

# Interprofessional education: effects on professional practice and health care outcomes (Review)

Reeves S, Zwarenstein M, Goldman J, Barr H, Freeth D, Hammick M, Koppel I



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[Intervention Review]

# Interprofessional education: effects on professional practice and health care outcomes

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## ABSTRACT

### Background

Patient care is a complex activity which demands that health and social care professionals work together in an effective manner. The evidence suggests, however, that these professionals do not collaborate well together. Interprofessional education (IPE) offers a possible way to improve collaboration and patient care.

### Objectives

To assess the effectiveness of IPE interventions compared to education interventions in which the same health and social care professionals learn separately from one another; and to assess the effectiveness of IPE interventions compared to no education intervention.

### Search strategy

We searched the Cochrane Effective Practice and Organisation of Care Group specialised register, MEDLINE and CINAHL, for the years 1999 to 2006. We also handsearched the Journal of Interprofessional Care (1999 to 2006), reference lists of the six included studies and leading IPE books, IPE conference proceedings, and websites of IPE organisations.

### Selection criteria

Randomised controlled trials (RCTs), controlled before and after (CBA) studies and interrupted time series (ITS) studies of IPE interventions that reported objectively measured or self reported (validated instrument) patient/client and/or healthcare process outcomes.

### Data collection and analysis

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Two reviewers independently assessed the eligibility of potentially relevant studies, and extracted data from, and assessed study quality of, included studies. A meta-analysis of study outcomes was not possible given the small number of included studies and the heterogeneity in methodological designs and outcome measures. Consequently, the results are presented in a narrative format.

### **Main results**

We included six studies (four RCTs and two CBA studies). Four of these studies indicated that IPE produced positive outcomes in the following areas: emergency department culture and patient satisfaction; collaborative team behaviour and reduction of clinical error rates for emergency department teams; management of care delivered to domestic violence victims; and mental health practitioner competencies related to the delivery of patient care. In addition, two of the six studies reported mixed outcomes (positive and neutral) and two studies reported that the IPE interventions had no impact on either professional practice or patient care.

### **Authors' conclusions**

This updated review found six studies that met the inclusion criteria, in contrast to our first review that found no eligible studies. Although these studies reported some positive outcomes, due to the small number of studies, the heterogeneity of interventions, and the methodological limitations, it is not possible to draw generalisable inferences about the key elements of IPE and its effectiveness. More rigorous IPE studies (i.e. those employing RCTs, CBA or ITS designs with rigorous randomisation procedures, better allocation concealment, larger sample sizes, and more appropriate control groups) are needed to provide better evidence of the impact of IPE on professional practice and healthcare outcomes. These studies should also include data collection strategies that provide insight into how IPE affects changes in health care processes and patient outcomes.

## **PLAIN LANGUAGE SUMMARY**

### **Training health and social care professionals to work together effectively**

Health and social care professionals, such as doctors, nurses, physiotherapists and social workers, need to work together effectively to take care of patients effectively. Unfortunately, professionals may not always work well together. Training and educational programmes have been developed as a possible way to improve how professionals work together to take care of patients. Interprofessional education (IPE) is any type of educational, training, teaching or learning session in which two or more health and social care professions are learning interactively.

This review found six studies that evaluated the effects of IPE. Four of these studies found that IPE improved some ways in how professionals worked together and the care they provided. It improved the working culture in an emergency department and patient satisfaction; decreased errors in an emergency department; improved the management of the care delivered to domestic violence victims; and improved the knowledge and skills of professionals providing care to mental health patients. But two of those four studies also found that IPE had little to no effect on other areas. Two other studies found that IPE had little to no effect at all.

The studies evaluated different types of IPE and were not of high quality. It is, therefore, difficult to be certain about the effect of IPE and to understand the key features of IPE to train health and social care professionals to work together effectively.

## **BACKGROUND**

This is an update to a previous Cochrane IPE review ([Zwarenstein 2000](#)) which found no studies that met the inclusion criteria. Since the publication of that review, interest in IPE as a means to cultivate collaborative practice and enhance care has continued to grow amongst policy makers, educators, and researchers ([Barr 2002](#); [DoH 2001](#); [Health Canada 2003](#); [McKeown 2005](#)).

