REVIEW

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A systematic review of peer teaching and learning in clinical education

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Correction added after online publication 30 November 2007: the qualification PhD has been removed; amendments to Table 2 have been made, text that had been omitted in error has been reintroduced and Table 2 is now complete.

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A systematic review of peer teaching and learning in clinical education

Aims and objectives. The purpose of this review is to provide a framework for peer teaching and learning in the clinical education of undergraduate health science students in clinical practice settings and make clear the positive and negative aspects of this teaching and learning strategy.

Background. The practice of using peers incidentally or purposefully in the clinical education of apprentice or undergraduate health science students is a well-established tradition and commonly practiced, but lacks definition in its implementation.

Method. The author conducted a search of health science and educational electronic databases using the terms peer, clinical education and undergraduate. The set limitations were publications after 1980 (2005 inclusive), English language and research papers. Selection of studies occurred: based on participant, intervention, research method and learning outcomes, following a rigorous critical and quality appraisal with a purposefully developed tool. The results have been both tabled and collated in a narrative summary.

Results. Twelve articles met the inclusion criteria, representing five countries and four health science disciplines. This review reported mostly positive outcomes on the effectiveness of peer teaching and learning; it can increase student's confidence in clinical practice and improve learning in the psychomotor and cognitive domains. Negative aspects were also identified; these include poor student learning if personalities or learning styles are not compatible and students spending less individualized time with the clinical instructor.

Conclusions. Peer teaching and learning is an effective educational intervention for health science students on clinical placements. Preclinical education of students congruent with the academic timetable increases student educational outcomes from peer teaching and learning. Strategies are required prior to clinical placement to accommodate incompatible students or poor student learning.

Relevance to clinical practice. The findings from this systematic review, although not statistically significant, do have pragmatic implications for clinical practice. It can increase clinical placement opportunities for undergraduate health students,

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assist clinical staff with workload pressures and increase clinician time with clients, while further developing students' knowledge, skills and attitudes.

Key words: nurses, nursing students, peer, undergraduate clinical education

Introduction

The purpose of health science programmes is to provide undergraduate students with the skills, knowledge and attitudes which enable a level of competence when they join the workforce (Ladyshewsky 2002). Therefore, it is important that they have access to 'real-world situations' (clinical placements) to apply these attributes in preparation for their graduate practice (DeClute & Ladyshewsky 1993, p. 683). Providing clinical placements for undergraduate students is problematic for educational institutions (National Review of Nurse Education 2002, Queensland Nursing Council 2001). Demand for undergraduate clinical placements has increased in Australia and other countries at the same time as clinical placement opportunities have decreased, to the point that demand now exceeds supply. This shortage is the direct result of fiscal demands on global healthcare systems, which have led to the endemic rationalization of services (Currens 2003, National Review of Nurse Education 2002, Queensland Nursing Council 2001). Universities are now using more 'flexible' and innovative education models that optimize the availability of clinical placement opportunities (Currens 2003, p. 540). Many of these new innovative models are using peer teaching and learning in their frameworks (Wotton & Gonda 2003).

Peer teaching and learning

It is common practice for peers to review journal articles and to tutor in tertiary educational programmes (Lake 1999), although disparity exists surrounding its origins.

McLaughlin *et al.* (1995, cited in Currens 2003, p. 541) stated that 'peer teaching and learning was first conceptualized by Bell in the eighteenth century'. Topping (1996, p. 322) believed that this teaching and learning strategy originated from the 'ancient Greeks'. Again, Krammer (1982, p.17) claims that the first documented use occurred in New York City, as a method called the 'Lancastrian system'. Both Krammer (1982) and Topping (1996) established that early employment of this intervention used the peer tutor as the 'surrogate teacher' to transmit knowledge.

Peer-assisted learning or peer teaching and learning describes a collaborative and co-operative teaching and learning strategy; learners are active equal partners, students are self-directed, share in interventions and actively participate in discussions and feedback (Clarke & Feltham 1990, Walker-Bartnick *et al.* 1984). The pedagogical origins of this teaching and learning strategy lie with theorists such as Piaget and Perry, who espoused the virtues of social interaction, collaboration and non-evaluation as essential elements to the construction of knowledge (Perry 1970).

Much of the supporting literature in the included studies of this review derives from educationalists and social learning theorists, such as Bandura, Piaget, Slavin, Dewey and Lovings. The studies that do not use a theoretical framework draw from the conceptual foundation that peers facilitate learning by providing emotional support, feedback and assisting with physical tasks; and cite earlier papers by DeClute and Ladyshewsky (1993), Gerace and Siblano (1984), Erikson (1987) and Iwasiw and Goldenberg (1993).

