The Evidence Base for Peer Assisted Learning in Undergraduate Medical Education: a Scoping Study

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Abstract

Peer-assisted learning (PAL) is increasing in popularity in medical education. While PAL has been used informally for generations, more formal use of it as a tool to teach and consolidate information and practical skills has been shown to be beneficial to both tutors and those being taught. This scoping study aimed to garnish a clearer understanding of the concept of PAL in undergraduate medical education and its benefits to both tutors and students alike.

A five-stage methodology was performed as follows. The research question and aim of the scoping study were identified, and relevant studies were identified on a search of the literature. Screening took place to select a smaller number of studies by measurement against inclusion (e.g. referring to medical students) and exclusion (e.g. qualified doctors acting as tutors) criteria. Data was extracted and charted by two reviewers. Finally, results were collated, summarised and reported upon.

Fifty-six papers met inclusion criteria and were included in the study. Many related to clinical examination, though students had identified medical sciences, mock examinations and epidemiology/statistics as subjects of interest. Organisation varied from mandatory involvement as part of a core curriculum to sporadic or once off teaching with volunteer tutors and participants. Training from tutors ranged from six weeks to nil documented. Numerous benefits for students and tutors were identified, including some within the "Hidden Curriculum".

This scoping study includes suggestions for future PAL research projects including evaluation of the degree of formal training required for tutor success; use of this practice in the teaching of basic clinical sciences (specifically statistics and epidemiology) and patient management and prospective studies into whether PAL as an undergraduate inspires future involvement in medical education for both students and tutors.

Keywords: peer assisted learning; students
Introduction

Peer-assisted learning (PAL), or peer-peer teaching (PPT) is defined as "People from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching"\(^1\). It is a well-established tradition in general education. Recently, studies and reviews have demonstrated its benefits in medical education to both tutors\(^2,3\) and those being taught\(^4-6\). PAL is rooted in the concepts of both social constructivism and cognitive congruence\(^7\). In undertaking this scoping study, the aim was to garnish a clearer understanding of the concept of PAL in undergraduate medical education and its benefits to both tutors and students alike. The scoping study focused on medical students acting as PAL tutors as graduation is seen as a significant step increasing cognitive incongruence\(^8\).

Methods

A five-stage methodology\(^9\) was performed as follows. Firstly, the research question and aim of the scoping study were identified. The aim in performing this review was to provide a broad overview of PAL in medical education as a concept, and to summarise the research performed so far in relation to its application to the education of health science students. To do this, several specific questions were identified (Table 1). For the purposes of this review, PAL was defined as: "People from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching".

| Specific questions identified for a scoping study on Peer Assisted Learning in undergraduate medical education |
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| • What peer assisted learning (PAL) concepts or initiatives are published as implemented in the education of undergraduate health science students? |
| • How are these initiatives being organised? |
| • How are peer tutors recruited and trained for this responsibility? |
| • What are the responses of students and tutors to PAL? |
| • Is PAL an effective learning intervention for undergraduate health science students? |
| • What are the benefits and disadvantages for both tutors and tutees? |
| • What subject areas is PAL being used in, and what areas are neglected? |

Secondly, relevant studies were identified on a search of the literature. A search was undertaken by performing a comprehensive search of the PubMed, CINAHL and EMBASE databases using defined terms and their Boolean combinations. The following search strategy was used: "Students, Nursing"[Mesh], "Students, Medical"[Mesh], "(near) peer learning", "(near) peer teaching", "(near) peer-to-peer", "(near) peer-assisted learning", "student teachers" and "(near) peer mentors". The MedEdPublish journal was also searched, paying particular attention to a special issue on PAL in 2017.

Next, screening took place to select a smaller number of studies by measurement against inclusion and exclusion criteria. The inclusion criteria chosen were based on population, intervention, outcome and study design. The population in question was defined as undergraduate health science students of any discipline, and the intervention
which they must have undergone was participation in a PAL programme. Outcomes searched for included the response of students/tutors to the concept of PAL, what they deemed to be its positive and negative attributes, and/or the objective or subjective improvement in knowledge or skill of students/tutors.

