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Knowledge of radiographic interpretation of X-Ray among final year physiotherapy students

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Abstract
Introduction: The need of this study was initially due to increased demand of physiotherapy student to interpret X-rays during the postings, even though the capacity of education received about X-ray interpretation skills does not correlate with the high demand. For example, students encounter X-ray during their posting in either cardiorespiratory or musculoskeletal with no previous experience.
Objective: This study aimed to assess the ability of final-year physiotherapy students in interpreting X-ray images in Malaysia.
Methods: A cross-sectional descriptive study was conducted among 150 final-year physiotherapy students from three different Malaysian universities. Participants were presented with a questionnaire containing cardiorespiratory and musculoskeletal related radiographic interpretation.
Results: Out of 73 participants, 59% were categorized as "not able to interpret," indicating a poor ability to interpret X-ray images. Musculoskeletal conditions were more accurately interpreted (61%) compared to cardiorespiratory conditions (39%). Notably, common pathologies such as COPD were missed by 70% of students. Students with respiratory placement experience or a keen interest in cardiorespiratory careers showed slightly higher scores in cardiorespiratory X-ray interpretation, though not statistically significant. Similarly, students with an interest in musculoskeletal specialties scored slightly higher in musculoskeletal X-ray interpretation (8% higher) than their peers without such interest.
Conclusion: This study reveals a significant gap in the ability of final-year physiotherapy students in Malaysia to interpret X-ray images. Despite some variations based on clinical interest, overall proficiency remains low. These findings underscore the need for comprehensive radiology training and curriculum enhancements in physiotherapy education to ensure graduates possess the necessary skills for accurate X-ray interpretation in their clinical practice.

Keywords: X-ray interpretation, final year physiotherapy students, radiographic education, radiographic education in Malaysia

Introduction
The need of this study was initially due to increased demand of physiotherapy student to interpret X-rays during the postings, even though the capacity of education received about X-ray interpretation skills does not correlate with the high demand. For example, students encounter X-ray during their posting in either cardiorespiratory or musculoskeletal with no previous experience. Although only one literature targets the prevalence of X-ray exposure among physiotherapy students, but it is subjectively established that the exposure is high to medium based on students report from this study. Moreover, the demand of X-ray interpretation skill is not only restricted to clinical posting. Many of the midterms and final exams in different Malaysian universities contain X-ray which the student is required to interpret. This issue of increased load of X-ray interpretation demand and low student's X-rays interpretation skills was seen in several educational institutes in Malaysia as reported by students, lecturers and clinical preceptors. Although this issue is well recognized, there are no proper educational materials or courses which prepare the student for this required load. Therefore, causing the students to fail to interpret X-ray imaging leading to, firstly, improper assessment findings resulting in poor diagnosis and ineffective treatment plan. Secondly, can cause low understating of musculoskeletal and cardiorespiratory condition as X-ray is used as educational tool and lack of academic achievements, such as, low marks in assignments due to improper reading to X-ray.

Methodology

A cross-sectional descriptive study employing a quantitative approach will be devised to assess the interpretive skills of final-year physiotherapy students in relation to X-rays. The most fitting design for this investigation is the descriptive design, which effectively captures and portrays the attributes of X-ray interpretation among these senior students. The choice of a descriptive study design stems from its focus on the inherent characteristics of the subject, devoid of external variables. Moreover, this design aligns seamlessly with the study's objectives. The data collection process will be conducted using a quantitative approach, ensuring that the amassed data can be objectively analysed through statistical tools, as advocated by Bhandari (2020) [8].

Inclusion Criteria: Study in Malaysia, In-person, Approve the informed consent and Final year physiotherapy student.

Exclusion Criteria: Diploma course**,** previous radiology courses and previous radiology training

Sampling Design and Sample Size Calculation

This study will employ purposive judgmental sampling, a non-probability approach, to select participants. The selection will be contingent on both relevance and accessibility criteria, in line with the insights of. The participant selection process will be driven by the study's objectives, ensuring an equal opportunity for each potential participant. In line with theoretical considerations, the anticipated sample of 150 participants will be distributed across three groups, with 50 participants in each group. The current sample size has been determined using. The data analysis will encompass a 5% margin of error, a 90% confidence level, an assumed 50% response distribution, and a total population size of 150.

Group Allocation: Total of 150 students divided over 50 for each of the 3 universities with informed consent. Comprising each 50 students from three different private universities in Malaysia. Ethical considerations: First and foremost, permission to conduct this descriptive research had been obtained from faculty research review committee from the University, with the reference number of (FOHS/PT/23/UG28).

