Interprofessional pre-qualification clinical education: a systematic review

Megan Davidson, Robyn A Smith, Karen J Dodd, Jenni S Smith and Meredith J O'Loughlan

Abstract

A search was made of relevant databases and the reference lists of key textbooks and reviews. Of 420 potentially relevant articles, 25 were included in the review. Medicine, nursing, physiotherapy, occupational therapy and social work were the professions most often included. Aims and activities of interprofessional clinical education (IPCE) programs were varied, and there was inconsistency in outcome evaluation approach and tools.

The models of IPCE described in the literature are diverse. The major barriers to IPCE were logistical, and the careful planning and negotiation required to overcome these barriers was time consuming. Detailed planning, stakeholder enthusiasm and commitment appear to be essential to the success of IPCE. The literature provides guiding principles for establishing a program; however, there is limited evidence to support a particular approach.

What is known about the topic?

Interprofessional rivalry, negative stereotyping and ignorance of the role and contribution of other professions are barriers to effective teamwork in health care. Interprofessional education (IPE) occurs when individuals of two or more professional groups learn together collaboratively. The aim of IPE is to improve interprofessional collaboration and thereby improve patient health outcomes.

What does this paper add?

This review has located papers reporting on IPE in a clinical or fieldwork setting and identifies the barriers to and enablers for successfully implementing such a program. The review reveals great diversity in the models that have been trialled.

What are the implications for practitioners?

Successful interprofessional clinical education (IPCE) models require considerable planning and commitment from stakeholders and are time consuming to organise. Effective IPCE can produce positive experiences for students and faculty; however, less is published about patient and organisational outcomes.

Aust Health Rev 2008: 32(1): 111–120

Megan Davidson, PhD, BAppSc(Physio), Head of School of Physiotherapy
Karen J Dodd, PhD, BAppSc(Physio), Associate Dean Division of Allied Health
School of Physiotherapy, La Trobe University, Melbourne, VIC.

Robyn A Smith, BAppSc(OT), GradDip Gerontology, MPH, Health Service Manager, Allied Health Learning and Research
Jenni S Smith, BAppSc(Physio), GradDipPhysioResearch, Physiotherapy Health Service Manager
Meredith J O'Loughlan, BSW, BAppSc(HumBiol), BAppSc(ChineseMed), Project Manager
Division of Allied Health, Northern Health, Epping, VIC.

Correspondence: Dr Megan Davidson, School of Physiotherapy, La Trobe University, La Trobe University, Melbourne, VIC 3054. **m.davidson@latrobe.edu.au**

EFFECTIVE TEAMWORK is considered an essential component of safe and effective health care,[1] however, there are many barriers. These barriers include interprofessional rivalry, negative stereotyping and ignorance of the role and contribution of other professions.[2] Interprofessional clinical education (IPCE) is promoted as a means of addressing these barriers. IPCE occurs when individuals of two or more health care professions come together within a clinical or fieldwork environment to learn "with, from and about each other in order to improve collaboration and the quality of practice".[3]

The aim of IPCE is to improve patient health outcomes through the collaboration of health care professionals.[4,5] It is widely assumed that effective interprofessional health care delivery can

1 Quality rating scale used in detailed review

Quality element	Ratings
Design appropriate to research question	RCT, controlled pre–post = 2 Pre-post or pre–during–post = 1 Post only, case study = 0
Selection of students based on clear criteria	More than one criteria = 2 One criterion = 1 No mention of criteria = 0
Aims clearly stated	Aims specific and linked to evaluation = 2 Aims mentioned but not specific and not linked to evaluation or outcomes = 1 No mention of aims = 0
Outcome variables and measures clearly described	Clear description of outcome measurement methods include reliability and validity = 2 Description of evaluation techniques = 1 Not stated = 0
Analysis clearly described	Replicable analysis described = 2 Analysis unclear (could not be replicated) = 1 No analysis described = 0

RCT = randomised controlled trial.

improve the safety and quality of health care.[2,4,6-8] This includes reducing adverse events, minimising duplication and assisting in the delivery of the right care at the right time by the right person.[1] Since collaboration between health care workers is considered so important there has been increasing interest in developing and evaluating the effects of pre-qualification interprofessional education conducted in clinical or fieldwork settings.

