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A review of peer-assisted learning to deliver interprofessional supplementary image interpretation skills

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Keywords

Students, radiography, medical students, image interpretation, peer-assisted learning.

Abstract

***Background*:** Peer-assisted learning provides a means through which individuals can learn from one another through a reciprocal process. Radiographic image interpretation skills are fundamental to both diagnostic radiography students and medical students due to their shared role in preliminary evaluation of conventional radiographic images. Medical students on graduation, may not be well prepared to carry out image interpretation, since evidence suggests that they perform less well than radiographers in e.g. Accident and Emergency situations.

Method: A review of literature was conducted exploring the application of peer-assisted learning within diagnostic radiography and health education more widely as well as the practice of initial image interpretation. An extensive and systematic search strategy was developed which provided a range of material related to the areas.

Findings: An overview was obtained of the effectiveness of peer assisted learning and the issues associated with development of image interpretation skills and a degree of discrepancy was identified between the two cohorts regarding their interpretative competence and confidence. This inconsistency may create an opportunity to apply peer assisted learning, better preparing both disciplines for the practical application of image interpretation skills.

Conclusion: The review identified the lack of a substantial evidence base relating to peer-assisted learning in radiography. Peer-assisted learning is not widely embraced in an interprofessional context. Multiple positive factors of such an intervention are identified which outweigh perceived negative issues. Student teacher and learner may benefit as should the clinical service from enhanced practitioner performance. The findings justify further research to develop the evidence base.

Highlights

- Many diagnostic radiographers and medics are involved in image interpretation
- Evidence indicates an imbalance in image interpretation competence and confidence

- Practice of peer-assisted learning is novel within radiography education
- A range of potential benefits concerning peer-assisted learning are identified
- Peer-assisted learning could provide a platform to improve interpretation skills

Introduction

Within the domain of radiology, basic image interpretation includes the perception of radiographic image appearances, followed by analysis of that perception with the aim of reaching a clinical conclusion[1]. In the context of training, effective image interpretation skills could be considered paramount to two undergraduate professions in particular; diagnostic radiography students and medical students. For different though equally important reasons, such students must be equipped at entry to the profession, with the skills to provide preliminary interpretation of conventional radiographic images[2,3,4].

Over the years, the role of the radiographer has evolved in the United Kingdom (UK) with many practitioners carrying out advanced practices such as musculoskeletal image reporting[5,6]. Evolution of the radiographer's role could be considered responsive to current factors impacting on the provision of radiology services, which include increased demand for radiology[7], rising waiting times[8], fiscal restrictions[8], and staff-shortages[9]. These factors combined have altered the way in which undergraduate diagnostic radiography courses are delivered within the UK with more focus on technical elements such as image interpretation[10].

Preliminary interpretation of conventional radiographic images differs significantly from a formal radiographic report which is produced by specialist clinical staff[7,5,6]. Formal radiographic reports serve as legal documents and are expected to be unambiguous and definitive[11]. Conversely, preliminary interpretation and comment by non-specialist diagnostic radiographers and junior doctors serve as interim guidance before a formal radiographic report is produced[2,4] providing a crucial means of informing immediate patient management in for example, the Accident and Emergency scenario. In the absence of specialised reporters therefore, basic image interpretation skills are of significant importance to diagnostic radiographers and junior doctors. Despite the increased role of radiology in diagnosis, the focus on this and particularly image interpretation, is not reflected within undergraduate medical training[12,13,14]. Consequently, many medical students lack confidence in interpreting radiographs and the basic aspects of radiology[3,12,15] which has the potential to impact negatively on patient management. Increased presence of image interpretation within undergraduate diagnostic radiography syllabi[10] and a lack of focus on image interpretation within medicine[12,14] creates opportunity for an effective, efficient and mutually beneficial method to better prepare both student cohorts for the practical application of image interpretation. The concept of peer-assisted learning

offers a potential avenue to achieve this goal. This review explores the evidence and background to this topic area in order to establish the presence or absence of factors that might support an educational initiative. The following article is not intended to be a systematic review and thus does not align with the full elements set out by PRISMA. No suitable literature pertaining to the radiographer/medical student issue was discovered that would meet the criteria. This comprehensive review instead aims to provide an initial foray into the subject area.

Search Strategy

A search strategy was conducted with the aim of identifying suitably robust literature relevant to the topic area. The search process involved a two stage process accompanied by search of associated reference lists (See Figure 1).

