

Physiotherapy Theory and Practice

An International Journal of Physical Therapy

ISSN: 0959-3985 (Print) 1532-5040 (Online) Journal homepage: <http://www.tandfonline.com/loi/iptp20>

Final year physiotherapy student's reliability in chest X-ray interpretation

Valerie Ball, Caren Sze Chiu, Yun-Perng Lian & Laksmini Lingeswaran

To cite this article: Valerie Ball, Caren Sze Chiu, Yun-Perng Lian & Laksmini Lingeswaran (2018) Final year physiotherapy student's reliability in chest X-ray interpretation, *Physiotherapy Theory and Practice*, 34:1, 54-57, DOI: [10.1080/09593985.2017.1360423](https://doi.org/10.1080/09593985.2017.1360423)

To link to this article: <https://doi.org/10.1080/09593985.2017.1360423>



Published online: 17 Aug 2017.



Submit your article to this journal [↗](#)



Article views: 50



View related articles [↗](#)



View Crossmark data [↗](#)

DESCRIPTIVE REPORT



Final year physiotherapy student's reliability in chest X-ray interpretation

Valerie Ball, MSc, MCSP^a, Caren Sze Chiu, BSc (Hons), PT^b, Yun-Peng Lian, BSc (Hons), PT^c, and Laksmi Lingeswaran, BSc (Hons), PT^d

^aSchool of Health and Rehabilitation, Keele University, Keele Staffordshire, UK; ^bDepartment of Physiotherapy, Medical Professional Consultation Company, Hong Kong SAR, Hong Kong; ^cHealthworks, Mont Kiara, Kuala Lumpur, Malaysia; ^dEast and North Hertfordshire NHS Trust, Lister Hospital, Corey's Mill Lane, Stevenage, England

ABSTRACT

Background: Newly qualified physiotherapists may be required to interpret an unreported chest X-ray (CXR) as part of their physiotherapy assessment in “on call” situations. Their interpretation may influence the patient management strategies they adopt. There is no research published which have tested the reliability of final year physiotherapy students in CXR interpretation. **Methods:** Twenty-five final year physiotherapy students were asked to view and interpret the findings of six CXRs, together with a brief vignette, typical of a single commonly encountered diagnosis. Students were also asked if they had received additional CXR training on placement or had a desire to specialize in respiratory care. **Results:** The CXR interpretations were scored as incorrect 0, partially correct 1 (abnormality detected but not able to diagnose or missed some detail) and 2 correct. Scores for each of the six CXRs were added to give a total score (out of 12). The median score was 3 out of 12, (range 0–9). Median scores were slightly higher at 4 out of 12 in those students with additional training or a desire to specialize (range 1–7), but this was not statistically significant ($p = 0.43$). **Conclusions:** Final year physiotherapy students were not able to reliably interpret CXRs. These findings were consistent with previous published research involving medical students. Therefore on graduation before starting “on call” duties it is recommended newly qualified physiotherapists receive additional training in CXR interpretation.

ARTICLE HISTORY

Received 9 Dec 2015
Revised 8 Nov 2016
Accepted 12 Dec 2016

KEYWORDS

Chest X-ray interpretation;
physiotherapy respiratory
assessment; reliability

Introduction

Newly qualified physiotherapists in the United Kingdom (UK) who undertake out of hours “on call” duties are asked to manage patients with acute respiratory deterioration. In questionnaires conducted UK-wide both Gough and Doherty (2007) and Thomas et al. (2008) concluded that physiotherapists are increasingly required to work competently and respond promptly in emergency situations. As part of the physiotherapy assessment, interpretation of an unreported chest X-ray (CXR) is possible and may influence patient management strategies. Sixty-nine percent of UK National Health Service (NHS) Trusts providing an “on call” physiotherapy service rely on undergraduate teaching and experience to prepare newly graduated physiotherapists for out of hours work (Gough and Doherty 2007). Medical students are also prepared for working in acute situations; a study by Jeffrey et al. (2003) revealed that medical students had poor ability to interpret simple CXRs when presented without any additional clinical information. To date there appears to have been no studies published that have evaluated the ability of newly qualified

physiotherapists to accurately interpret CXRs. Therefore, the aim of the current study was to evaluate if final year physiotherapy students were able to accurately interpret CXRs.