Although there are a number of literature reviews on interprofessional education, none have separated out studies on prequalification IPCE.[2,4,7-9] In one systematic review[7] only 10 of the 217 included studies related to interprofessional education where students participated in clinical placements, and none of these included groups of more than two different professional disciplines. A Cochrane systematic review in 2000[9] located no randomised or other controlled trials of interprofessional education interventions that considered improved collaboration or the health and wellbeing of patients as outcomes. Other reviews have reported positive results across a range of clinician-related outcomes, including attitudes, knowledge, skills, and behaviour, as well as benefits for the patient.[2,4,7,8,10]

The purpose of this review was to identify the requirements for a good prequalification IPCE experience, and to identify enablers and barriers to implementing such a program.

Methods

We searched MEDLINE, CINAHL and EMBASE from the earliest available year to April 2006 using a search strategy based on that used by the Cochrane review.[9] The full search strategy (for MEDLINE) appears in the Appendix. PubMed was searched from 2000 to April 2006. We also checked the reference lists of included articles, and identified reviews and key text books[4,11] for additional relevant studies.

Studies were included in the review if two or more prequalification health profession students were learning with, from and about each other in a clinical or fieldwork setting. Studies were excluded if the education was entirely based in a university or college setting with no clinical or fieldwork component, or if the clinical environment was simulated. We excluded studies if any of the participants were qualified health professionals, or if the report was in a language other than English.

The inclusion and exclusion criteria were applied independently to the abstracts (or full text if a decision could not be made from the abstract) by two of the researchers (M D and R S). Disagreements were resolved by discussion.

The full text of all included articles was obtained and data extraction was performed by two independent reviewers (M D and R S). Data were extracted on the organisation of the IPCE experience, the setting and duration, number and discipline of student participants, facilitator discipline and training, IPCE objectives, teaching and learning methods, evaluation strategies, analyses, results, and facilitators and barriers experienced.

Results reported in studies were classified according to the 6-point Joint Evaluation Team (JET) classification of interprofessional education outcomes:[4]

- Level 1: Learners' reactions
- Level 2a: Modification of learners' attitudes and perceptions
- Level 2b: Learners' acquisition of knowledge and skills
- Level 3: Learners' behavioural change
- Level 4a: Change in organisational practice
- Level 4b: Benefits to patients/clients.

Study quality was appraised using a 5-item scale designed by the authors for this review (Box 1). The five aspects of study quality were derived from previous systematic reviews[7] and from common elements in quality checklists.[12] Each item received a score of between 0 and 2, yielding a total possible overall quality score between 0 and 10. The quality of the included articles was independently assessed by two reviewers (MD and RS) who subsequently resolved disagreements on quality ratings by discussion.

Results

The initial search strategy yielded a total of 420 potentially relevant articles. After screening the titles and abstracts of these articles against the inclusion/exclusion criteria, 51 potentially relevant articles remained and the full text of these articles was obtained. Of these, 13 had no clinical component, six had only a single discipline, three used a simulated clinical experience, four included qualified health professionals, and were excluded. This left a total of 25 articles for detailed review.

The characteristics of the included studies are shown in Box 2. As the table shows, medicine and nursing were included in 18 (72%) and 17 (68%) of the included studies, respectively. Of the allied health professions, physiotherapy, occupational therapy and social work were included in 11, 10 and 10 studies respectively. Other allied health disciplines were rarely studied, with speech therapists included in four and podiatry, audiology and orthotics in just one study each.