There are four main concepts to 'peer teaching and learning in clinical education' encompassing 'peer', 'teaching', 'learning' and 'clinical education'. The definition of these concepts varies depending on the situation or application. The Oxford dictionary defines 'peer' as 'a colleague, person the same age, or a person from a different school or class, or a person from within the same course'. Whereas, Lincoln and McAllister (1993) in a discussion paper on the benefits of peer-assisted learning use terms such as 'peer teaching', 'peer group learning', 'peer tutoring' and 'peer consultation', to describe this educational phenomenon. The literature does support the notion that differing descriptors refer to the same overall concept; that peer tutors/teachers are pupils/students at similar or differing levels of education teaching and learning from one another (Lincoln & McAllister 1993, Clarke & Feltham 1990, Costello 1989).

In the context of this investigation, peer teaching and learning refers to undergraduate health science students enrolled in the same course at university (diversity may/may not exist in the level of education), teaching and learning from one another in hospital and community practice settings (service providers).

There has been a distinct lack of clarity and consensus about peer teaching and learning in the literature and its influences on short-term outcomes, such as clinical practice development, feedback increasing undergraduate knowledge development and increased learning opportunities. The implications for graduate practice, particularly the impact

of peer teaching and learning on the use of evidence-based practice, life-long learning, clinical decision-making and affective development, needed to be investigated. This review and synthesis of the literature has assisted in the investigation of this educational intervention and identified research opportunities and discussed best practice in the use of peer teaching and learning in clinical education, based on the best available evidence.

Methods

To provide evidence for practice, primary and secondary research studies have been located and synthesized in answer to the question:

Is peer teaching and learning an effective educational intervention during clinical placements for undergraduate health science students?

The following subjective and objective learning outcomes, educational measurements and student characteristics were analysed in the literature:

- Cognitive: The development of clinical reasoning skills and clinical decision-making skills and further development of existing knowledge, reflected by increased academic scores.
- Psychomotor: Competence and development of clinical skills demonstrated in mastery of skill and ability to perform, either self-reported or reflected in clinical performance scores.
- Clinician satisfaction: Clinician satisfaction demonstrated by allocation of clients to students and a student's clinical performance scores.
- Student satisfaction and preference: Student satisfaction demonstrated by a student's willingness to work alongside a peer and subjective student feedback.
- Client confidence: Client confidence in care received, demonstrated by client satisfaction scores and feedback regarding student's ability to be empathetic.
- Increased learning opportunities: Increased learning opportunities based on subjective student feedback. Did students report that by working alongside a peer, they were given more opportunities to develop their knowledge and skills?
- Student satisfaction with feedback: The effect of critical feedback from a peer on a student's progress, demonstrated in their development and willingness to act on peer critique.
- Student participation: Is there reported increased student participation in clinical practice activities and equal roles in organizing clinical practices?
- Promotion of student leadership: Demonstrated by self-reported confidence in performing leadership roles.
- Life-long learning: Lifelong learning was reflected in increased academic scores. Did it increase or decrease knowledge base in the development of critical thinking and analysis skills, and their understanding and use of evidenced-based practice?

This systematic review was conducted in three stages: (1) the development of analysis strategies with inclusion and exclusion criteria; (2) quality and critical appraisal, selection of studies and data extraction; and (3) aggregation of data and synthesis of the findings.

A comprehensive search of the databases was undertaken, including Australian Education Index, Campbell Collaboration, CINAHL, Cochrane Collaboration, Education Research Online, EMBASE, ERIC, Evidence for Policy and Practice (EPPI), Joanna Briggs Institute for Evidence-Based Nursing and Midwifery, MEDLINE, PeDRO, PsychINFO, Science Direct and Sociofile. The set limitations were English language, years 1980–2005 inclusive. The key words used were: *undergraduate# or student# and *clinical education or placement# or practicum and *peer# and *evaluat# or percept# or effect# (* denotes wild card with the same stem, while # denotes truncation of terms). This search fielded a total of 78 published primary studies. Snowballing identified a further 19 papers and the grey literature was also searched to eliminate publication bias. The journals *Nurse Education Today* and *Journal of Nursing Education* were hand-searched for any missed studies, but none were located.

The inclusion criteria evaluated participant, intervention, learning outcomes and research method. Exclusion of studies occurred if educational and practice outcomes were not reported and if they received a poor rating during critical and quality appraisal, many excluded papers had poor conceptual or theoretical underpinnings.