The continued interest in IPE is unsurprising, given the increasing complexity of the organisation and delivery of health care. A num-

ber of factors, such as an ageing population and the shift of the burden of illness from acute to chronic care, require a number of different health and social care professions to be involved in the delivery of care. As a result, the need for good interprofessional communication and collaboration to help coordinate patient care in an effective manner is critical. Despite this need, research indicates that such communication and collaboration can be problematic. For example, studies have shown that effective interprofessional collaboration can be undermined by boundary infringements, a

lack of understanding of one another's roles, limited communication and poorly coordinated teamwork (Pethybridge 2004; Reeves 2004; Skjorshammer 2001).

IPE aims to encourage different professionals to meet and interact in learning to improve collaborative practice and the health care of patients/clients, and therefore has more potential for enhancing collaborative practice than a programme of multiprofessional education (where professionals share their learning experiences but do not interact with one another, such as a joint lecture) or uniprofessional education (where professionals learn in isolation from one another).

Given that our earlier Cochrane review found no IPE studies employing randomised controlled trials (RCTs), controlled before and after studies (CBAs), and interrupted time series studies (ITSs), some researchers have adopted broader methodological and outcomes criteria to provide an indication of the wider effects of this type of education. Results from these reviews have provided some insights into the impact of a range of IPE studies on a number of outcomes, including changing learners' attitudes towards one another's profession; improving knowledge of interprofessional collaboration; enhancing collaborative behaviour; and making gains in the delivery of patient care (Barr 2005; Cooper 2001; Hammick 2007; Reeves 2001). While the studies in these reviews indicate positive outcomes for IPE, most did not address the question of the impact of IPE as defined by this review. In addition, most did not use rigorous research designs and objective or well validated measures of improved professional practices or improved patient morbidity, survival or satisfaction, making it difficult to attribute reported changes directly to IPE.

The development and delivery of IPE can require significant amounts of resources. Any large-scale changes to adopt and implement this educational approach should be based on evidence of its effects to current uniprofessional models of education. Thus, this review seeks to update the existing evidence from rigorous studies in this field.

## OBJECTIVES

The two objectives of this review are:

1. To assess the effectiveness of IPE interventions compared to education interventions in which the same professions were learning separately from one another.
2. To assess the effectiveness of IPE interventions compared with control groups which received no education intervention.

In the first objective we are seeking to better understand the effects of IPE in relation to the current dominant uniprofessional education model, where ideally the control group should receive the same education in a uniprofessional manner. We included the

second objective as there was a lack of studies addressing the first objective.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

Randomised controlled trials (RCTs), controlled before and after (CBA) studies, and interrupted time series (ITS) studies.

#### Types of participants

Health and social care professionals (e.g. chiropodists/podiatrists, complementary therapists, dentists, dietitians, doctors/physicians, hygienists, psychologists, psychotherapists, midwives, nurses, pharmacists, physiotherapists, occupational therapists, radiographers, speech therapists, and social workers).

#### Types of interventions

An IPE intervention occurs when members of more than one health and/or social care profession learn interactively together, for the explicit purpose of improving interprofessional collaboration and/or the health/well being of patients/clients. Interactive learning requires active learner participation, and active exchange between learners from different professions.

All types of educational, training, learning, or teaching initiatives, involving more than one profession in joint, interactive learning, as described in the above IPE definition.

#### Types of outcome measures

1. Objectively measured or self-reported (validated instrument) patient/client outcomes in the following areas: health status measures; disease incidence, duration or cure rates; mortality; complication rates; readmission rates; adherence rates; satisfaction; continuity of care; use of resources (i.e. cost-benefit analyses).
2. Objectively measured or self reported (validated instrument) health care process measures (e.g. skills development, changes in practice style, interprofessional collaboration, teamwork).

#### Search methods for identification of studies

Effective Practice and Organisation of Care Group (EPOC) specialised register (see Specialised Register under Group Details), 1999-2006, searched 18 September 2006.

The search strategy from the previous IPE Cochrane review, shown below, was adapted for each of the following databases searched:

MEDLINE, 1999 to 2006, August week 4 2006.

CINAHL, 1999 to 2006, September week 1, 2006.