Studies were excluded if they were not published in the English language. Those in which junior doctors acted as tutors were excluded as they did not meet our definition of a tertiary level student.

In the fourth step data was extracted and charted. Two reviewers (D.K. and O.F.) independently performed extraction of data on each article. Details extracted included details of the aim of the study, population studied, methods employed, outcomes measured and results. Finally, results were collated, summarised and reported upon.

Ethics - this study was exempt from ethics review due to its nature as a review of published papers.

**Results**

The search was performed on 22\textsuperscript{nd} January 2018 using the search strategy listed in the methods. This search generated a list of 218 potentially relevant papers. These 242 article titles were screened by two reviewers (DK, OF), for the removal of duplicates and papers that were clearly not related to peer-assisted learning. This led to the exclusion of 146 articles. The abstracts of remaining 96 articles were then screened against the pre-established inclusion and exclusion criteria. In the case of uncertainty about relevance, the opinion of a third reviewer (MH) was sought. This led to the further exclusion of 37 papers, leaving 59 papers which were reviewed in full. Fifty-six papers met inclusion criteria and were included in the study.

Subjects covered

Studies addressing as wide a range of subject areas as possible were included to give a broad picture of the possible applications of this teaching method.

The most common subject for PPT was that of clinical examination\textsuperscript{10-13}, with pre-clinical or clinical theory being less frequent\textsuperscript{14}. Clinical examination included practical examination performance, objective structured clinical examination (OSCE), communication skills and specific practical skills including advanced trauma life support (ATLS)\textsuperscript{13}, electrocardiogram (ECG) interpretation\textsuperscript{16} and musculoskeletal ultrasound\textsuperscript{10,17}. Other studies reviewed teaching of professionalism\textsuperscript{18} and simulation skills, including non technical skills\textsuperscript{19}.

Less commonly covered topics in PAL were pre-clinical or clinical theory: six studies were identified\textsuperscript{17,20-24}, all of which involved senior medical students teaching basic/clinical sciences to pre-clinical (first or second year) students.

Organisation of PAL Initiatives

Just as the subject areas in which PAL has been trialled and implemented are many and varied, the organisation, structure and duration of these initiatives are equally so. This variation exists in relation to whether programmes are run as part of the curriculum or as an adjunct, and if they are student-led or faculty-led initiatives. Further variation
is evident in relation to the duration of such events, and whether they exist as one-off events or are run for a series of weeks, or even throughout an entire academic year.

For example, one study described a programme which was formally incorporated into the curriculum for undergraduate medical students, though organised by a student interest group. Tutors were paired with faculty members to co-teach a single case-based session. By contrast, in another study, near-peer tutors (NPTs) were expected to teach for a minimum of six weeks, and although this programme was also designed and led by students, near-peer learners attended voluntarily, a factor the authors, during their discussion, deem as important to the study's success. Another study offered a programme organised by faculty members, in which NPTs only taught a maximum of two two-hour sessions, though again, it was not mandatory for students to attend. Another study was similar, taking place in an extra-curricular learning environment and being a short-term undertaking. In contrast, other PAL voluntary programmes ran throughout the academic year.

One study took a populist view, arranging microbiology PAL based on a popular singing competition in Thailand. One university founded a PAL society to facilitate PAL within the medical school at all stages; their suggestions and comments should be mandatory reading for all academics and students considering PAL. Other studies focused on PAL in large group format or in small group using the whiteboard rather than slides.

Recruitment

The methods used for recruitment of study subjects varied hugely. Students were often recruited voluntarily in some studies, however, tutees had no choice as to whether to participate or not, because, as previously discussed, the programme was included as part of their core curriculum. In contrast, tutor participation was almost exclusively on a voluntary basis. This does, of course, introduce a possible risk of bias, as students who are more highly motivated or interested in learning are likely to be the ones who choose to partake.