Critical and quality appraisal of the potential studies occurred utilizing an appraisal tool (worksheet). This tool was specifically adapted following the in-depth analysis of many appraisal and data extraction worksheets used in a broad range of educational, quantitative and qualitative systematic reviews of literature (*National Review of Nurse Education* 2002, Joanna Briggs 2002, Glasziou *et al.* 2001, Queensland Nursing Council 2001, Chalmers & Attman 1995, Guyatt *et al.* 1994, 1993). The learning outcomes from the included studies were identified in the worksheets, the findings from these worksheets where then tabled and combined into a narrative summary, while making sense of the findings within the existing body of knowledge. This is isochronal with the review process and involves inductive and interpretative reasoning approaches (Booth 2001, Suri 2000, Jensen & Allen 1996); and this constituted the theoretical framework underpinning this review. The initial narration

included the studies' limitations, their biases, the strength of evidence they represented and the applicability, benefit or harm, and the implications for further research.

Limitations

The objective of this investigation was to provide high-quality evidence as rated against the Australian National Health and Medical Research Council levels of evidence (2000). Considerable heterogeneity between groups of participants, clinical settings, method of educational delivery, and diversity in the application of processes and associated study outcomes prevented statistical pooling or sub group analysis. Therefore, the level of evidence has not been central to the investigation and a broader analysis has occurred.

Results

Twelve studies met the inclusion criteria (Table 1), from these papers five countries and four health science disciplines (Table 1) are represented. Two of the studies share a common author and four share a common model. The included studies differ in terms of methodology and processes (Table 1). Although quantitative studies are included, the majority used descriptive and qualitative methods. The qualitative studies represent a high level of internal validity for clinical education due to the hermeneutic paradigm informing them (Guba & Lincoln 1994), while the quantitative studies represent strength of evidence (National Health and Medical Research Council 2000). The majority of studies used convenience samples, one of which was a pilot study. All had limitations including sample and design issues (Table 1). Generally, usually one or more studies have supported a positive impact on student outcomes from peer teaching and learning. However, it was reported that problems emerged if peers were incompatible and their mentor was unaware of their education level differences (Faure *et al.* 2002, Martin & Edwards 1998).

The effect of peer teaching and learning on the learning outcomes

Cognitive development

Five of the included studies reported an increase in cognitive development (Currens & Bithell 2003, Cortazzi *et al.* 2001, Bos 1998, Iwasiw & Goldenberg 1993, DeClute & Ladyshewsky 1993). Reliability of the evaluation process in three studies, Bos (1998) descriptive survey, Cortazzi *et al.* (2001) narrative study and Currens and Bithell (2003) descriptive study may be questionable because all improvements are self-reported. Although educationalists such as Biggs (1999) and Perry (1970) would support these improvements, as they believe that being reflective and analysing one's own development would indicate higher levels of cognitive thinking. This assumption is further supported by Iwasiw and Goldenberg (1993); in the findings in their randomized control trial, the authors report a definite increase in cognitive scores in the experimental group (peer group). Although the lower-than-pretest score in the control group casts doubts on the validity and the reliability of the cognitive test. The lack of clarity within the findings of these studies highlights the need for further research in this area.

Psychomotor development

Bos (1998), Yates *et al.* (1997), Iwasiw and Goldenberg (1993) and DeClute and Ladyshewsky (1993), all reported that peers who teach and learn from one another in clinical practice settings have a positive impact on student psychomotor development (clinical skills development). Three of these studies – Bos (1998), Yates *et al.* (1997a) and Iwasiw and Goldenberg (1993) – evaluated undergraduate nursing students. In all, apart from one of the studies, the students self-report an increase in the development of their skills. A clinical instructor evaluated and reported an increase in students' psychomotor performances in Iwasiw and Goldenberg (1993) randomized control trial. Again, further research using both quantitative and qualitative methods is required in this area to support these findings.

Affective development

No studies formally reported that peer teaching and learning improved a student's ability to be empathetic towards clients, as these characteristics are difficult to measure in both clients and students. Although in Faure *et al.*'s (2002) survey of physiotherapy students, the junior students reported that it increased their interaction and comfort with clients. It is, therefore, feasible that peer teaching and learning will impact on the affective development of students in clinical practice areas. Further research is needed in this area, and the development of a reliable tool or method of analysis that will generate valid results is required.