2 Characteristics of the 25 articles included in the detailed review

Aspect	Results (number of studies)
Countries	United States (11), Australia (5), United Kingdom (5), Sweden (2), Canada (2)
Settings	Rural facilities (10), urban hospitals (7), university clinics (3), other (5), not stated (1)
Quality of studies	Median 5 on a 0–10 scale, range 0–9
Evaluation schedule	Post only (10), Pre-post (9), Pre-during-post (3), Unclear (3)
Duration of clinical experiences	Range 2.5 hours to 9 weeks Placement in blocks of clinical time (12) with the most common being of 2 weeks duration (7). Other models had small amounts of time spread across weeks, for example, 1hr per week for 4 weeks (5). Others did not state the duration (4)
Disciplines	Range 2 to 14 disciplines in any study (median 3). Medicine (18), nursing (17), physiotherapy (11), occupational therapy (10), social work/social welfare (10), pharmacy (9), speech (4), dental (2), dental hygiene (2), medical records administration (2), physician assistant (2), public health (2), podiatry (1), audiology (1), orthotics (1), lab technician (1), counselling (1), health administration (1), kinesiology (1), human ecology (1), therapeutic recreation (1)
Team sizes	Team size ranged from 2 to 10

Number in parenthesis is the number of studies

The quality scores ranged from 0 to 9 (Box 3); the mean was 4.5 and the median 5.0. Fourteen studies (56%) evaluated outcomes only at the end of the IPCE experience, while eleven studies (46%) were pre–post research designs characterised by evaluation before and after the experience. None of the studies included a control group.

Specific aims linked to evaluation were evident in eight studies (33%).[13-20] For example, in the RIPE project, one of the learning objectives was to "develop an understanding of the roles and boundaries of different disciplines" (p. 580) and

3 Quality ratings for the 25 articles included in the detailed review

Author	Research design	Selection of participants	Aims	Outcomes	Analysis	Total
Albert 2004[13]	1	1	2	1	0	5
Guest 2002[14]	0	1	2	1	2	6
Itano 1991[15]	1	2	2	1	1	7
McNair 2001[16]	1	2	2	1	0	6
McNair 2005[17]	1	2	2	1	2	8
Miller 2001[18]	1	2	2	2	2	9
Morison 2003[19]	0	1	2	1	2	6
Ponzer 2004[20]	1	2	2	1	2	8
Benson 2002[21]	0	0	1	1	0	2
Dalton, 2003[22]	1	2	1	1	0	5
Freeman, 2003[23]	0	0	1	1	2	4
Hayward 1996[24]	1	1	1	2	2	7
Lary 1997[25]	0	1	1	0	0	2
LaSala 1997[26]	1	1	1	1	2	6
Miller 1999[27]	0	2	1	1	0	4
Norris 2003[28]	0	1	1	1	0	3
O'Neill 2005[29]	0	0	2	1	2	5
Russell 1999[31]	0	0	1	0	0	1
Sommer 2992[32]	0	1	1	0	0	2
Wahlstrom 1998[33]	0	1	1	1	0	3
Beynon 1983[34]	0	0	0	0	0	0
Greene 1996[35]	0	1	0	1	1	3
Madsen 1998[36]	1	0	0	1	2	4
Philippon 2003[37]	0	1	0	0	0	1
Reeves 2002[30,39]	1	0	1	1	2	5

this objective was evaluated before and after the experience with questionnaire items relating to professional roles and boundaries.[17] Another 13 studies (52%) mentioned aims, but these were not clearly linked to the evaluation of outcomes,[21-33] and four studies did not clearly state the aim of their project at all.[34-37] Nineteen studies (79%) provided at least some description of the outcome variables and measures used. For example, the study by Hayward et al[24] used the Interdisciplinary Education Perception Scale[38] as a pre–post measure of attitudes to ones' own and others' professions.

Eleven studies (44%) described their analysis in a way that could be replicated.[14,17-20,23,24,26,30,36] For example, LaSala et al[26] used analysis of variance to test differences in the group's score before and after the clinical experience. Diverse learning and teaching methods were employed (Box 4), with 17 (68%) using a mix of class and clinic-based learning, and eight (33%) being almost entirely clinic based. Outcomes were most often measured in the domains of learner reaction, modification of attitudes and perceptions, acquisition of knowledge and skills, and behavioural change. A number of studies evaluated benefits to patients or clients,[20,27,30,31,36,39] but outcomes at the level of organisational practice were rarely considered.[23,27]

Reported outcomes were generally positive in the studies that used focus groups and interviews to evaluate outcomes, and significant changes were reported in attitudes and knowledge before and after the IPCE experience. The barriers to IPCE identified in the studies are summarised in Box 5. Logistical issues were the most frequently noted barrier (18 studies), and the need for careful planning and early identification of logistical concerns was recognised as a facilitator of a successful IPCE model.[14,18,26,31] Other enablers included enthusiasm and commitment of staff and commitment of institutions, with clear and open communication between stakeholders and use of a variety of training methods and adequate resources.