Research instruments: **Primary Research Instruments**: The exclusive outcome measure employed in this study is a questionnaire, allowing no time restriction for the examination of each radiograph. The questionnaire will be structured into three sections. The initial section will encompass an introduction, demographic data, and a consent form. The subsequent section will directly pertain to X-ray interpretation, encompassing a diverse array of question types, including multiple-choice questions with varying levels of difficulty: easy, medium, and hard. The questionnaire will consist of 12 questions, 6 of which are related to common cardiorespiratory conditions while the others representing musculoskeletal conditions. The chest X-rays will be sourced from "Chest X-ray made easy" by Corne and Kumaran (2015) [10], while musculoskeletal radiographs will be extracted from "Radiological Image Analysis" by Martensen (2013). These chosen conditions represent the most prevalent clinical scenarios and mirror what students are likely to encounter during their clinical placements. The third segment will consist of general knowledge-based questions focusing on the theoretical knowledge of X-ray images. The validation of the questionnaire will be undertaken by my respectful supervisor and the esteemed lecturers of the faculties at university. The validation process must have certain points that includes: Each radiograph will feature a single probable diagnosis or a succinct, list of potential differential diagnoses, each radiograph should be clear and unambiguous, contain 3 levels of easy, medium and hard and Represent common pathologies found in Malaysia

Procedure:

Preparation Phase: After establishing the research objective, the subsequent step involves exploring into the literature review process. This phase serves to gain an insight into the current state of existing research. Once data collection is accomplished and limitations are identified, a clearer comprehension of the research objectives comes into focus. The research methodology is subsequently chosen in alignment with the study's aims. To ensure heightened accuracy and reduced bias, a preliminary questionnaire will be meticulously crafted, adhering to the guidelines outlined by Arnetz *et al*. (2019) [5]. Moreover, formal authorization to conduct the study will be sought from all three participating universities.

Implementation Phase: Following the acquisition of approvals from various universities, the implementation phase will commence, commencing with a pilot study conducted via email involving a select group of students. Subsequently, the questionnaire will be administered in person, within a designated discussion room, engaging participants directly. The pilot study will consist of 3 distinct sections with the selection of radiographs, integral to the questionnaire, will be meticulously guided by sound radiology references and validated by my respectful supervisor and the esteemed faculties from university. The ensuring results will undergo comprehensive evaluation, with a view to enhancing and refining them. If minor refinements are deemed necessary, the adjusted questionnaire will be employed. Conversely, in the event of substantial revisions, a fresh pilot study will be conducted. Following the validation of the questionnaire through pilot study, the third part named “knowledge-based questions” was replaced with “radiographic experience” which include questions like the presence of radiology subject, exposure to X-ray, placements completed, additional radiographic training received and the interest to pursue cardiorespiratory or musculoskeletal specialization. Additionally, 2 images related to musculoskeletal and 3 related to cardiorespiratory was replaced to clearer images. Ultimately, the questionnaire, having undergone necessary iterations, will be administered to the participants for the purpose of data collection.

Data Collection Phase: The data collected from the questionnaire will undergo assessment through quantitative analysis, utilizing statistical methods to present numerical findings with the help of Microsoft Excel ToolPak. This approach will facilitate the eventual addressing of the primary objective, achieved by: Calculate the mean, median and total score by each student and the percentages of correctly answered and missed conditions will be computed.

Result

Total of 73 participants were recruited from 150 final year physiotherapy students across 3 universities in Malaysia. Out of 73 students 34 students were recruited from Group A, 22