Student, client and clinician evaluation and satisfaction with the learning experience

Satisfaction with peer teaching and learning experience has been reported in the majority of included studies. Students self-reported that peer teaching and learning increased self-confidence, autonomy, clinical reasoning, self-evaluation and collaboration with peers (Table 2). Although two studies reported negative feedback from junior students, including incompatibility with other students and that they did not

Table 1 Overview of included studies

Author(s)	Country	Study type/level of evidence (National Health and Medical Research Council 2000)	Cohort	Clinical area and student level	Question	Sample	Results	Limitations
Aston and Molassiotis (2003)	UK	Thematic analysis and descriptive statistics	Nursing students and clinical mentors	Senior and junior students; clinical area not stated	Examination of a peer support and supervision initiative	Thirty-one senior students and 27 junior students	Most students found it useful; senior students reported increased mentor and teaching skills; junior students reported reduced anxiety with clinical instructor	Poor response rate to questionnaires from mentors. Co-existence of two different curricula; students not allocated at the same time; no explanation of sampling methods
Bos (1998)	USA	Descriptive study using content analysis	Nursing students	Junior nursing students in a four year baccalaureate programme on surgical placement	Junior nursing students peer leader for a day responsible for the organization and management of other junior students at the same level of education	Twelve students completed the peer leadership role over a six-week rotation	Peer leaders self-reported: improved critical thinking skills and technical skills; realization of peer as a resource; development of managerial skills	Small sample group in one clinical area; one group of students; educational benefits not reported; educational effect not reported; bias might have occurred because of educational assessors aware of the trial; voluntary participation
Cortazzi *et al.* (2001)	UK	Narrative	Nursing students	Second year *students* at the end of second year clinical placement	Narrative analysis helps students to interpret and give meaning to experience	Ten students	Narratives mediate learning by re-telling experience students learnt by reflection	Sample selection not clear; educational benefits in relation to costs not reported; method of clinical placement not recorded
Currens and Bithell (2003)	UK	Descriptive statistics and qualitative analysis	Physiotherapy students and clinical mentors, ratio 2:1 model	Cardio-respiratory, orthopaedics, 1st, 2nd and 3rd year students	Exploration of clinical placements to accommodate more students, peer learning promoted, part of a larger study	Thirty-seven clinical educators; 61 physiotherapy students in 34 placements across five clinical areas	Feasible, most students valued peer discussion (98·3%); peer support (81·4%)	One author had university links; extra neous variables regarding age, clinical areas, single or repeat placement; extent of client allocation to students not fully described; all hospital-based placements; limited generalizability of data

Table 1 (Continued)

Author(s)	Country	Study type/level of evidence (National Health and Medical Research Council 2000)	Cohort	Clinical area and student level	Question	Sample	Results	Limitations
DeClute and Ladyshewsky (1993)	Canada	Comparative Level III.2	Physical therapist students and clinical instructors, 2:1 model	Thirty-eight 3rd year students on a 2:1 clinical placement compared with eighty 3rd year students on a 1:1 clinical placement in three acute-care areas: neurology, orthopaedics and cardio-respiratory over a four-week clinical placement	To determine whether students in the collaborative model increased levels of competence in comparison to the 1:1 group	Allocation was through a com puterized matching system; for students in the experimental group, after allocation, reshuffling occurred to match students with similar grade point averages	Significantly higher scores in the peer-assisted learning group	Theoretical underpinning of study unclear; comparison between groups relied on a single instrument; authors stated a relationship be tween increasing problem-solving and the 2:1 model; there was no discussion or evidence to support this statement and no under pinning theory to support this outcome; no experience of clinical instructor in the control group identified or very little background on student characteristics in the control student group; educational outcomes limited to clinical competence; use of only one student-year level reduces generalizability of data
Erikson (1987)	USA	Descriptive statistics	Senior students in baccalaureate programme for community nursing	Community placement, student level not stipulated, only senior students described	Students paired; one became peer nurse and the other peer observer–evaluator	Not stated	Participants reported the activity valuable; student learning took place in a non-threatening way; peer collaboration and accountability increased; stu dents gained experience in evaluation and assessment; they felt good about helping each other	Hasty pre-conferencing and verbal contracting disadvantaged students; greater knowledge of client needed by both students prior to visit; visits needed to occur earlier in semester when client relationship first established; no description of sampling method or size; no discussion on educational outcome or how data was collated and analysed; results from likert scale not published; students stated they would prefer written to verbal contracting

Table 1 (Continued)