MEDLINE search strategy (adapted for Cinahl) used was:

- 1 (interprofession\$ or inter-profession\$).tw.
- 2 (interdisciplin\$ or inter-disciplin\$).tw.
- 3 (interoccupation\$ or inter-occupation\$).tw.
- 4 (interinstitut\$ or inter-institut\$).tw.
- 5 (interagen\$ or inter-agen\$).tw.
- 6 (intersector\$ or inter-sector\$).tw.
- 7 (interdepartment\$ or inter-department\$).tw.
- 8 (interorgani?ation\$ or inter-organi?ation\$).tw.
- 9 interprofessional relations/
- 10 team\$.tw.
- 11 (multiprofession\$ or multi-profession\$).tw.
- 12 (multidisciplin\$ or multi-disciplin\$).tw.
- 13 (multiinstitution\$ or multi-institution\$).tw.
- 14 (multioccupation\$ or multi-occupation\$).tw.
- 15 (multiagenc\$ or multi-agenc\$).tw.
- 16 (multisector\$ or multi-sector\$).tw.
- 17 (multiorgani?ation\$ or multi-organi?ation\$).tw.
- 18 exp professional-patient relations/
- 19 or/1-18
- 20 (education\$ or train\$ or learn\$ or teach\$ or course\$).tw.
- 21 exp education, continuing/
- 22 exp education, graduate/
- 23 or/20-22
- 24 19 and 23
- 25 program evaluation/
- 26 "health care outcome?".tw.
- 27 (education\$ adj outcome?).tw.
- 28 or/25-27
- 29 24 and 28
- 30 limit 29 to yr="1999 - 2006"

We placed no language restrictions on the search strategy.

The search generated a total of 1801 abstracts (201 from EPOC, 1157 from MEDLINE, 443 from CINAHL). While the abstract search was sensitive to identifying a high proportion of relevant IPE intervention studies, it was not specific in relation to differentiating between IPE interventions and other interprofessional teamwork interventions, such as continuous quality improvement and total quality improvement initiatives.

We also searched ISI Web of Science for papers which cite studies included in the review; hand searched the *Journal of Interprofessional Care* (1999 to 2006); and reviewed reference lists of the included studies and two leading IPE books (Barr 2005; Freeth 2005); reviewed proceedings from the 'All Together Better Health' (Better Health 2006) and 'Grounding Action in Theory' (IPE Conference 2005) conferences; and reviewed the grey literature held by the Centre for the Advancement of Interprofessional Education, accessible on the internet (CAIPE 2006). In addition, we drew upon other related work, in particular systematic reviews (Barr 2005; Hammick 2007; Zwarenstein 2005), as well as our

international networks, to ensure that all relevant published and unpublished work in the field would be identified.

## Data collection and analysis

Two authors (SR and JG) independently reviewed the 1801 abstracts retrieved in the searches to identify all those that suggested that:

1. there was an intervention where interprofessional exchange occurred;
  2. education took place;
  3. professional practice, patient care processes or health and satisfaction outcomes were reported;
  4. the intervention was evaluated using a RCT, CBA or ITS design.
- We identified 56 studies from this abstract search as potentially meeting these criteria (11 from EPOC, 23 from MEDLINE, 22 from CINAHL). We then obtained the full text of these articles. The same two authors independently assessed each full text article to further examine whether it met all of the criteria. We resolved any disagreements and uncertainties by discussion, with the input of a third author (MZ), who also reviewed all of the final papers as a further quality check for inclusion in the review.

## Study quality assessment

We used the quality criteria recommended by EPOC to assess study quality of all studies included in the review (EPOC Review Group Checklist, 2002).

The criteria used to assess RCTs were:

1. concealment of allocation;
2. follow up of professionals;
3. follow up of patients or episodes of care;
4. blinded assessment of primary outcome(s);
5. baseline measurement;
6. reliable primary outcome measure(s);
7. protection against contamination.

The criteria used to assess CBA studies were:

1. baseline measurement;
2. characteristics for studies using second site as control;
3. blinded assessment of primary outcome(s);
4. protection against contamination;
5. reliable primary outcomes measure(s);
6. follow-up of professionals;
7. follow-up of patients.

No ITS studies were identified so these criteria are not relevant.