Method

Study design and participants

A prospective study evaluating final year physiotherapy student's ability to interpret CXRs was designed, and following ethical approval from the School of Health and Rehabilitation Ethics Committee, invitation to participate was by the year group email so all final year (Year 3) physiotherapy students were contacted, given an information sheet and invited to participate.

Outcomes and data collection procedures

After signing consent forms, participants were asked to complete a short questionnaire asking for details on their respiratory experience on clinical placement, any

Table 1. CXR diagnoses.

CXR number	Diagnosis
1	Fractured ribs right 2–8
2	Spontaneous left pneumothorax with midline shift to right
3	Right lower lobe collapse with midline shift to right
4	Severe pulmonary edema
5	Left lower lobe consolidation (pneumonia)
6	Hyperinflation

additional training in CXR interpretation received on placement and if they had an interest in specializing in cardiorespiratory physiotherapy. Participants were randomly assigned to start at a different CXR station, and given 5 minutes to write down their interpretation before moving on the next X-ray. Six standard posterior–anterior or anterior–posterior CXRs were selected from the School of Health and Rehabilitation, Keele University learning and teaching resources, representative of those used during teaching of the cardiorespiratory curriculum and common conditions encountered in clinical practice. The CXRs had been previously assessed by a radiologist or respiratory medicine consultant as typical of a single diagnosis (Table 1). Brief vignettes for each of the CXRs were created comprising a short history and the cardinal symptoms typical of the patient diagnosis.

Data analysis

Answer sheets were scored between 0 and 2, with 2 being in agreement with expert opinion, 1 being partially correct, for example the correct interpretation of abnormality but failed to diagnose, or missed some detail, such as the exact number of fractured ribs, and 0 being no consistency with expert opinion. Total scores for each participant were calculated, with a maximum score of 12 being possible. The number of students achieving a correct, partially correct score or no consistency for each CXR were also calculated. Medians and ranges were calculated. The Mann–Whitney U test was used to test for intergroup significance.

Results

Twenty-five participants were recruited from the cohort of 63-third-year physiotherapy students. All

Table 2. Participant's ($n = 25$) demographic data.

	Number (%)
Respiratory experience on clinical placement	
Yes	6 (24)
No	19 (76)
Additional training in CXR interpretation while on clinical placement	
Yes	2 (8)
No	23 (92)
Interest in specializing in cardiorespiratory physiotherapy	
Yes	9 (36)
No	16 (64)

the participants ($n = 25$) completed the questions on the questionnaire (Table 2) and twenty-two participants interpreted all 6 CXRs. Three participants failed to give an answer in one station (one CXR); the unanswered interpretations were scored at 0. The 147 interpretations were scored 0, 1, or 2 by the research students and verified by the research supervisor. The frequency with which students interpreted the CXRs as correct, partially correct, or incorrect are presented in Table 3.

The data were not normally distributed therefore medians were calculated (Figure 1). The median total score for the whole group was 3 out of 12, (range 0–9). The median total score for the group of participants without cardiorespiratory placement experience or an interest in cardiorespiratory as a career ($n = 13$), was 3 (range 0–9) (Table 3). The mean score for the subgroup of students with cardiorespiratory placement experience or an interest in cardiorespiratory as a career ($n = 12$) was 4 (range 1–7). Nonparametric testing for significance was used and the difference between the groups was not significant ($p = 0.430$).

A small subgroup ($n = 3$) on respiratory clinical placements with access to CXR in the weeks immediately preceding the study scored a median total score of 5 (range 4–7), this sub group was considered too small for statistical comparison.