Author(s)	Country	Study type/level of evidence (National Health and Medical Research Council 2000)	Cohort	Clinical area and student level	Question	Sample	Results	Limitations
Faure *et al.* (2002)	South Africa	Descriptive statistics	Physiotherapy students and clinical mentors	2nd, 3rd and 4th year students; clinical area not stated	Investigation of students' perceptions about structured peer-led introduction to clinical placement	Not described in detail; just states all students	Positive feedback from students, increased motivation and confidence, and preparation for clinical practice	Timeline between clinical introduction and placement not reported. University links, so bias presumed
Iwasiw and Goldenberg (1993)	USA	Pre-test/post-test design. Level IV	Nursing students	2nd year students on a surgical rotation	Hypothesis: the effects of peer teaching pre- and post-surgical dressing	Random.Control $n = 24$ Experimental $n = 26$ Different venues	Increased psycho motor and cognitive development with peer-assisted teaching	All control groups in the same venue and all experimental groups in same venue; extraneous variables as dressing size and degree of difficulty; small random sample; instructors did not instruct both groups
Ladyshewsky (1995)	Canada	Comparative control trial Level III.1	Eight clinical instructors and 16 physical therapy students	Acute inpatient set tings; recently completed 3rd year of a four year physical therapy programme	To examine the productive effects of the 2:1 teaching model in an acute inpatient setting	Blinded; participants unaware of trial	Each clinical instructor and student team's mean productivity was greater during the clinical placement than during the control period i.e. when the clinical instructor worked independently	Unequal duration of control and treatment groups; reliance on a single measure patient outcome and preference not commented on; variations in student results
Martin and Edwards (1998)	UK	Qualitative	Occupational therapy students and clinical mentors, 2:1	Not explicit about year level; acute psychiatry	Perceived advantages and dis advantages of peer teaching and learning in clinical education	Fourteen students contacted post-clinical placement	Thirteen responses identified advantages of shared learning and support, travel and accommodation; increased stress if incompatible; reduced individuality and independence	Small sample; single placement; no explanation of previous student experience or year level; one study author, so bias might have occurred

Table 1 (Continued)

Author(s)	Country	Study type/level of evidence (National Health and Medical Research Council 2000)	Cohort	Clinical area and student level	Question	Sample	Results	Limitations
Schwab and Robinson (1991)	USA	Descriptive	Senior undergraduate nursing students	Community home visits	Pairing students on community home visits; does it increase the outcomes for students?	Sixty senior baccalaureate students on community home visits	Increased collegiality and feeling of autonomy, reduced stress of clinical placement	Poor theoretical underpinning stated, educational assessors aware of the study. Method of data analysis and collection not clear. No cost analysis
Yates *et al.* (1997)	Australia	Descriptive statistics	1st & 2nd year nursing students	Area of clinical education not stated	1st year students mentored by 2nd year students on clinical placement	Volunteers for 1st year students 55/323. 2nd year students chosen by researchers	Potential benefits from this model, further investigation needed; preclinical sessions need to be congruent with academic timetable	Sample selection not specific; pilot study only; 47·3% of first year students returned questionnaires; unclear whether both groups treated equally or analysed in the group allocated; educational assessors aware of the study

enjoy competition for clinical practice and clinician or clinical instructor time (Martin & Edwards 1998, Schwab & Robinson 1991). Conflicting evidence was found within the literature on client satisfaction and confidence with this method of clinical education. Erikson (1987) in a nursing study reported client preference for this method of teaching and learning and Schwab and Robinson (1991) reported that clients appeared to interact with the students without inhibition. But, Faure *et al.* (2002) reported negative comments from clients, although the reliability of this information is questionable because of the researchers reporting poor client understanding of the questionnaire used. The majority of studies did not comment on client satisfaction regarding the experience at all. Again, this is an area requiring further investigation.

Learning opportunities

Martin and Edwards (1998) and Yates *et al.* (1997) using descriptive statistics and thematic analysis, both reported on learning opportunities. Yates *et al.* (1997) found that peer teaching and learning increased nursing students' access to and involvement in learning activities. However, Martin and Edwards (1998) reported that it decreased occupational therapy students' learning opportunities, as they had to share learning experiences with the other allocated students (two students:one clinical instructor). In the later study, students self-reported a preference for one-on-one teaching with the clinical educator and they felt that they had less opportunity to be independent. More students were involved in the nursing study than in the occupational therapy study. Conceivably, therefore, a larger number of students may ensure a more diverse learning experience, or the student expectations may vary between the differing professional bodies and this may have influenced the results. Again, this disparity highlights the need for further research.

