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REVIEW

Barriers to undergraduate peer-physical examination of the lower limb in the health sciences and strategies to improve inclusion: a review

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Abstract Peer-physical examination is a widely adopted and an integral component of the undergraduate curriculum for many health science programs. Unwillingness or perceived inability to participate in peer-physical examination classes may have a negative impact upon students' abilities to competently conduct physical examinations of patients in future as registered health professionals. A literature review on the perceptions and attitudes of peer-physical examination of the lower limb amongst medical and health science students was conducted to identify potential barriers to participation, and to review strategies to improve participation in classes designed to develop clinical examination skills. A pragmatic search strategy of the literature from PubMed and Google Scholar published prior to June 2012 yielded 23 relevant articles. All articles were concerned with the views of medical students' education and there were no articles explicitly addressing the role of peer-physical examination in health science disciplines. Several ethical issues were identified including feelings of coercion, embarrassment, and perceptions of a lack of consideration for cultural and religious beliefs. The available evidence suggests that barriers to participation may be overcome by implementing standard protocols concerned with obtaining informed written consent, adequate choice of peer-examiner, changing facilities and garment advice, and possible alternative learning methods.

Keywords Clinical examination · Health science students · Lower extremity · Nursing · Occupational therapy · Peer-physical examination · Physiotherapy · Podiatry

Introduction

Peer physical examination (PPE) can be formally defined as an experiential method of learning clinical skills where students act as model patients for one another to allow practice of physical examination techniques (Outtram and Nair 2008; Rees 2007). The

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experiential learning model can be defined as the process where knowledge is developed from the combination of grasping and transforming experience (Kolb 1984). This method has been widely adopted for the facilitation of the development of students' clinical skills in medical schools as well as allied health higher education programmes such as podiatric medicine, physiotherapy, nursing, occupational therapy, and sports and exercise science. PPE is normally incorporated within an iterative approach to clinical education, where competencies progress to the point where it is safe for students to be introduced to early patient contact (EPC) under supervision (Smithson et al. 2010). It is important to highlight that PPE is just one component of clinical education and is normally delivered alongside alternative methods including manufactured models such as mannequins, video demonstrations of examination techniques, simulated patients, real patients and volunteers from the community (Wearn and Bhoopatkar 2006).

There are several advantages to the PPE approach in undergraduate health sciences education. PPE is considered cost-effective as there are no additional cost requirements for transportation of patients or fees for standard model patients (Wearn and Bhoopatkar 2006). It provides a potential solution to the contemporary problem of increasing numbers of students in Australia enrolling in health science courses coupled with decreasing opportunities for gaining access to patients through external clinical placements (Outtram and Nair 2008; Joyce et al. 2007). It is also considered to be a valuable method for teaching an appreciation of 'normal', development of compassion and empathy, gaining insight into the patient's psychosocial experiences from being examined, and improving communication skills in a supervised environment that is safe, and allows opportunities for constructive feedback from tutors (Wearn and Bhoopatkar 2006; Braunack-Mayer 2001).

Despite the apparent benefits of PPE in health science education it appears as though there are several disadvantages of the use of the technique that revolve around certain ethical dilemmas together with a lack of universal, institutional, or program specific guidelines. Braunack-Mayer (2001) describes several ethical issues for students acting as patient surrogates for the purposes of education including inconsistencies in the promotion of informed consent, the ability to choose desired partners, the ability to choose alternative methods of clinical examination education, and the unexpected findings of potentially serious medical problems in students. Furthermore, several researchers have identified that more sensitive issues such as gender, location and nature of body region to be examined, ethnicity and religious beliefs may impact upon students' willingness or ability to participate in PPE (Reid et al. 2012; Rees et al. 2009a, b). The majority of the available literature to date has emerged from qualitative studies of medical students who have previously been required to examine more intimate body regions such as the female breast, male and female genitals, the abdomen, and rectal examinations (Rees et al. 2009a). As such this data is not necessarily transferrable to the undergraduate health sciences education context. However this data suggests that issues separate from 'body region to be examined' may have a greater influence on students' willingness to participate in PPE.