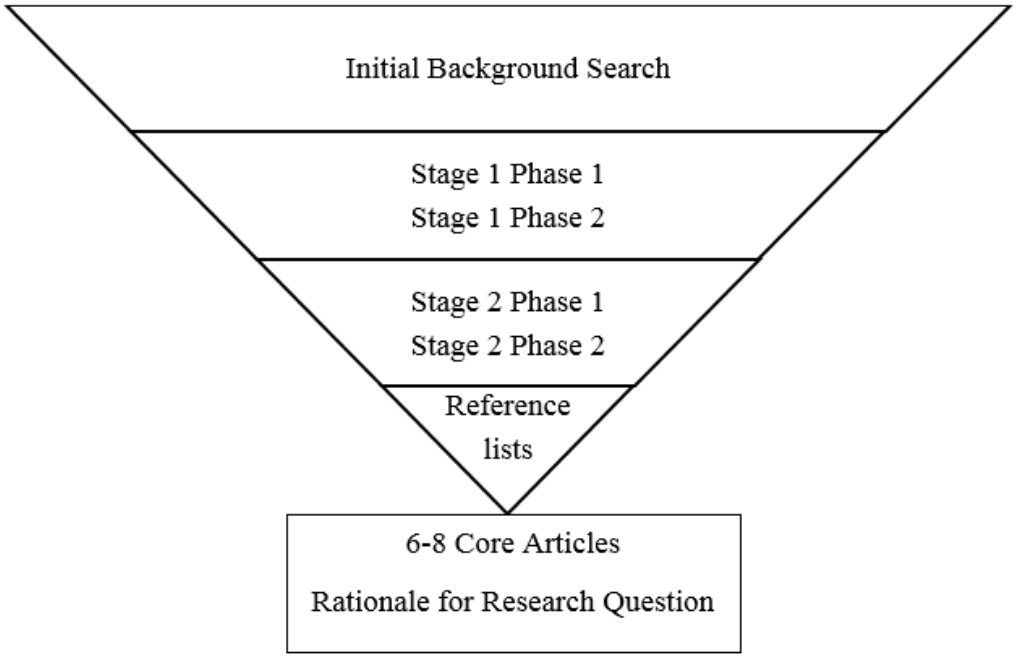

Figure 1 – Diagram demonstrating an overview of the search process

An initial broad database search for background information about peer teaching and radiology/radiography education was carried out. This was conducted using multiple sources including only English language publications with no set time range. Information found throughout this initial search was used to provide historical, political and social impetus for the topic and to provide supporting evidence for arguments that would be developed.

Following the initial broad search, a two-stage two-phase search strategy was conducted to narrow down literature and identify core articles. Stage one phase one involved searching key words and phrases related to peer teaching and radiography education. Stage one phase two involved the use of search techniques to narrow down and specify material to the topic area (See Table 1).

	Keywords and Phrases	Databases Searched	Year Inclusion
	Peer teaching, peer tutoring, peer learning, clinical education, radiography education, diagnostic radiography education, student teachers	ScienceDirect, ERIC, CINAHL, Google Scholar, PUBMED	2006-2016 (past 10 years)
Phase 2 (S1P2)	• peer teach* AND clinical AND technical • peer teach* AND radiograph* • peer teach* AND interprofessional*	ScienceDirect, ERIC, CINAHL, Google Scholar, PUBMED	2006-2016 (past 10 years)

Table 1 – Summary of stage 1 search strategy

Stage one of the search process identified a highly relevant diagnostic radiography peer learning article[16] which highlighted a radiography specific skill (image interpretation) as a potential area for further research. This finding guided the stage two search process.

Stage 2 identified keywords and phrases from the initial search, confirming the specific importance of image interpretation to undergraduate radiographers and medical students. This understanding formed the basis of stage 2 phase 2 in which the search sought to narrow down and specify material related to this theme (See Table 2).

	Keywords and Phrases	Databases Searched	Year Inclusion
Phase 1 (S2P1)	Image interpretation, radiology education, image reading, pattern recognition	ScienceDirect, ERIC, CINAHL, Google Scholar, PUBMED	2006-2016 (past 10 years)
Phase 2 (S2P2)	• "image interpretation" AND "radiology education" AND undergraduate • "image interpretation" AND "radiography education" • radiographer AND image interpretation AND ("junior doctor" OR "casualty officer" OR "medical student" OR "senior house officer")	ScienceDirect, ERIC, CINAHL, Google Scholar, PUBMED	2006-2016 (past 10 years)

Table 2 – Summary of stage 2 search strategy

To ensure depth of search, reference lists from manuscripts obtained from the search were scrutinised, identifying titles with key words. Relevant articles found during this process were used as supporting evidence.

