 2).

Abnormality was restricted to a single fracture or dislocation site per case, all clearly visible with satisfactory search. Soft tissue findings such as raised fat pad, effusion and lipohaemarthrosis where visible provided additional evidence of abnormality. Orthogonal projections were included to create a realistic simulation of clinical practice.

Whilst both control (CG) and additional training (ATG) groups continued to follow their normal working practice in the clinical environment, the ATG radiographers undertook an in-house training program focused on musculo-skeletal (MSK) image interpretation. A blended learning approach was used over three months, where ATG radiographers completed a series of e-learning activities within a virtual learning environment to include all appendicular body areas in terms of anatomy, radiological anatomy, normal variants, and practice assessments. In parallel, five 2 h face to face tutorials were conducted by consultant radiologists to further develop the learning and answer questions directly.

One week after completion of the in-house training program, all the study participants took the phase one RadBench® test. The study was conducted in the hospital's IT training room with a standardised level of ambient lighting and monitor calibration. Images were presented sequentially. Participants had the option to go back and forth within the image set until completion. Each image could be maximised and zoomed to full screen to optimise viewing. For each image, participants were required to make a decision using a five-point rating scale ('Definitely Normal', 'Probably Normal', 'Possibly Abnormal', 'Probably Abnormal' and 'Definitely Abnormal') and then provide written commentary to describe their observations.

The results were then analysed using IBM Statistical Package for the Social Sciences (SPSS) version 20.0 software; age, years of experience, degree/diploma, university/college of education, sensitivity, specificity and accuracy at 95% confidence level.

All participants were provided with feedback and the opportunity to discuss their results.