Discussion

Twenty-one different professional groups participated in the 25 IPCE studies reviewed. Medicine and nursing were the most frequently included followed by physiotherapy, occupational therapy and social work.

The models of IPCE described in the literature are extremely diverse in terms of setting, team size and composition, duration, aims and the teaching and learning strategies. It is therefore not

4 Learning and teaching methods described in the 25 articles included in the detailed review

Non-patient contact activities	Patient care-related activities
Project work (9)	Work shadowing/observation/visits/meet health professionals (10)
Presentations (8)	Assessment (including planning, interviewing) (7)
Team planning session/team development/ team discussion (6)	Devise problem list, management or care plan, set goals (4)
Seminars/forums/in-service (6)	Treatment (including planning) (4)
Introductory/orientation session (5)	Clinical teaching/clinical experience (4)
Reflective sessions (5)	Patient care (3)
Learning package/training module (4)	Ward rounds (3)
Tutorials (3)	Handover (3)
Lectures/guest presentations (3)	Ward work (2)
Form and procedure design (2)	Patient/care conference (2)
On-line discussions/forums (2)	Social interaction with clients (1)
Structured debriefing (1)	
Social interaction with students (1)	

Number in parenthesis is the number of studies reporting this method

possible to identify any preferred model(s) for the delivery of IPCE. This variation may be related to the particular set of logistical barriers to be overcome in the development of each program and the need to fit within a particular set of existing courses and health care services. It also reflects the state of current research, with no controlled studies comparing outcomes for different models or approaches and inconsistency in outcomes measurement in program evaluation.

The diversity in the duration and intensity of IPCE experiences offered no consistent pattern as to an "optimum dose" of IPCE. Some programs were only a few hours in duration[14,25,35] while others were over extended periods of several weeks[15,19,25,26,32,36] or months.[18,21] The most common duration was 2 weeks.[13,16,17,20,22,30,33] Few studies, however, gave precise details of the number of hours of the IPCE experience.

Many projects had primary or secondary aims of exposing students to a particular area of practice, the most common being rural health and health services to otherwise underserved groups in the community.[13,16,17,22-24,26,28,32] In some cases the setting, such as a hospital training ward,[19,20,30,33,39] on-campus student clinic,[21,36] or rural[24] setting, was selected primarily for its suitability to foster the interprofessional learning experience. For other projects, the setting was chosen specifically to build capacity for clinical placement opportunities, or to recruit graduates to the area of practice.[16,22,26,28] Some IPCE projects were strongly focussed on developing knowledge and skills in a specialised area of practice such as oncology[15] gerontology[27] and HIV/AIDS.[29]

The aims of the IPCE projects were diverse, but only 16 (67%) explicitly stated an aim of developing interprofessional practice, collaboration or teamwork. This is surprising given that the main purpose of interprofessional learning is said to be the development of collaborative practice relationships and teamwork skills.[4,8,9]

Studies variously used written questionnaires and focus groups or interviews to evaluate the outcomes of the IPCE experience. Twelve of the articles provided little information about how outcomes data were analysed, limiting the useful-

ness of these articles to their descriptions of process and the pragmatic areas of IPCE. Some studies analysed the scores of survey instruments to examine changes in attitudes and knowledge before and after the experience,[17,18,20,23,24,26,36] but most of these were instruments designed for the particular study and reporting of the reliability or validity of the tests was rare.[36] Hayward et al[24] used the Interdisciplinary Education Perception Scale[38] to evaluate attitudes relating to interdisciplinary practice and Miller and Ishler[18] used the Team Skills Scale.