Findings

The literature search confirmed four main areas relating to the development of skills across varied student groups. The predominant feature was the use of peer assisted learning however the efficacy and perceptions of peer assisted learning also figured strongly, as did the issue of interpretive competence as specific to the area of consideration.

Peer-Assisted Learning

Peer-assisted learning was first introduced in higher education during the 1950s[17] and since then its popularity has grown particularly in health education[18,19,20]. The benefits of peer-assisted learning have been explored extensively in medicine and throughout many social professions where future collaborative working is considered key[21,22]. In current pedagogy, peers are often characterised into 'near-peer' and 'co-peer' subgroups[23], however it can generally be accepted that peer teachers are students studying at an equal or similar stage of education learning from one another through a reciprocal process[24,25,26].

Peer-assisted learning allows students to connect on a social and intellectual level and thus exploits learning potentially lost within traditional hierarchical (lecturer-student) teaching methods[27,28]. It also allows students to work autonomously and effectively as part of a team[16] and to gain confidence as a mentor[16].

Student learners have also been shown to have increased understanding of course content and topic areas along with a more positive educational experience in relation to features such as teacher approachability and reduced anxiety[29,30]. Moreover, it has been shown that student teachers have the ability to educate tutees to a standard equal to if not superior to control groups of experienced faculty members and professionals[18,31,32]. There does however, remain a degree of debate and controversy relating to the teaching method, perhaps due to its relative infancy in many fields. Some studies have identified that students could lack the practical skills and expertise to effectively teach the more challenging aspects of specific procedures[33] with others disputing the probability of reduced anxiety levels[34].

Efficacy of Peer-Assisted Learning

It is recognised that the interactive passing of knowledge has the ability to strengthen the learning process[35,36,19]. Within long-established clinical disciplines, empirical evidence has demonstrated peer-assisted learning to be of comparable academic efficacy to traditional teaching models[37,31] in addition to promoting increased student satisfaction[38]. More recently, advances in educational innovation have evidenced peer-assisted learning growing within other allied health professions[39,40]. Despite a shift towards student-centred approaches within other health professions, no evidence of the academic efficacy of peer-assisted learning within diagnostic radiography education has been published. In this context, the ability to teach technical skills through a model of peer-assisted learning was explored by Weyrich et al.[41] who compared peer-assisted learning to traditional teaching methods for teaching technical skills to medical students, which in the case of this study was a range of clinical injection techniques[41]. The study was partially replicated in a randomised controlled trial by Knobe et al.[32] exploring the efficacy of near-peer teaching by medical students involving the practice and interpretation of musculoskeletal ultrasound[32]. Research evaluating the efficacy of complex and technical clinical skills such as those described above could be considered relevant and supportive to the domain of diagnostic image interpretation.

Knobe et al.[32] highlighted that intensive training is not necessarily required to achieve effective results, a finding which conflicts with the study by Weyrich et al.[41] and the historical evidence base[42,43]. Interestingly, student teachers in the study by Knobe et al.[32] demonstrated significantly better academic outcomes than alternative student cohorts. Enhanced student teacher outcomes is possibly in response to the process of knowledge reiteration which promotes active learning and has the potential to increase knowledge retention[44,45].

The findings of both studies reinforce the ability of student teachers to perform to an equal, and at times superior, standard than traditional teaching staff when teaching technical clinical skills and strengthens the evidence base regarding the efficacy of peer-assisted learning. Furthermore, student teachers in the study by Knobe et al.[32] were shown to have a statistically significant improvement in their results both regarding their knowledge base and practical abilities when compared to the other student cohort.

Perceptions of Peer-Assisted Learning

University students' opinions of their learning experience has become of significant focus in recent years[46,47]. Consequently, the successful objective outcome of a peer-assisted learning intervention and a positive student experience could be considered to be of equal importance. A pioneering study by Meertens[16] aimed to evaluate peer-assisted learning of radiographic elements including positioning, care, safety and equipment within an undergraduate diagnostic radiography course[16]. Similar to the

study by Meertens[16], a study by McLelland, McKenna and French[48] was the first published of its kind exploring the subjective effectiveness of peer-assisted learning within an interprofessional context. During this study, undergraduate midwifery student teachers provided information regarding patient care during childbirth to undergraduate paramedic students.