Student leadership skills

Numerous studies identified that student leadership skills did develop (Table 2). Aston and Molassiotis (2003), using descriptive statistical and thematic analysis, reported that peer teaching and learning increased senior students' mentoring and teaching skills. Erikson (1987) in a pretest/post-test survey, reported that this intervention increased collaboration and accountability within the student body. Schwab and Robinson (1991) found in their descriptive study, students' self-reported feelings of autonomy when using peer teaching and learning. Again, Bos (1998) reported that leadership increased in the peer group. The theoretical framework underpinning Bos' study was Loving's (1993) 'model of competence validation'. As cited in Bos, this

Table 2 The significant findings for clinical practice from this systematic review of literature

Finding	Method of peer teaching and learning	Author	Method of analysis
More than one student working with a clinician increases client care time	Two students to one clinical instructor in hospital based clinical practice settings 1st, 2nd and 3rd year physiotherapy students level of pairing not stipulated	Currens and Bithell (2003)	Content analysis of questionnaires and focus groups from both clinical instructors and students
	Two physiotherapy students paired to one clinical instructor in acute inpatient settings	Ladyshewsky (1995)	Comparative control trial measuring productivity of clinical instructor alone (control group) in comparison to a clinical instructor-lead student group (experimental group)
More than one student allocated to a clinician reduced instruction time for the clinician	Two physiotherapy students paired to one clinical instructor in hospital based clinical practice settings 1st, 2nd and 3rd year students, level of pairing not stipulated	Currens and Bithell (2003)	Content analysis of questionnaires and focus groups from both clinical instructors and students
	Two occupational therapy students paired to one clinical instructor in an acute psychiatry placement, level of pairing not stipulated	Martin and Edwards (1998)	Thematic analysis of open-ended questionnaires sent to students post clinical placement
Peer teaching and learning increased students' comfort initially in clinical practice, therefore reducing the need for constant supervision by clinician	3rd year and 4th year physiotherapy students supported and gave a structured orientation to 2nd year students on their 1st clinical placement	Faure *et al.* (2002)	Descriptive survey of students post clinical placement given in class time
	Senior students supervised and supported junior students on clinical placements	Aston and Molassiotis (2003)	Descriptive statistics and thematic analysis of student questionnaires post clinical placement
	Two physiotherapy students paired to one clinical instructor in hospital based clinical practice settings 1st, 2nd and 3rd year level of pairing not stipulated	Currens and Bithell (2003)	Content analysis of questionnaires and focus groups from both clinical instructors and students
	1st year nursing students mentored by second year student on first clinical placement	Yates *et al.* (1997)	Descriptive statistics and content analysis of pre and post questionnaires and focus group inter views with both participating and non-participating students
	Two intermediate-level physiotherapy students paired to one clinical instructor	DeClute and Ladyshewsky (1993)	Comparative control trial, consisted of a measurement of clinical competence of a student alone (control group) in comparison to a collaborative student group (experimental group)
	Nursing students paired on community home visits over three semesters to assess the needs of their allocated patients	Schwab and Robinson (1991)	Descriptive study – students reported to faculty weekly on their individualized care plan, knowledge and mutuality. Faculty followed this with a home visit at the end of semester to evaluate dynamics and student interactions

Table 2 (Continued)

Finding	Method of peer teaching and learning	Author	Method of analysis
Students reported peer teaching and learning increased time-management skills	Junior nursing student peer leader for a day, responsible to the clinician for other students (peers) performance	Bos (1998)	Content analysis of a written self-evaluation from peer leader
	1st year nursing students men tored by second year student on first clinical placement	Yates *et al.* (1997)	Descriptive statistics and content analysis of pre and post questionnaires and focus group inter views of both participating and non-participating students
Increased productivity for service providers if more than one student present on clinical placement at the same time	Two physiotherapy students paired to one clinical instructor in acute inpatient settings	Ladyshewsky (1995)	Comparative control trial measuring productivity of a clinical instructor alone (control group) in comparison to a clinical instructor-lead student group (experimental group)
Senior and junior students became more autonomous and increased skills in leadership and clinical reasoning while on clinical placement	Two physiotherapy students paired to one clinical instructor in hospital based clinical practice settings 1st, 2nd and 3rd year students, level of pairing not stipulated	Currens and Bithell (2003)	Content analysis of questionnaires and focus groups from both clinical instructors and students
	Senior students supervised and supported junior students on clinical placements	Aston and Molassiotis (2003)	Descriptive statistics and thematic analysis of student questionnaires post clinical placement
	Junior nursing student peer leader for a day during a six week surgical rotation, responsible to the clinician for other students (peers) performance	Bos (1998)	Content analysis of a written self-evaluation from peer leader
Pre-clinical preparation needs to be congruent with the academic timetable to increase student attendance	3rd year and 4th year physio therapy students supported and gave a structured orientation to 2nd year students on their 1st clinical placement	Faure *et al.* (2002)	Descriptive survey of students post clinical placement given in class time
	Senior students supervised and supported junior students on clinical placements	Aston and Molassiotis (2003)	Descriptive statistics and thematic analysis of student questionnaires post clinical placement
	1st year nursing students mentored by second year student on first clinical placement	Yates *et al.* (1997)	Descriptive statistics and content analysis of pre and post questionnaires and focus group inter views with both participating and non-participating students
More preparation in senior and junior student roles prior to clinical experience	3rd year and 4th year physio therapy students supported and gave a structured orientation to 2nd year students on their 1st clinical placement	Faure *et al.* (2002)	Descriptive survey of students post clinical placement given in class time
	Senior students supervised and supported junior students on clinical placements	Aston and Molassiotis (2003)	Descriptive statistics and thematic analysis of student questionnaires post clinical placement