There is emerging evidence from the literature suggesting that physical musculoskeletal examinations skills are poor amongst many new graduates employed in the clinical setting (Myers et al. 2004). This may have a significantly adverse effect on patients' clinical care due to either inaccurate or delayed diagnoses. Accordingly, the aims of this review article are to identify potential barriers to-, and potential solutions to improve undergraduate health science students' participation in lower limb peer physical examination classes.

Methods

A pragmatic search strategy was conducted to identify literature exploring perceptions and attitudes of medical and/or health sciences students to the role of PPE as part of their clinical education. The search strategy was limited to the English language and restricted to literature published in the last fifteen years (1997–June 2012). To be eligible for inclusion in this review, preference was given to literature that was in the form of peer-reviewed journal articles. The following primary search terms were adopted and conducted using the PubMed database and the Google Scholar search engine:

- Peer physical examination (text word), OR PPE (text word), OR physical examination [medical subject heading (MeSH) term and text word], OR patient simulation (MeSH term and text word), OR clinical examination (text word), or clinical skills (text word).

AND

- Lower extremity (MeSH term and text word), OR lower limb (MeSH term and text word)

AND

- Medical student (MeSH term and text word), OR nursing student (MeSH term and text word), OR health occupations students (MeSH term and text word), OR health professions (MeSH term and text word), OR allied health occupations (MeSH term and text word), OR podiatry (MeSH term and text word), OR physiotherapy (MeSH term and text word), OR nursing (MeSH term and text word)

AND

- Undergraduate medical education (MeSH term and text word), OR higher education (text word), OR health occupation schools (MeSH term and text word),

Relevant references cited within relevant articles were also explored manually and appraised for inclusion in this review. Articles were retrieved by a single researcher (GJH). Literature inclusion criteria for this review were inclusive of all article formats and study designs such as letters to the editor, literature reviews, expert opinion, discussion papers, qualitative studies, and quantitative studies.

Results

Descriptive analysis

The available literature on PPE that was identified using the search strategy outlined above was dominated by a focus on qualitative data derived through open-ended questionnaires and focus group methods. All of the articles identified (n = 23) were concerned with the views of medical students, and/or the use of PPE in medical education. None of the studies identified addressed the issues surrounding the use of PPE to educate students who were undertaking health sciences undergraduate courses including podiatry, physiotherapy and nursing. The majority of studies identified were retrospective in nature, where respondents provided their views, opinions and feedback following participation in PPE. Four studies evaluated students' opinions and concerns prior to participation in PPE, while four studies

Table 1 Peer physical examination literature

Letters to the editor	Discussion papers/ expert opinion/ literature reviews	Cross-sectional studies	Retrospective studies	Longitudinal studies
Delany and Frawley (2011)	Braunack-Mayer (2001)	Koehler and McMenamin (2012)	Bokken et al. (2009)	Chen et al. (2011)
Power (2011)	Outtram and Nair (2008)	Rees et al. (2005)	Das et al. (1998)	Rees et al. (2009b)
	Rees (2007)	Rees et al. (2004)	McLachlan et al. (2010)	Smithson et al. (2010)[a]
	Wearn and Vnuk (2005)	Reid et al. (2012)	O'Neill et al. (1998)	Wearn et al. (2008)[a]
			Pols et al. (2003)	
			Power and Center (2005)	
			Rees et al. (2009b)	
			Chinnah et al. (2011)	
			Wearn and Bhoopatkar (2006)	

[a] Qualitative longitudinal study designs without quantitative longitudinal data analysis

evaluated students' opinions and perceptions both before and after participation in PPE (Table 1).

Discussion

Students' attitudes following exposure to PPE

Chen et al. (2011) conducted a longitudinal (pre & post) survey of Hong Kong medical students' attitudes towards PPE using an adapted version of the Examining Fellow Students (EFS) questionnaire (O'Neill et al. 1998), and evaluated associations between students' backgrounds and changes in attitudes over time. Results indicated a high level of willingness to participate in PPE amongst students except for examination of intimate body regions. A key finding in this study was that following participation in PPE, there were statistically significant differences between male and female subgroups for willingness to be examined by peers of the same gender. Specifically; significantly more females had gender preferences in the direction of being examined by a fellow female, and were reluctant to have hip examinations by either gender. For the feet and leg regions, high proportions (> 95 %) of males and females were willing to be assessed before and after exposure to PPE. The results of this study should be interpreted with caution due to a small sample size limiting generalisability, and a poor response rate (65 %) for participants providing longitudinal follow up data.