The majority of studies explored student perceptions and experience of IPCE using focus groups or interviews. A number of studies used data triangulation[19,23,30] as an evaluation strategy, but none of the studies controlled expectation bias by having an independent person conduct the focus groups or interviews, and this may result in an overly positive view of IPCE being reported. The lack of an independent interviewer and the use of self-reported attitudinal questionnaires also fail to control for social desirability bias. This may result in an overestimation of positive change, and it cannot be assumed that attitudinal or knowledge changes necessarily carry over into behaviour change.

There were numerous barriers to IPCE identified in studies, but logistical barriers relating to timetabling were considered by many authors to be the biggest challenge and were identified as time-consuming to address.[13,14,16-20,22,30,32,37] Other student-related challenges included dealing with unequal numbers of students in different disciplines,[20,30] students at different stages of their course[22] or at different academic levels[16] in the same IPCE team, organising suitable clinical experience,[33] and time for discipline-specific activities.[37] Where IPCE placements were voluntary, recruiting sufficient students was problematic[16,22,37] and resulted in high withdrawal rates in one program.[17] A compulsory placement may overcome recruitment problems, but can result in uninterested persons obstructing teamwork.[33]

Staff-related challenges were the recruitment and training of staff or preceptors,[16,40] project staff inexperience,[27] lack of time on a busy ward[19] and heavy faculty staff workload.[21] Adequate resources to successfully deal with logistical and operational issues appear to be a key issue in planning and implementing successful IPCE.

A number of structural and policy barriers were identified, the major theme being that existing curricula did not have IPCE embedded in them and that existing curricula were not organised or delivered from an interprofessional framework.[16,17,22] The lack of a history of collaboration and the level of commitment to IPCE by the university departments involved[13,16] were also noted as barriers. Another structural barrier was

5 Barriers to interprofessional clinical education (IPCE) identified in the 25 articles included in the detailed review

Barrier type	Details
Logistical ■ timetabling/ scheduling ■ student recruitment ■ suitable experience	Lack of timetabling alignment between programs (11) Student recruitment (3) Voluntary nature of IPCE (2) Achieving equal student numbers from each discipline (1) Finding suitable wards (1) Organising time for discipline-specific activities(1)
Student-related issues	Unequal numbers from each discipline (1) Students at different stages of their course (1) Students at different academic levels (1) Role uncertainty (2) Compulsory placement (1) Does not count toward final exam/ assessment (1)
Staff-related issues	Recruiting/training preceptors (2) Inexperience of project staff (1) Time/workload (2)
Other structural and policy issues	Curriculum issues (3) Lack of collaborative history (1) Level of commitment (1) Joint validation/accreditation (1)
Finance/ funding difficulties	Funding (5) Financial viability (1)

Number in parenthesis is the number of studies reporting this barrier.

the challenge of joint accreditation of courses (eg, medicine and nursing).[30]

Funding for IPCE was identified as a barrier, with challenges noted as difficulty obtaining ongoing funding for rural[17,18] or university-based clinics,[21] different levels of funding for different disciplines,[22] and difficulties with sharing costs and resources among disciplines.[30] Models requiring a dedicated Clinical Education Ward were particularly costly.[20] There is general agreement that IPCE incurs a substantial cost for the university and agency. This is largely due to the complex logistics of coordinating the placement of a group of students from various courses, communicating with all stakeholders and the limits on group sizes necessary for effective interactive learning and dictated by the clinical environment. In one of the pair of textbooks published by the Centre for the Advancement of Interprofessional Education (CAIPE),[4,10] the authors note that "... in cases where IPE offers resource savings over uni-professional education, IPE will be preferred, but we have not yet located an example of this type".[10] (p. 47)

In describing the factors enabling IPCE a number of themes were identified across studies. The strongest theme emerging was the importance of careful and detailed planning and flexibility in the model. The key elements to address are: scheduling constraints, selecting suitable sites, recruiting and training facilitators, building relationships between the key stakeholders, and preparing students and facilitators for the experience.