students from Group B and 18 students from Group C. All the participants (n=73) completed the questions on the questionnaire, however, 12 participants failed to give an answer in 2 stations related to cardiorespiratory and 1 related to musculoskeletal; the unanswered interpretations were scored as 0. Total of 876 interpretations were obtained from (n=73) participants and were scored 0, 1, or 2 by the research students. Out of 876 interpretations, 368 were correct, 70 were partially correct and 438 were incorrect. After analyzing the 368 correct answers, musculoskeletal conditions were most answered by students with total of 224/368 interpretations (61%), while cardiorespiratory interpretations were lower with 144/368 (39%). After calculating the mean score from the students in each university, student who scored same
or above the mean were collected and labeled as "able to interpret" while students scoring lower than the mean value from their respective university were collected and labeled as "Not able to interpret". For example, while Group A student's mean value of answered questions is 11.72/ 24, a student scoring 14/24 will be considered as "able to interpret". Therefore, most students (n=43) were not able to interpret X-ray presenting 59%. 30 students (41%) were able to interpret common X-rays. 13 Group A students achieved the most correct answers covering 18%, followed by 10 Group B students of 14% and 9% were obtained from 7 students from Group C. Total mean score from 3 universities was 11.414.Total score achieved by participants was presented. While the highest achieved mark of 22/24 was gained by one student from Group C, lowest score of 3/24 was gained by 1 student from Group A. Regarding the frequency with which students interpreted. X-rays as correct, partially correct or incorrect are presented. Most answered musculoskeletal questions were fractured clavicle & scoliosis by 66 students with correct rate of 91%, followed by anterior shoulder dislocation answered correctly by 55%. On the other hand, the most unanswered musculoskeletal question was scaphoid fracture by 57 students (78%). Followed by medial malleolus fracture answered incorrectly by 51 students (70%).Regarding cardiorespiratory X-rays, most answered and unanswered questions were related to pleural effusion of 59% and 71%, respectively. 63% of final year physiotherapy students came across radiological images during their postings with 16% received additional radio graphical training. Most radio graphical images seen in posting were related to cardiorespiratory conditions as reported by 31 students (42%), followed by musculoskeletal related X-rays reported by 15 students (20%). However, 37% of the students reported no exposure to X-ray during their posting. In terms of Student's interest in either musculoskeletal or cardiorespiratory as future career, 49% of the students were interest to peruse musculoskeletal, 12% interested in cardiorespiratory, 19% interested in both specialties and 20% no interested in neither musculoskeletal nor cardiorespiratory.

Discussion

The findings of this study indicate that final year physiotherapy students in Malaysia had poor ability to interpret X-ray images. Even though 41% is still acceptable value, students were predicted to score from 90% to 100%; as these X-ray images present common pathologies expected from fresh graduates to encounter and treat. It should be noted that a common pathology in cardiorespiratory which is COPD was missed by 70% of students. Moreover, students were not sure regrading a clear anterior shoulder dislocation X-ray image as only 55% were correct. Another important factor to understand the relationship between the student interest and experience with the image interpretation to have better understating about the causality of the resented issue. The 12% of physiotherapy students with respiratory placement experience or a keen interest in pursuing a cardiorespiratory-focused career displayed slightly elevated scores in their X-ray interpretation assessments. Nevertheless, it is essential to note that these differences did not achieve statistical significance. Similarly, the 49% group of students with musculoskeletal interest scored slightly higher in musculoskeletal related X-ray images by 8% compared to other students with no interest in pursuing musculoskeletal specialty. While it may seem normal that students with hands-on experience in a specific field might out perform their peers in related theoretical assessments, the small differences of this phenomenon warrant further investigation. The lack of statistical significance in this study suggests that multiple factors influence students' ability to interpret X-rays accurately. These factors could include individual learning styles, study habits, and even random variations in test performance. Consequently, the influence of respiratory placement experience or career aspirations may be overshadowed by these other variables. In terms of significance and implication among the studies, Both Cheung *et al*. (2018) [9] and Ball *et al*. (2018) [7] suggests that the formal undergraduate curriculum fails to sufficiently equip students for chest X-ray interpretation post-graduation highlighting the need for improved training in interpreting radiographs. Similarly, relates the lack of interpretation and low interest to poor radiological education which can influence the number of students choosing radiology as a career. Also, the absence of students perceiving themselves as excellent highlights the complexity of radiograph interpretation and the importance of seeking advice from a senior colleague or a radiologist. While addressing the gender difference is insignificant, but it can increase the awareness in medical students that can have implications for educational interventions. Another important implication suggested by Cheung *et al*. (2018) [9] is that over-reliance on radiologist reports or interpretations by more senior colleagues may contribute to the challenges in chest X-ray interpretation. Institutions should encourage junior doctors to develop their skills in interpreting radiographs rather than solely relying on the interpretations of others. Therefore, this study may provide thoughts on the educational curriculum because of the higher competency in musculoskeletal radiology may indicate a stronger emphasis on this aspect in the curriculum. Moreover, the poor interpretation skills suggest that the radiological education provided to physiotherapy students in Malaysia need to be improved. The strength in this study can be noticed as it included students from three Malaysian universities, enhancing the diversity of the sample and generalizability. Also, it investigates students' career interests adds depth to the findings, considering the varying career opportunities in either cardiorespiratory or musculoskeletal physiotherapy, which may provide an understanding of the student's career aspirations, delivering valuable insights into the future healthcare workforce and can guide curriculum planning and career counselling. While career interest exploration may provide an explanation of the presented issue, the study provides limited explanation of other variations such as educational background, leaving room for future research.