For example, one study invited potential tutors (3rd and 4th year students) via email and social media. In this study, student attendance was also voluntary, as the PAL programme was student-led and ran as an adjunct to established "traditional" teaching. Another study also recruited tutors via an email invitation, but in this case, tutors were paired with a faculty member to co-teach small group sessions that formed part of the curriculum, and therefore students were required to attend. An alternative option, demonstrated in one study, involved tutors being recommended by previous NPTs as suitable teachers. Institutions sometimes screened potential tutors to select the most suitable candidates, either based on academic performance or by interviewing potential tutors. Another option for tutor selection was the completion of certain clinical placements and assessments. A previous review noted that "the tutor recruitment process was not always clearly reported", but the majority of studies had voluntary participation of tutors. In the previously mentioned study outlining the foundation of a PAL society, tutors volunteered to participate.

Training processes

Training for tutors varied dramatically from study to study, both in terms of the time commitment involved and the content covered. Many studies reported training the tutors in specific knowledge, skills, teaching or facilitation methods, or indeed a combination of all.
Some studies provided training only on facilitation skills despite the programme involving the teaching of clinical and procedural skills. In some studies, there was no documented preparatory training provided for tutors. The time commitment for tutor training was equally variable, with as much as 18 hours, spread over multiple sessions, in one study, and ten hours in another. Further studies, on the other hand, reported minimal tutor training, e.g., only one hour in preparation for peer assessment in an OSCE session, or one session of observation of a faculty member. Other training methods involved an expectation of self-directed learning from the tutor, either in the form of a literature review or of skills practice. Two studies provided tutor manuals as a guide. One suggested accessing online learning from a professional organisation as a support to tutor preparation; another showed that faculty input was more than doubled by facilitating training for PAL.

One review effectively discussed the impact of training processes, or the lack thereof, on tutors’ confidence and abilities. They quote from an American national survey that, of the medical schools using PAL, around half offer instructive courses in effective teaching/facilitation. Interestingly, when examining the methods used to nurture and educate peer teachers, they found limited research and no consensus regarding what knowledge and skills are needed by peer teachers to allow them to succeed in their role. Peer teachers, in many studies identified, often have concerns about taking on this role, feeling anxious about their teaching abilities. Furthermore, peer teachers stated their desire for training in how to deal with teaching/assessing a group, though a lack of studies evaluating whether formal training improves the success of peer teachers was also noted by the reviewers.

As an example of tutor training and preparation, in a study of medical students compared to junior doctors in the teaching of neuroanatomy, teachers were briefed at least one week before their given teaching session took place with regards to content, aims and learning outcomes, and were expected to further prepare for the lesson themselves. They were also provided with a standardised PowerPoint presentation and handouts, should they choose to use these. It is not clear whether instructions or guidelines on "how to teach" were provided to students. Another study stated that "all tutors were given identical material to deliver to groups of 10-17 students via any methods they desired." Again, no details on training for the teaching process itself are given. However, it is important to note that these studies address the teaching of clinical sciences and were not skills-based, so it may be that further teaching of the topic in question to tutors would have been of limited benefit. The self-directed nature of tutor preparation for the teaching was identified in other studies, with studies reporting expectation of tutors to prepare handouts or support with a curriculum guide and bank of OSCE stations.

Comparison with faculty teaching

One meta-analysis was identified which described ten studies in which PAL was compared with faculty teaching for medical students. In each study, students were randomised to either peer or faculty teaching, and were objectively assessed in terms of skills and knowledge. There was likely a high degree of faculty involvement, with many of the PAL initiatives forming an integral part of the curriculum. Duration varied from single teaching sessions to term-long engagements, with the included studies varying from a three-day revision course to long term integration in the curriculum. Many showed a statistically significant improvement in OSCE and test scores among the learners. Indeed, in one study, PAL students had a 98% pass rate, while those thought by faculty members had a pass rate of 85% (p<0.05).