Models that involve placing teams of students in a hospital ward-based experience required up to 2 years' planning before implementation.[20,30,33,39] These models involved teams of students from between four to six disciplines with facilitators having responsibility, in 2-week block placements, for the running of a hospital ward. In a model in which nursing, health administration and social work students undertook placement in a rural community setting,[26] the authors concluded that "Careful detailed planning, open communication and flexibility were central to the course's success".(p. 298)

The enthusiasm and commitment of individuals (managers, administrators, coordinators and facilitators) and institutions was widely considered to be essential to the success of IPCE.[16,18,19,22,26,30,32,39] In some models incentives were used to facilitate involvement of staff and students. Faculty were given time release and supported to go to conferences and workshops.[18] Student incentives included being awarded credit and certificates for participation.[18,27]

Another aspect cited as important to the successful implementation of IPCE was the quality of the supervising professionals. A study that included medical, nursing, physiotherapy and occupational therapy students concluded that the "quality of tutoring and support for the students as a team are important factors and should be focused on when developing interprofessional training in a clinical setting".[20] (p. 735) Another study[19] involving medical and nursing students reported that "students indicated that the success of placement shared learning was linked to the encouragement given by teachers". (p. 101)

Student characteristics of flexibility, cooperation, open mindedness, willingness to negotiate differences in perspective, and to make suggestions were also cited as important contributors to a successful IPCE experience.[26,31]

Limitations of this systematic review are that we did not search for unpublished studies and excluded studies published in languages other than English. A search of conference presentations and contact with key researchers may have uncovered additional studies; however, limiting the search to published articles meant that all included studies had undergone some level of peer review. Another limitation is that the quality scale used in the study, while based on common approaches, has no formal evidence of reliability and validity.

Conclusion

Although no preferred model(s) for the delivery of IPCE could be identified, consistent messages about barriers and enablers to IPCE programs are apparent. These barriers and enablers can form a

set of guiding principles to underpin development and implementation of IPCE programs.

The most common barrier was the logistics of coordinating students from a range of existing courses to participate at the same time in an IPCE experience. Structural issues, student-related and funding issues provide some hurdles, but were less often reported.

The enablers essentially represent the characteristics of any effective project or initiative: planning; clear and open communication; enthusiasm and genuine commitment to partnership and the project objective; flexibility and adaptability of stakeholders; and clear expectations.

When judging the efficacy of the IPCE experience in achieving learning objectives, comparisons are difficult due to the often limited descriptions of project objectives and the broad range of outcome approaches used. Further research and better reporting of outcomes is needed to test the specifics of program content and identify the most effective and efficient ways to offer IPCE. Future reports of IPCE should ensure that aims are clearly stated and that outcomes linked to the program aims are evaluated using clearly described methods. Using a framework such as the JET classification of interprofessional education outcomes[4] would improve our capacity to establish a more robust knowledge base about the essential activities and outcomes of IPCE. Researchers should employ instruments with demonstrated reliability and validity to measure outcomes, and focus groups and interviews should be conducted by an independent person.

Acknowledgements

This project was funded by the Department of Human Services, Victoria, under the Clinical Placements Strategy. The DHS played no role in the study design, data collection, analysis or interpretation, and writing or publication of this paper.

Competing interests

The authors declare that they have no competing interests.