Discussion

The results of the study indicate that final year physiotherapy students had a poor ability to diagnose from CXR and a vignette. The physiotherapy students with respiratory placement experience in CXR interpretation or interest in pursuing a career in cardiorespiratory

Table 3. Number of participants correctly, partially correctly, or incorrectly interpreting each CXR (percentage of sample).

CXR	Expert diagnosis	Number of participants scoring 2 points (%)	Number of participants scoring 1 point (%)	Number of participants scoring 0 points (%)
1	Fractured ribs 2–8	0 (0%)	15 (60%)	10 (40%)
2	Spontaneous left pneumothorax with midline shift to right	6 (24%)	4 (16%)	15 (60%)
3	Right lower lobe collapse with midline shift to right	2 (8%)	0 (0%)	23 (92%)
4	Severe pulmonary edema	6 (24%)	0 (0%)	19 (76%)
5	Left lower lobe consolidation (pneumonia)	9 (36%)	0 (0%)	16 (64%)
6	Hyperinflation	9 (36%)	2 (8%)	14 (56%)

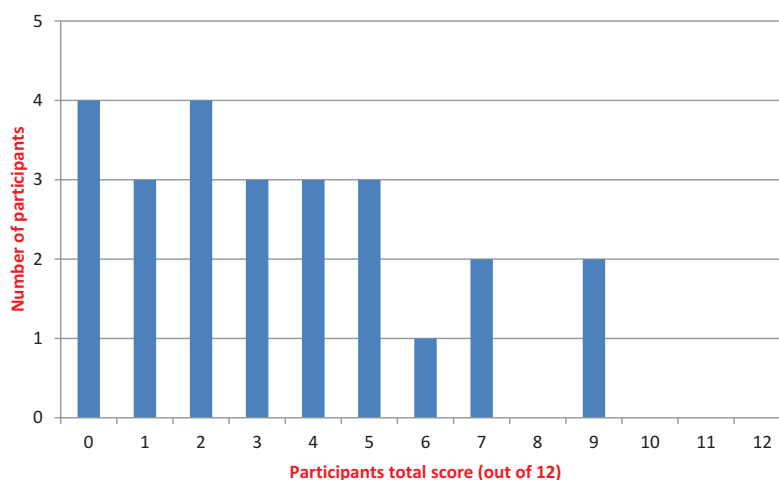


Figure 1. Total score achieved by participants.

scored slightly higher, but the results were not statistically significant. The small group of participants who had a respiratory placement in the weeks immediately prior to the study scored higher than the rest of the cohort

These results are consistent with previous research on final year medical students who did not perform well when interpreting simple CXRs (Jeffrey et al. 2003). Physiotherapists working in respiratory “on-call” or emergency duties may be called upon to review unreported CXR during their initial assessment. NHS Trusts rely on undergraduate teaching and clinical placements to prepare their new graduate staff members for out of hours working (Gough and Doherty 2007; Thomas et al. 2008). The results of this study suggest that the formal undergraduate curriculum does not adequately prepare students for CXR interpretation after graduation.

The results comparing the amount training with total scores supports the finding by Jeffrey et al. (2003) study demonstrating no correlation between amount of medical student formal teaching and ability to interpret CXRs accurately. The lack of significant difference between the current study’s subgroups may reflect the time period (almost 12 months) between the formal CXR teaching and the current study.

A small subgroup (three participants) who had a respiratory placement just prior to the study scored substantially higher than the rest of the cohort, although this sub group was too small for statistical comparison there is evidence that greater exposure in a quality driven and meaningful environment increases learning (Patton et al. 2013).

It has been noted that greater experience in reading CXRs will make an individual more reliable in their interpretation. Satia et al. (2013) and Eisen et al. (2006) found that Foundation Year 2 doctors were more

reliable than medical students. Other researchers also found that greater experience increased the correct CXR interpretation of pneumonia (Hopstaken et al. 2004; Ojutiku et al. 2005); and congestive cardiac failure (Feldmann, Jain, Rakoff, and Haramanti, 2007). Emergency department junior doctor’s findings were considered unreliable in their CXR interpretation (Gatt et al. 2003) and frequently misinterpreted life threatening abnormalities (Mehotra et al. 2009).