Student outcomes
Overall outcomes for the students were favourable, with one study stating that students "perceived the peer tutoring program as affording opportunities not otherwise available within the curriculum," while also offering a valuable learning experience which was noted as being unique from the more traditional faculty-led teaching. Another study reviewed the use of peer-assisted learning in the teaching of respiratory pathophysiology. Student perceptions were very positive, with 90% stating that peer tutors increased their knowledge of the material. Furthermore, 92.7% rated their tutors as ‘good’, ‘very good’ or ‘outstanding’, and 92.4% reported that the quality of teaching in joint sessions was similar, or better, than sessions taught by faculty members alone.

Other studies have echoed these responses, with the concept of social and cognitive congruences being highlighted as significant in the effectiveness of peer-assisted learning. Students viewed senior peers as more realistic regarding expected knowledge gradient required for examinations, and deemed them more empathetic and less intimidating than faculty members in dealing with questions. One study compared these social and cognitive congruences amongst senior medical students (SMS), first year junior doctors (JD) and specialist registrars (SpR). Surprisingly (or perhaps unsurprisingly) the perceived improvement by students in their level of knowledge was significantly greater in sessions given by senior medical students compared to those offered by junior doctors or specialist registrars. Sessions given by SMS received an average rating of 4.3/5.0, while those given by junior doctors received an average of 4.0/5. The authors suggested that the SMS group outperformed the JD group “due to their educational proximity which subsequently impacted upon the teachers’ performance in the classroom,” and ultimately concluded that the distance between students and tutors affected students’ learning experience in near-peer teaching programs.

Interesting findings referred to the concept of the "Hidden Curriculum"—learning occurring outside of that which was originally intended. In a study of simulation skills taught by clinical medical students to pre-clinical students, the students learnt non-technical skills of team working and closed loop communication as well as consolidating knowledge of medical conditions such as pulmonary embolism. Students also spoke about the pastoral support and sense of community of mixing with near peers.

As well as assessing self reported opinion of the teaching, non-national students attending PAL had improved scores compared to native students, postulated to be due to improved communication and confidence following a low pressure teaching environment.

Disadvantages of PAL have also been identified. These included students spending less one-on-one time with clinical educators (a situation noted as being less preferable to some students), and poor student learning in the instance that personalities or learning styles are deemed incompatible. The comparison with faculty teaching was discussed elsewhere in this paper, with some studies suggesting that PAL was a hindrance to student performance.

Tutor outcomes

Many studies reported that it was the tutors who benefitted most from the practice of PAL. One review reported an array of studies highlighting the development of key skills and knowledge, as well as an improvement in the self-reported confidence of student tutors who engage in PAL. These included improved test scores and enhanced learning.

Peer tutors reported feeling anxious about their role as a teacher and expressed a desire to receive formal training of
some kind in this regard\textsuperscript{10,36,47}, though it is noted in a previous review\textsuperscript{44} that there is a paucity of studies evaluating whether formal training in fact improves the teaching success of peer teachers. Tutors also requested feedback from students in the format of set questions and free text comments\textsuperscript{8}.

Many tutors displayed a substantial improvement in terms of examination results (both MCQ and OSCE)\textsuperscript{2,3,4,10,58}, with one reporting a 100\% pass rate in examinations for PAL tutors versus an 87\% pass rate for those who did not teach\textsuperscript{1}. Student tutors spent a considerable amount of time preparing for teaching sessions, thus further consolidating knowledge and improving retention as compared to non-peer tutors\textsuperscript{48}. Tutors may benefit not just based on examination results and knowledge but also with respect to confidence levels.

Student tutors regarded PAL as a worthwhile activity in terms of development of professional qualities necessary in the future, such as an increased understanding of teaching, feedback and assessment, as well as development in leadership qualities, enhanced confidence and an ability to appreciate one’s own uncertainty\textsuperscript{12,38,41-43,59-60}. PAL offered peer tutors an opportunity to identify flaws and areas of weakness in their own knowledge, and thus improve on these, allowing for a deeper understanding of the topic being taught. Again, studies assessing objective benefits for tutors are contradictory, with some\textsuperscript{10} showing enhanced academic performance, while others\textsuperscript{42} fail to display any substantial benefit to student tutor knowledge.