Rees et al. (2009b) conducted a similar study design to evaluate first-year medical students' changing attitudes following participation in PPE at 6 culturally and geographically diverse centres. Similar findings regarding high proportions of student willingness to participate in PPE were demonstrated, as well as changes in attitudes over time in the female group. Over 97 % of respondents were willing to have their feet examined before

and after exposure to PPE. An important finding from this study was the influence of ethnicity and religion on willingness to participate in PPE. White students and non-religious students were more willing than non-white students and religious students to examine and be examined by students of the opposite gender ($p < 0.05$).

Using qualitative survey data from 617 medical students, Wearn et al. (2008) evaluated student concerns both before and after PPE exposure, although data were not evaluated longitudinally. Several key themes were identified including the complexity of the peer examiner-examinee relationship, which differs from that of a patient-doctor relationship as doctors are not routinely involved in the everyday lives of patients. Some students were uncomfortable due to fear of harm or harming others as a result of incompetent examination techniques. Finally, several important process issues were raised including the lack of guidelines with regards to confidentiality, the apparent normality of students' bodies and the 'inside knowledge' of the examination technique by the examinee who may assist the examiner thus reducing the value of the examination techniques. However this study is limited in that it relies on qualitative data only from surveys and did not attempt to supplement this information with quantitative data. Therefore it is impossible to determine the frequency of students who perceived such problems with PPE.

Student fears and concerns regarding PPE

There appears to be overwhelming agreement in the literature with regards to the student perceptions of PPE. Feelings of dread, embarrassment, anxiety and discomfort appear to be commonly experienced before, during and after participation in PPE (Chinnah et al. 2011; McLachlan et al. 2010; Rees et al. 2009a; Rees et al. 2005; O'Neill et al. 1998). These appear to be due to fear of harm from the examination, discomfort with partial undressing, and a lack of information regarding what to expect from the PPE encounter. McLachlan et al. (2010) and Rees et al. (2005) both highlight that the existing relationships between peers may have an impact on students' willingness to participate in PPE. However there are differing opinions amongst students as some would prefer to be examined by friends, whilst others would prefer to be examined by relative strangers (McLachlan et al. 2010).

Gender and body regions

Gender appears to have a significant influence on student perceptions of PPE. Discomfort with examining students of a different gender has been identified by females due to fear of sexual exploitation, but also by males for fear of accusations of harassment (Rees et al. 2009a). Indeed there are strong negative perceptions amongst students for conducting PPE of intimate body regions of the opposite sex such as the groin, breast and genitalia (Koehler and McMenamin 2012; Rees et al. 2009a, 2005, 2004; Das et al. 1998). However it is acknowledged that examination of non-intimate regions such as the foot and ankle appears to be more acceptable regardless of gender (Koehler and McMenamin 2012; Rees et al. 2009a).

Religion, ethnicity and cultural beliefs

Religion, ethnicity and cultural beliefs are commonly recurring themes in the PPE literature and appear to be potential barriers to some students' willingness to participate. There are several references in the literature to students practicing a variety of different religions (Islam and Christianity) or from different ethnic backgrounds (Traditional Chinese) who

appear to consider PPE to be inappropriate (Koehler and McMenamin 2012; Rees et al. 2009a; Wearn and Bhoopatkar 2006; Das et al. 1998; O'Neill et al. 1998). It is acknowledged that that majority of students are referring to PPE of intimate body regions. However it was noted that one student explained that PPE for intimate regions is permitted in Islam for the purposes of learning (Rees et al. 2009a). Nevertheless, Quranic verses dictate that Muslim women should guard their modesty, and Muslim men should not expose his body from the navel to the knees in public (Kahan 2003). As such, it appears that willingness to participate in PPE amongst students from diverse cultural backgrounds may be highly dependent on individual interpretations of religious texts/doctrines. As a result individual beliefs and values should be taken into consideration by academic staff.