Appendix: full search strategy for MEDLINE

1. (inter-profession$ or interprofession$).mp.
2. (inter-disciplin$ or interdisciplin$).mp.
3. (inter-occupation$ or interoccupation$).mp.
4. (inter-institut$ or interinstitut$).mp.
5. (inter-agen$ or interagen$).mp.
6. (inter-sector$ or intersector$).mp.
7. (inter-department$ or interdepartment$).mp.
8. (inter-organisation$ or interorganisation$).mp.
9. (inter-organization$ or interorganization$).mp.
10. Interprofessional Relations/
11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. team$.mp.
13. Patient Care Team/
14. (multi-profession$ or multiprofession$).mp.
15. (multi-disciplin$ or multidisciplin$).mp.
16. (multi-institut$ or multiinstitut$).mp.
17. (multi-agenc$ or multiagenc$).mp.
18. (multi-sector$ or multisector$).mp.
19. (multi-organisation$ or multiorganisation$).mp.
20. (multi-organization$ or multiorganization$).mp.
21. Professional-Patient Relations/
22. 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 0 or 21
23. 11 or 22
24. (education$ or train$ or learn$ or teach$ or ourse$).mp.
25. Education, Professional/
26. Competency-Based Education/
27. Clinical education.mp.
28. Clinical supervision.mp.
29. 24 or 25 or 26 or 27 or 28
30. 23 and 29
31. course evaluation.mp.
32. Program Evaluation/
33. Evaluation Studies/
34. evaluation methods.mp.
35. evaluation research.mp.
36. "Outcome and Process Assessment (Health are)"/
37. education$ outcome$.mp.
38. learning outcome$.mp.
39. 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38
40. 30 and 39
41. undergraduate.mp.
42. pre-registration.mp.
43. Pre-qualification.mp.
44. pre-qualification.mp.
45. 41 or 42 or 43 or 44
46. 30 and 45
47. 40 and 45

References

1 Australian Council for Safety and Quality in Health Care. National Patient Safety Education Framework. Canberra: Commonwealth of Australia, 2005.

2 Barr H. Interprofessional education. Today, yesterday and tomorrow. London: UK Centre for the Advancement of Interprofessional Education, 2003.

3 Centre for the Advancement of Interprofessional Education. Interprofessional education definition. CAIPE, 2002. Cited 7 Nov 2007. http://www.caipe.org.uk/index.php?&page=news&page=news&news=18

4 Barr H, Koppel I, Reeves S, et al. Effective interprofessional education. Argument, assumption and evidence. Oxford: Blackwell, 2005.

5 World Health Organization. Learning together to work together for health. Geneva: WHO, 1988.

6 Braithwaite J, Travaglia JF. Inter-professional learning and clinical education: an overview of the literature. Canberra: Braithwaite and Associates and the ACT Health Department, 2005.

7 Freeth D, Hammick M, Koppel I, et al. A critical review of evaluations of interprofessional education. London: UK Centre for the Advancement of Interprofessional Education, 2002.

8 Tope R. Inter-professional education. A literature review prepared for the NHS Executive South West. London, HERC Associates, 1999.

9 Zwarenstein M, Reeves S, Barr H, et al. Interprofessional education: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2000; (3): CD002213. DOI: 10.1002/14651858.CD002213.

10 Freeth D, Hamick M, Reeves S, et al. Effective interprofessional education. Development, delivery and evaluation. Oxford: Blackwell Publishing, 2005.

11 Freeth D, Nicol M. Learning clinical skills: an interprofessional approach. *Nurse Educ Today* 1998; 18: 455-61.

12 Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* 1998; 52: 377-84.

13 Albert E, Dalton L, Spencer J, et al. Doing it together: the Tasmanian interdisciplinary rural placement program. *Aust J Rural Health* 2004; 12: 30-1.

14 Guest C, Smith L, Bradshaw M, Hardcastle W. Facilitating interprofessional learning for medical and nursing students in clinical practice. *Learn Health Soc Care* 2002; 1: 132-8.

15 Itano JK, Williams J, Deaton MD, Oishi N. Impact of a student interdisciplinary oncology team project. *J Cancer Educ* 1991; 6: 219-26.

16 McNair R, Brown R, Stone N, Sims J. Rural interprofessional education: promoting teamwork in primary health care education and practice. *Aust J Rural Health* 2001; 9 Suppl 1: S19-26.

17 McNair R, Stone N, Sims J, Curtis C. Australian evidence for interprofessional education contributing to effective teamwork preparation and interest in rural practice. *J Interprof Care* 2005; 19: 579-94.

18 Miller BK, Ishler KJ. The Rural Elderly Assessment Project: a model for interdisciplinary team training. *Occup Ther Health Care* 2001; 15: 13-34.