Table 2 (Continued)

Finding	Method of peer teaching and learning	Author	Method of analysis
The need for more preparation in clinician roles and more understanding of the differing educational levels of students prior to clinical experience	3rd year and 4th year physio therapy students supported and orientated 2nd year students initiation into clinical practice	Faure *et al.* (2002)	Descriptive survey of students post clinical placement given in class time
	Senior students supervised and supported junior students on clinical placements	Aston and Molassiotis (2003)	Descriptive statistics and thematic analysis of student questionnaires post clinical placement
If conflict of personality unresolv able, then the peer group needs to be carefully restructured to enable teaching and learning to re-occur	Nursing students paired on community home visits over three semesters to assess the needs of their allocated patients	Schwab and Robinson (1991)	Descriptive study – students reported to faculty weekly on their individualized care plan, knowledge and mutuality. Faculty followed this with a home visit at the end of semester to evaluate dynamics and student interactions
	Two occupational therapy students paired to one clinical instructor in an acute psychiatry placement, level of pairing not stipulated	Martin and Edwards (1998)	Thematic analysis of open-ended questionnaires sent to students post clinical placement
Effective strategies need to be put in place if peer teacher or peer learner not performing to expected level, so as not to impact on student development and learning.	Two occupational therapy students paired to one clinical instructor in an acute psychiatry placement; level of pairing not stipulated	Martin and Edwards (1998)	Thematic analysis of open-ended questionnaires sent to students post clinical placement

model differentiates learning between extrinsic and intrinsic environments; 'the former is primarily evaluative of student performance and the latter being the student's internal motivation to acquire knowledge and skills to continue learning' (1998, p. 189). This intrinsic motivation described by Bos was identifiable in the work done by Aston and Molassiotis (2003), Erikson (1987) and Schwab and Robinson (1991). These studies found that students developed skills in teaching, mentoring, organizing, managing staff and accountability in a non-evaluative and self-directed environment. Consequently, these studies consistently recognized that a student's intrinsic motivation was important to the educational outcomes reported. In addition, a prominent theme that emerged from the studies was increased confidence in clinical practice. The students evaluated their own learning and reported increased confidence in leadership roles when working with a peer. Many clinicians and educationalists may argue that this approach to teaching and learning requires students to function independent of the clinician or clinical instructor. In fostering this aspect of independence in the junior students, it might, in the longterm, result in a regression of leadership skills, as they do not have the resilience or the knowledge to handle such independence. Again, it will be necessary to conduct further research in this area.

Students' appreciation of life-long learning

No studies formally reported on life-long learning, although they may have commented on it indirectly. Biggs (1999) and Perry (1970) report a link between cognitive development and life-long learning. They believe that students who are at a higher level in the cognitive development continuum have an appreciation and realization of the need for life-long learning. This leads to the conclusion that students who show an increase in cognitive development indirectly appreciate the need for life-long learning.

Students' ongoing understanding of their own development

It is anticipated that students at a higher cognitive level are able to reflect and understand their limitations, and are realistic about their own development (Perry 1970). All the

studies reviewed supported some development in the identified learning outcomes.

Other important issues for education

When compiling this literature review, it became evident that other important issues for education and clinical practice (Table 2) emerged, other than the learning outcomes that had been specifically targeted.

Economic benefits of peer teaching and learning
A cost-effectiveness analysis and cost-benefit analysis needs to be undertaken to provide evidence for the economic benefits of peer teaching and learning in clinical education. *The National Review of Nursing Education* (2002) and the Queensland Nursing Council (2001), in their reviews of Australian nurse education, recommend peer teaching and learning as being economically viable for stakeholders, though no substantial evidence exists within the literature to support this notion. Although Ladyshewsky (1995) using the Canadian Workload Measurement System, did investigate the efficiency and work-related outcomes for service providers and reported that the clinicians spent up to 60% more time with clients when instructing more than one student (Table 2).