Student learners in the study by Meertens[16] described the teaching environment as comfortable and personal which is comparable with previous studies[49]. Learning with other students as opposed to traditional teaching staff builds an environment where student teachers and student learners can interact freely in the absence of an imposing teacher-student hierarchy[50,24]. Student learners in the study by Meertens[16] also discussed feelings of reduced anxiety, which is a consistent finding throughout peer research[48,49,51].

Student learners in the studies by Meertens[16] and McLelland, McKenna and French[48] described feelings of gratefulness and new-found respect for their student teachers specialist knowledge which is a common finding within interprofessional education[52,53]. Increased appreciation of professional roles through a model of peer-assisted learning could be considered best exploited within an interprofessional setting, where there is the potential to diminish stigmatisation and the traditional barriers built between health professions, whilst at the same time reinforcing the concept of team work[54,55].

All of the studies reviewed above identified a highly satisfying experience for student teachers. Multiple positive benefits were gained including increased passion, knowledge and improved self-esteem. Historically, it has been suggested that an increase in self-esteem may be due to the superior position the student teacher role encompasses[56] which allows student teachers to feel confident in their knowledge and understanding. Student teachers also understood this experience to be important to their future role as a teacher to less experienced practitioners[57,58,59].

Furthermore, when considering image interpretation as a skill, it would be inadvisable to isolate its relevance to radiography alone. In the contemporary clinical environment, image interpretation is conducted by many professions including, but not limited to: radiologists, radiographers, medical staff and nurses[60,61]. Nonetheless, the ability to interpret images comes as a role extension or speciality to many of these professions. The only undergraduates with a primary role in preliminary interpretation of radiographs upon graduation are diagnostic radiography and medical students[2,3,4].

Undergraduate interprofessional education has been shown to improve team working, approachability and communication between different health professionals once qualified[62,63] and therefore future research in this area could be considered highly important. Sustainable and effective interprofessional

education requires a creative scenario which is reflective of professional interactions and the clinical environment[64]. Nevertheless, successful implementation of such research is very much reliant on the interpretive competence and effective collaboration of both radiographic and medical cohorts.

Interpretive competence

In 2006 the College of Radiographers voiced their aspiration that by 2010, all diagnostic radiographers would qualify with the appropriate skills to provide preliminary written comment on skeletal trauma radiographs[65]. Consequently, this professional goal influenced increased focus on image interpretation training within undergraduate diagnostic radiography courses[10]. Focus on radiology and image interpretation skills is however seen to be lacking within undergraduate medical curricula despite the role of non-radiologist medical staff in the interpretation of images[3,12,13,14,66].

As far back as 1985, comparisons have been made between the interpretative abilities of diagnostic radiographers and junior doctors[67]. More recently, Coleman and Piper[68] aimed to identify and compare the confidence and interpretive accuracy between radiographers, casualty officers and nurse practitioners[68]. In reality, it is rarely the case that professionals work in complete isolation from one another; disciplines are encouraged to work interprofessionally[69], a method which has ultimately shown to improve patient management[70]. Kelly et al.[71] aimed to identify whether a partnership between diagnostic radiographers and junior doctors improved interpretative accuracy and thus, diagnostic outcomes.

Results from Coleman and Piper[68] identified radiographers as being significantly more accurate in all elements in comparison to nurses and casualty officers. Additionally, radiographers were identified as being more accurate regarding their perceived image interpretation competence, with casualty officers appearing most out of touch with their actual image interpretation skills. This is an interesting finding as false confidence in image interpretation and subsequent misdiagnoses can have a detrimental impact on both the patient and the National Health Service (NHS)[72]. Kelly et al.[71] identified a statistically significant increase in diagnostic accuracy by junior doctors when paired with radiographers in comparison to independent interpretation. Furthermore, radiographers showed an increase in accuracy when working collaboratively with junior doctors; however this change in accuracy did not reach statistical significance. Both disciplines rated the experience positively and gained confidence in their diagnostic decisions when working collaboratively. Although these findings relate to qualified practitioners, it would be contextually valid to extrapolate them to the student scenario.

The results identified by Kelly et al.[71] highlight the potential benefits of collaborating radiographic and medical cohorts to improve interpretative accuracy. It has been postulated throughout literature that

radiology training, such as image interpretation, requires experienced instructors[13,14,66], however, the nationwide shortage of radiologists[9] means it would be unfeasible to utilise this profession for supplementary image interpretation training. Moreover, increased workforce pressures[73] and the rapidly increasing number of imaging examinations[7], means it would also be impractical to remove qualified radiographers from work commitments.