19 Morison S, Boohan M, Jenkins J, Moutray M. Facilitating undergraduate interprofessional learning in healthcare: comparing classroom and clinical learning for nursing and medical students. *Learn Health Soc Care* 2003; 2: 92-104.

20 Ponzer S, Hylin U, Kusoffsky A, et al. Interprofessional training in the context of clinical practice: goals and students' perceptions on clinical education wards. *Med Educ* 2004; 38: 727-36.

21 Benson JD, Williams DL, Stern P. The Good Beginnings clinic: an interdisciplinary collaboration. *Occup Ther Health Care* 2002; 16: 21-37.

22 Dalton L, Spencer J, Dunn M, et al. Re-thinking approaches to undergraduate health professional education: interdisciplinary rural placement program. *Collegian* 2003; 10: 17-21.

23 Freeman J. A multidisciplinary, learner-centered, student-run clinic for the homeless. *Fam Med* 2003; 35: 394-7.

24 Hayward KS, Powell LT, McRoberts J. Changes in student perceptions of interdisciplinary practice in the rural setting. *J Allied Health* 1996; 25: 315-27.

25 Lary MJ, Lavigne SE, Muma RD, et al. Breaking down barriers: multidisciplinary education model. *J Allied Health* 1997; 26: 63-9.

26 LaSala KB, Hopper SK, Rissmeyer DJ, Shipe DP. Rural health care and interdisciplinary education. *Nurs Health Care Perspect* 1997; 18: 292-8.

27 Miller BK, Ishler KJ, Heater S. Gerontological initiatives for visionary education project: interdisciplinary training for occupational and physical therapy students. *Gerontol Geriatr Educ* 1999; 19: 21-37.

28 Norris TE, House P, Schaad D, et al. Student providers aspiring to rural and underserved experiences at the University of Washington: promoting team practice among the health care professions. *Acad Med* 2003; 78: 1211-6.

29 O'Neill BJ, Wyness MA. Student voices on an interprofessional course. *Med Teach* 2005; 27: 433-8.

30 Reeves S, Freeth D. The London training ward: an innovative interprofessional learning initiative. *J Interprof Care* 2002; 16: 41-52.

31 Russell KM, Hymans D. Interprofessional education for undergraduate students. *Public Health Nurs* 1999; 16: 254-62.

32 Sommer SJ, Silagy C, Rose AT. The teaching of multidisciplinary care. *Med J Aust* 1992; 157: 31.

33 Wahlstrom O, Sanden I. Multiprofessional training ward at Linkoping University: early experience. *Educ Health* 1998; 11: 225-31.

34 Beynon GP, Croker J. Multidisciplinary education in geriatric medicine. Continuing experience at the Middlesex Hospital. *Age Ageing* 1983; Suppl: 26-9.

35 Greene RJ, Cavell GF, Jackson SH. Interprofessional clinical education of medical and pharmacy students. *Med Educ* 1996; 30: 129-33.

36 Madsen MK, Gresch AM, Petterson BJ, Taugher MP. An interdisciplinary clinic for neurogenically impaired adults: a pilot project for educating students. *J Allied Health* 1988; 17: 135-41.

37 Philippon DJ, Pimlott JFL, King S, et al. Preparing health science students to be effective health care team members: the InterProfessional Initiative at the University of Alberta. *J Interprof Care* 2005; 19: 195-206.

38 Luecht RM, Madsen MK, Taugher MP, Petterson BJ. Assessing professional perceptions: design and validation of an Interdisciplinary Education Perception Scale. *J Allied Health* 1990; 19: 181-91.

39 Reeves S, Freeth D, McCrorie P, Perry D. "It teaches you what to expect in future ...": interprofessional learning on a training ward for medical, nursing, occupational therapy and physiotherapy students. *Med Educ* 2002; 36: 337-44.

40 Pollard KC, Miers ME, Gilchrist M. Collaborative learning for collaborative working? Initial findings from a longitudinal study of health and social care students. *Health Soc Care Community* 2004; 12: 346-58.

(Received 6/02/07, revised 1/06/07, accepted 3/07/07) □