As training physiotherapy students at the point of care can be challenging given the increased demands on clinical educators (Patton et al. 2013), those running on-call training packages for new graduates may need to consider innovative learning and teaching methods; utilizing e-learning packages which have been demonstrated to improve medical students CXR interpretation skills (Tamaklo 2012) could be one method to enhance skills.

The differences in the type of pathology and number of students correctly interpreting the CXR are interesting. Participants found fractured ribs most easy to interpret followed by the “black lung field” problems of pneumothorax and hyperinflation. Problems generating an increase in lung field opacity were less often correctly interpreted which was consistent with but more pronounced than the Jeffrey et al. (2003) findings. The reason for this inconsistency is not clear.

Limitations and recommendations

This was a small study using CXRs limited to respiratory problems and a small number of participants from one cohort of final year physiotherapy students making analysis of the results less robust. The study assumes that the CXRs were accurately interpreted before being added to the School’s learning and

teaching resources and is a possible source of error. Before a larger study is commissioned an exploration of employer expectations of newly qualified physiotherapists is recommended.

Conclusions

Physiotherapists being called, out of hours, to patients with acute respiratory deterioration may have access to an unreported CXR to assist in their assessment process. More recent exposure to an undergraduate cardiorespiratory clinical placement may result in improved reliability postgraduation; however most newly graduated physiotherapists are unlikely to be able to interpret CXRs reliably and may require training to do so.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

- Eisen LA, Berger JS, Hedge A, Schneider RF. 2006. Competency in chest radiography. A comparison of medical students, residents, and fellows. *Journal of General Internal Medicine*. 21:460–65.
- Feldmann EJ, Jain VR, Rakoff S, Haramati LB. 2007. Radiology residents' on call interpretation of chest radiographs for congestive heart failure. *Academic Radiology*. 14:1264–70.
- Gatt ME, Spectre G, Paltiel O, Hiller N, Stalnikowicz R. 2003. Chest radiographs in the emergency department: Is the radiologist really necessary? *Postgraduate Medical Journal*. 79:214–17.
- Gough S, Doherty J. 2007. Emergency on-call duty preparation and education for newly qualified physiotherapists. *Physiotherapy*. 93:37–44.
- Hopstaken RM, Witbraad T, Van Engelshoven JM, Dinant GJ. 2004. Inter-observer variation in the interpretation of chest radiographs for pneumonia in community-acquired lower respiratory tract infections. *Clinical Radiology*. 59:743–52.
- Jeffrey DR, Goddard PR, Callaway MP, Greenwood R. 2003. Chest radiograph interpretation by medical students. *Clinical Radiology*. 58:478–81.
- Mehotra P, Bosemani V, Cox J. 2009. Do radiologists still need to report chest x-rays? *Postgraduate Medical Journal*. 85:339–41.
- Ojutiku O, Haramati LB, Rakoff S, Sprayregen S. 2005. Radiology residents' on call interpretation of chest radiographs for pneumonia. *Academic Radiology*. 12:658–64.
- Patton N, Higgs J, Smith M. 2013. Using theories of learning in workplaces to enhance physiotherapy clinical education. *Physiotherapy Theory and Practice*. 29:493–503.
- Satia I, Bashagha S, Bibi A, Ahmed R, Mellor S, Zaman F. 2013. Assessing the accuracy and certainty in interpreting chest x-rays in the medical division. *Journal of Clinical Medicine*. 13:349–52.
- Tamaklo E. 2012. Can e-learning improve medical students' ability to interpret chest x-rays in comparison with electronic text? http://www.elfh.org.uk/media/41698/Impact_of_Image_Interpretation_on_Medical_Students_ASME_Poster_2012.pdf.
- Thomas S, Gough S, Broad MA, Cross J, Harden B, Ritson P, Quint M. 2008. On-call competence: Developing a tool for self-assessment. *Physiotherapy*. 94:204–11.