Discussion

The review has demonstrated a broad perspective of experience in respect of peer-assisted learning and has enabled some exploration of issues specifically related to the interpretation of images. Evidence relating to the use of peer-assisted learning supports its potential for application in the context examined here, providing a spin off benefit from which students in both disciplines might gain.

Evidence supports the efficacy of peer-assisted learning, clearly indicating its potential value and supporting the notion that educational standards are not in danger of compromise. It is suggested that student teachers can perform to an equal, and at times superior, standard to that of traditional teaching staff in teaching technical clinical skills, indeed in some instances a statistically significant improvement in results regarding both knowledge base and practical abilities is shown[32]. A secondary benefit may be that experience in peer-assisted learning could prove beneficial in enhancing the confidence of qualified radiographers in dealing with students, an issue recognised to be of concern[59].

The review demonstrated a generally high level of satisfaction and acceptability amongst student cohorts. This may be considered a critical element of success in implementing any new initiative. In the context of situations where students are involved in teaching, student satisfaction and confidence in outcomes is very important in order to avoid notions passing on the burden of course delivery to students. The evidence indicates that such initiatives may be considered with some confidence in student support and the inclusion of peer-assisted learning within future diagnostic radiography and medical curricula could be considered an appropriate and worthwhile change. It is important to note however that peer-assisted learning sessions held in some instances[16] were supplementary to regular teaching. This suggests that a pilot scheme using supplementary sessions may be appropriate in initial explorations.

An additional feature in terms of student perception is the prospect of enhancing the interprofessional element of professional education for these groups. Their shared role in preliminary clinical evaluation[2,4] is an important interface where effective communication may have service benefits and contribute to minimising professional tribalism.

A fundamental aspect of any teaching intervention is that of the outcome competence of learners. It seems clear from the review that standards of image interpretation were universally enhanced with often tangible benefits to patient outcomes. The scope of the review in this instance needs to be considered of course however there is no evidence of any detriment to performance. Although indirectly related, the potential value feeds into the wider context of skill mixing in radiology where it is seen that a chronic shortage of radiologists endangers the prospect of timely image reports, especially in the context of the accident and emergency environment.

In summary; the evidence located for this review demonstrates a valid pathway to a useful educational development in which the primary aspects of success are shown to be present, particularly with regard to clinical standards and participant acceptance. The benefits are summarised in Table 3.

Recipient	Benefits
Radiography student teacher	• Increased student satisfaction[16,48] • Increased appreciation of professional roles[16,48] • Increased confidence[16,32,48] • Reinforced knowledge and understanding regarding image interpretation[32]
Medical student learner	• Increased student satisfaction[16,48] • Increased knowledge and understanding regarding image interpretation[32,71] • Increased appreciation of professional roles[16,48] • Reduced anxiety[16,48]
Higher educational institutions	• Preserved administrative and staff resources[74] • Increased student satisfaction[46,47]
The Service (NHS)	• Improved interprofessional team working[62,63] • Improved interprofessional communication[62,63] • Improved patient management[70] • Reduction in litigation and subsequent cost savings[72]

Table 3 - Summarised potential benefits of peer-assisted learning for first line image interpretation between medicine and radiography

Conclusion

The literature demonstrates that radiology training, including image interpretation, requires experienced instructors and that medical students lack support in developing interpretation skills[13,14,66]. Given the current pressures faced by qualified practitioners in service delivery, the prospect of using peer-assisted learning for supplementary image interpretation training could be considered a pragmatic and fascinating focus for a pilot study.

The numerous positive subjective benefits gained by student teachers and student learners within the literature accessed reinforces peer-assisted learning as a desirable choice for future student-centred research and a number of studies advocate future exploration of peer assisted learning research in radiography[16]. It seems clear through the evident range of potential benefits, that the area merits further investigation. With the ever-increasing clinical service pressures[7,8,9] it is a fundamental requirement that diagnostic radiography and medical graduates qualify not only with the necessary image interpretation skills[3,4,58] but also with the ability to work harmoniously for the benefit of the patient[69,70]. Peer-assisted learning could provide the sheltered environment for undergraduate diagnostic radiography students and medical students to elicit such skills, providing the potential to further change the culture of professional relationships from their undergraduate roots.

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