Further studies\textsuperscript{21-22} identified enjoyment and preparation for future teaching experiences as assets gained by the tutors, but also highlighted difficulties in time management, on-the-spot thinking and balancing the various roles of teaching, answering questions and writing.

**Discussion**

Peer assisted learning is a practice which has historically seldom been applied to the teaching of medical students. However, in recent years, studies have shown this method as being increasingly utilised, with a myriad of benefits to both tutors and students. Our review examined an array of such studies, ultimately analysing 54 studies. Key findings relating to tutors included significant improvements in tutor confidence and knowledge (despite initial anxieties), while some studies also noted an improvement in academic performance. Student opinions of PAL were similarly positive. Many studies emphasised the idea of cognitive and social congruences as being significant in the effectiveness of peer-peer teaching, a point which led many students to regard the practice as a valuable and focused alternative teaching method. With regards to current peer-peer teaching, initiatives tend to address a broad range of subject areas, though the majority focus on physical examination skills or OSCE preparation. Tutor preparation, regardless of the topic being taught, varied dramatically, ranging from nil to 18 hours formal preparation.

We noticed a paucity of studies discussing teaching of basic clinical sciences and patient management. This is especially interesting as students have identified medical sciences (pathology, anatomy), objective structured clinical examination (OSCE) and statistics/epidemiology as the three top topics to cover in PAL\textsuperscript{26}; specifically we did not identify any PAL studies reviewing statistics or epidemiology to medical students.

Three other scoping studies were identified during the search. The first focused on academic performance after PAL\textsuperscript{1}, while another reported on "group study" (identifying 18 peer reviewed studies and 17 studies from the grey literature)\textsuperscript{61} and another on "peer coaching"\textsuperscript{62}. The different synonyms that can be used to identify a practice such as peer teaching challenges any scoping study. For example, in 2017 a special issue of MedEdPublish called for researchers to provide as wide a definition of what "medical students and postgraduate trainees as medical educators” meant – even the opening editorial reflected that "peer education is everywhere"\textsuperscript{63} and the closing
editorial echoed these sentiments musing on the wide variety of responses. With the variety of definitions it is possible that studies may have been missed, considering also the language restrictions and that there was no search of the grey literature. It has been acknowledged that most of PAL is not recorded, but instead goes on locally in a spontaneous, practical, unplanned and immediate basis.

The inclusion criteria for articles were relatively subjective, and as such, may have been subject to interpreter bias. Finally, as this was a scoping review rather than a systematic review, the articles included were not formally assessed for quality of research design against a methodological analysis tool.

Based on this scoping study, possible areas for future research in PAL include the following: an objective assessment of the benefits of PAL for both tutors and students; more research into its possible use in postgraduate training; evaluation of the degree of formal training required for tutor success; use of this practice in the teaching of basic clinical sciences (specifically statistics and epidemiology) and patient management (areas where studies as to its use and benefits are lacking); and prospective studies into whether PAL as an undergraduate inspires future involvement in medical education for both students and tutors. For those inspired to start PAL several papers providing advice and tips are recommended.

**Conclusion**

In conclusion, PAL is a highly beneficial tool for both learners and tutors. Despite certain deficits as compared to traditional faculty-led teaching, PAL warrants further study and continued utilisation in the future.

**Take Home Messages**

- Match the planning of PAL to the student stated needs
- Read the top tips and consider starting a society for PAL
- Remember the Hidden Curriculum and the benefits you may not have considered
- Provide teaching to tutors not just on content but also on how to teach

**Notes On Contributors**

OF and DK are final year medical students about to sit examinations in 2017 and cross the significant step of graduation. Both have worked as PAL tutors.

MH is a consultant obstetrician working in Dublin and constantly learning about medical education @mairenihuigin

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Appendices

Declaration of Interest

The author has declared that there are no conflicts of interest.