Strategies to improve participation in PPE

More recently efforts have been made to address potential barriers to student participation in PPE by a number of means. There appears to be agreement amongst PPE researchers with regards to ensuring that PPE is a voluntary learning activity that is proposed to students without coercion (Outtram and Nair 2008; Wearn and Bhoopatkar 2006). In order to achieve this, researchers have recommended that strict written protocols are readily available to students before PPE classes, as well as the provision of participant information sheets outlining the risks and benefits of PPE, and an additional requirement for obtaining written informed consent from students (Delany and Frawley 2011; Power 2011; Outtram and Nair 2008; Rees 2007; Wearn and Bhoopatkar. 2006; Pols et al. 2003). Only one study has evaluated students' perceptions of a formal PPE consent process and subsequently demonstrated positive attitudes towards this approach (Wearn and Bhoopatkar 2006). Pols et al. (2003) recommended further PPE protocol development due to rare incidences of medical problems amongst medical students during PPE. However it remains unclear whether such protocols would improve student participation in PPE.

Practice points

As a result of the identification of the apparent barriers to PPE and potential solutions recommended in the medical education literature, the following good practice points are proposed as a strategy to (1) maximise students' participation in PPE, and (2) reduce perceptions of anxiety and discomfort with regards to participation in PPE.

- Student participation in PPE should be voluntary, and without coercion.
- Students should be provided with adequate information well in advance of PPE classes in order to make fully informed decisions about their willingness to participate.
- Written PPE protocols should be available to students which outline the advantages and disadvantages of PPE, but also suitable alternative experiential learning methods to PPE.
- Written PPE protocols should provide key information on specific issues that may be of importance to students including: definition and details of the PPE teaching format, discussion of ethical issues, lists of body regions to be examined, and details of procedures for students to raise concerns before, during or after PPE classes.
- Written PPE protocols should include a mechanism and guidance for further investigation of medical problems that are encountered during PPE.
- Academic staff should provide adequate supervision, feedback and encouragement, whilst ensuring strict adherence to written protocols.

- Students should be provided with adequate choice as to who they want to be examined by, with specific reference to existing peer relationships, gender and religious and ethnic background.
- Students should be provided with adequate private gender specific changing areas in order to change into appropriate garments for PPE classes.
- Possible alternatives to PPE for experiential learning include trained standard patients, simulated patients, mannequins, family or friend volunteers, and volunteers from the community.
- Fully informed consent should be sought from students prior to PPE classes, and should be ongoing for every subsequent PPE class.
- Students should keep a log book of experiential learning techniques performed including PPE and PPE alternatives to ensure a fair and equitable education of examination skills.
- Academic staff should seek formal feedback regarding students' perceptions of PPE before and after exposure to this teaching method, and feedback should be utilised to inform future PPE practice in higher education.

Limitations

The findings of this literature review should be interpreted with caution as the literature retrieval strategy was conceived and executed by a single researcher and as such may have been vulnerable to bias. Furthermore, due to the paucity of available literature the articles included were based upon the subjects they addressed as opposed to the quality of the research. It is acknowledged that results from studies of medical students' perceptions of PPE may not be relevant to undergraduate health sciences education. Medical students are typically involved in examination of regions that may be more sensitive and/or intimate, whereas lower limb examinations typically involve the foot, ankle, as well as the upper and lower leg only. Moreover, students undertaking medical education as opposed to allied health sciences education tend to have achieved a higher level of academic and educational outcomes which may impact on preferences to participate in PPE. Nevertheless the literature on PPE from qualitative research involving medical students provides a valuable insight into the complex and inter-related issues which may compromise the acceptability of PPE to undergraduate health science students.

In conclusion, PPE appears to be a valuable method of experiential learning which has several advantages in health sciences higher education. However there are several ethical and procedural issues with PPE that are outlined above which may have a significant impact on students' learning experiences; to the extent that PPE may be considered to be one of the worst experiences of a student's education. As such, several potential recommendations from the literature have been identified and a strategy proposed which may reduce the potential negative impact of PPE in undergraduate health sciences education. Further research is required to determine podiatry students' willingness to participate in PPE, and to investigate the effectiveness of the proposed strategies in robust longitudinal studies.

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