Incompatibility of students
Conflict will occur if students are incompatible because of the level of knowledge, education level or have incompatible personalities (Martin & Edwards 1998, Schwab & Robinson 1991). It is therefore necessary that strategies be implemented prior to clinical placements to address conflicts if they arise (Table 2).

Academic involvement and collaboration with clinician and student
No studies reported on outcomes of academic involvement, although the universities were involved at some level in all of these studies. The actual collaboration between the student, clinician and academic, however, were not detailed and this has impacted directly on the validity of results within the included studies.

Pre-clinical education increases outcomes from peer teaching and learning
Two nursing studies by Aston and Molassiotis (2003) and Yates *et al.* (1997) and a physiotherapy study by Faure *et al.* (2002) reported that pre-education prior to clinical placement on student and clinician roles increased the students' learning outcomes from peer teaching and learning (Table 2). It is interesting to note that in Yates *et al.*'s (1997) study, the students had a structured pre-clinical preparation of roles and student objectives and the post-intervention evaluative survey of these students saw no report on the need for more pre-clinical preparation. Whereas the other two studies reported on the need for an increase in student and clinician preparation (Faure *et al.* 2002, Aston & Molassiotis 2003).

Peer teaching and learning increased collegial behaviour among students
Erikson (1987) singularly reported enthusiastic collegial post-conferencing in a descriptive study of nursing students on community health placements. Other studies reported an increase in communication between students (Martin & Edwards 1998) and increased student comfort when placed with a peer (Currens & Bithell 2003) these findings indirectly support Erikson's study. Although further investigation is required before any recommendation of consequence could be interpreted.

Discussion

In undertaking this systematic review of the literature it is evident that peer teaching and learning in the clinical education of health science students is a multifaceted area and is under-researched. This research builds on that of Currens (2003), *National Review of Nursing Education* (2002) and the Queensland Nursing Council (2001) in demonstrating the relative value of 'peer teaching and learning in clinical education' and the gains for stakeholders. The purpose of this review has been to synthesize learning outcomes in the existing literature and to explore the impact of this educational intervention. A search of Australian and international sources yielded 12 studies with predominantly descriptive and qualitative research methods. This was expected, as educational literature is strongly influenced by human personality. Therefore, qualitative research methods are often used to investigate the educational effect on the participants (Davies *et al.* 1999). The initial protocol that was developed for this review enabled both quantitative and qualitative synthesis of the literature, but quantitative synthesis has not occurred because of the heterogeneity that exists within the studies. The level of evidence and the statistical significance of the studies are still included to reflect the research question, but it has not been central to this investigation.

Surprisingly, no medical studies met the inclusion criteria (most medical literature use simulated laboratory environments) despite many earlier medical studies using peer

teaching and learning as a framework for educational interventions. In addition, many studies reported on narrow learning outcomes, such as psychomotor skill development in aseptic technique (Iwasiw & Goldenberg 1993). No studies detailed curricula or examined whole units of learning (National Review of Nursing Education 2002), such as the direct effect on evidence-based practice and life-long learning. Few studies reported on client confidence or client care outcomes and this is consistent with previous findings (National Review of Nursing Education 2002, Queensland Nursing Council 2001). However, many did report on significant and bifold findings for clinical practice (Table 2), such as more than one student increases clinician time with clients while reducing their instruction time with students (Currens & Bithell 2003, Ladyshewsky 1995). It is imperative to the development of this educational intervention that further studies and testing strategies are conducted to increase the body of knowledge in this area. Wide-ranging research needs to be implemented to make recommendations for curricula. Investigation of the outcomes including a cost-effectiveness and cost-benefit analysis is warranted (Ladyshewsky 2002). More comparative studies, including both traditional and other models of clinical education, would yield more definitive evidence for its use in health science curricula (Currens 2003).

Conclusions

This systematic review of the literature has provided the groundwork to develop peer teaching and learning in the clinical education of health science students, and highlighted numerous research possibilities and responsibilities. The results are not statistically significant however every study included in this review reported that peer teaching and learning increased development in learning outcomes and has implications for clinical practice. From an educationalist perspective I encourage service providers to examine using this clinical educational intervention seriously in the clinical placement of undergraduate health science students. There is significant reporting within the literature which suggests both short and long-term advantages to them, while increasing the number of clinical placements available for universities.

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