Limitation of study

The results of this study can be improved if certain limitation were overcome. Firstly, this study was of modest scale, involving a small number of participants drawn from only 3 universities in Malaysia. Secondly, part of the study was conducted online through the common email of the physiotherapy cohort, which cannot limit the use of external factors such as, books, notes, online sources. Thirdly, Courtesy bias was noticed from various participants in this study. Consequently, the findings may not possess the robustness typically associated with larger, more diverse studies.

Conclusion

Final year physiotherapy students in Malaysia face challenges in interpreting X-ray images accurately and even common pathologies were frequently missed. These challenges could have implications for their future clinical practice and patient care. While career interests and clinical exposure may play a role in interpretation skills, other factors also contribute to the variations observed. The study highlights the need for enhanced radiological education in physiotherapy programs and suggests potential areas for future research.

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Conflict of interest: Nil

References

1. Alherz F, Alharthi F, Almutari F, Alahmari A, Alsolami A, Nojoom M. X-ray Interpretation in Emergency Department, Do We Need the Radiologist. Journal of Radiology and Clinical Imaging; c2023.
2. Almushayti Z. Estimation of clinical phase medical students' performance in diagnosing critical findings on abdominal X-ray; c2022.
3. Al Shammari M, Hassan A, AlShamlan N, Alotaibi S, Bamashmoos M, Hakami A, *et al*. Family medicine residents' skill levels in emergency chest X-ray interpretation. BMC family practice; c2021.
4. Ameer MA, Ashour AA. Practising physical therapy affects professionals in Egypt. Physiotherapy Quarterly; c2020.
5. Arnetz J, Sudan S, Goetz C, Arnetz B, Gowland L, Manji S, *et al*. Preliminary development of a questionnaire measuring patient views of participation in clinical trials. BMC Research Notes; c2019.
6. Australian Institute of Health and Welfare. Falls in older Australians 2019–20: hospitalisations and deaths among people aged 65 and over; c2022. Available from: https://www.aihw.gov.au/reports/injury/falls-in-older-australians-2019-20-hospitalisation/contents/what-were-the-type-of-injuries. [Accessed: 14th August].
7. Ball V, Chiu CS, Lian YP, Lingeswaran L. Final Year Physiotherapy Student's Reliability in CXR Interpretation. Physiotherapy Theory and Practice; c2018.
8. Bhandari P. What Is Quantitative Research? | Definition, Uses and Methods; c2020. Available from: https://www.scribbr.com/methodology/quantitative-research/#:~:text=Quantitative%20research%20is%20the%20process,generalize%20results%20to%20wider%20populations. {Accessed: 19th August].
9. Cheung T, Harianto H, Spanger M, Young A, Wadhwa V. Low accuracy and confidence in chest radiograph interpretation amongst junior doctors and medical students. Internal Medicine Journal; c2018.
10. Corne J, Kumaran M. Chest X-ray Made Easy E-book. Elsevier Health Sciences; c2015.
11. Eisen LA, Berger JS, Hegde A, Schneider RF. Competency in chest radiography: A comparison of medical students, residents, and fellows. Journal of general internal medicine; c2006.
12. Elabd A, Elabd O. The application of total quality management standards in Egyptian physiotherapy colleges. Egyptian Journal of Physical Therapy; c2021.
13. Feldmann EJ, Jain VR, Rakoff S, Haramati LB. Radiology residents' on-call interpretation of chest radiographs for congestive heart failure. Academic radiology; c2007.
14. Gough S, Doherty J. Emergency on-call duty preparation and education for newly qualified physiotherapists. Physiotherapy; c2007.
15. Ho R. Understanding statistics for the social sciences with IBM SPSS. Chapman and Hall/CRC; c2017.
16. ICEF Monitor. Malaysia exceeds target for new international student applications in 2022. ICEF Monitor; c2023. Available from: https://monitor.icef.com/2023/02/malaysia-exceeds-target-for-new-international-student-applications-in-2022/#:~:text=The%20top%20five%20sending%20markets,in%20application%20trends%20as%20well. [Accessed: 23th August].
17. Jeffrey DR, Goddard PR, Callaway MP, Greenwood R. Chest Radiograph Interpretation by Medical Students. Clinical Radiology; c2003.
18. Karadimitriou SM, Marshall E, Knox C. Mann-Whitney U test. Sheffield: Sheffield Hallam University; c2018.