We assigned an overall quality rating (high, moderate, low protection against bias) to each study. We gave a high quality rating if all criteria were rated as done (or not applicable); we gave a moderate quality rating if one or two criteria were not done or not clear; and we gave a low quality rating for studies if three or more criteria were not done or not clear.

## Data extraction

Two authors extracted the following information from included studies.

1. Type of study (RCT, CBA, ITS);
2. Study setting (country, health care setting);
3. Types of study participants;
4. Description of education program;
5. Description of any other interventions in addition to the education;
6. Main outcome measures;
7. Results for the main outcome measures;
8. Any additional information that potentially affected the results.

## Analysis

Ideally, we would have conducted a meta-analysis of study outcomes for this review. This however was not possible due to the small number of included studies and the differences in relation to methodological design and outcome measure across the studies. Consequently, we have presented the results in a narrative format.

# RESULTS

## Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Six studies met the inclusion criteria; all of the studies addressed objective number two, to assess the effectiveness of IPE interventions compared with control groups which received no education intervention. Given the major differences between the included studies, a description of each is provided below.

The first study ([Brown 1999](#)) was a RCT to examine whether a communication skills training program for physicians, physician assistants, nurse practitioners, and optometrists increased patients' ratings of clinicians' communication skills. The healthcare professionals worked at a not-for-profit group-model health maintenance organisation in the United States. The IPE intervention, led by two physicians, consisted of two four-hour workshops delivered a month apart, with two hours of homework in between. The intervention involved didactic components, role playing, and interactive dialogue. Of the 69 participants (75% of whom were physicians), 37 were randomly assigned to receive the intervention and 32 were assigned to the control group (who received the IPE intervention after the study). A questionnaire was sent to patients within ten days of their visit. Data collection occurred during a six month follow-up period.

The second study ([Campbell 2001](#)) was a group RCT that evaluated an interprofessional training program for emergency department physicians, nurses, social workers, and health administrators,

along with representatives from local domestic violence service organisations, to improve the effectiveness of their collective response to intimate partner violence. The emergency departments were in hospitals in the United States. The two-day education program, developed and implemented by violence prevention organisations, involved didactic instruction, role playing, team planning, and teamwork to develop a written action plan. The program addressed systems change and coalition building, as well as provider attitudes and skill building. The attendees were expected to collaborate in order to implement system changes in their respective emergency departments. The instructors were available for telephone assistance during the implementation phase. Six emergency departments were randomly assigned to receive either the IPE intervention (three hospitals) or to be in a control group which received no intervention (three hospitals). Data were collected at 9-12 months and 18-24 months; although only 19 individuals attended the education sessions, data were collected from the whole emergency departments.

The third study ([Morey 2002](#)) was a CBA study to evaluate the effectiveness of a program to improve collaborative behaviour of emergency department staff physicians, nurses, technicians, and clerks. The emergency departments were all located in hospitals in the United States. The intervention consisted of an emergency team coordination education course, as well as implementation of formal teamwork structures and processes. A physician-nurse pair from each emergency department was involved in developing and implementing the curriculum. The course consisted of eight hours of instruction in one day. The format was lecture, discussion of behaviours, practical exercises, and discussion of video segments. Teamwork implementation involved forming teams by shift and delivering care in a team structure. Each staff member completed a four-hour practicum in which teamwork behaviours were practiced and critiqued by an instructor. Staff coached and mentored teamwork behaviours to all staff during normal shifts. This teamwork implementation phase lasted six months. Nine hospital emergency departments self-selected either to receive the IPE intervention (six emergency departments, 684 clinicians) or to act as a control (three emergency departments, 374 clinicians). Control group departments received the intervention at a later date. Data were collected at two four-month intervals following the training.

The fourth study ([Thompson 2000](#)) was a group RCT to evaluate the effectiveness of IPE and a clinical practice guideline to improve recognition and management of depression in primary care practices in the United Kingdom. A primary care physician, practice nurse and community mental health nurse delivered the four-hour IPE seminars to general practitioners and practice nurses in groups of two to three practices when convenient. Teaching was supplemented by videotapes, small-group discussion of cases, and role play. The educators were available for nine months after the seminars to facilitate guideline implementation and promote use of teamwork. Fifty-nine primary care practices were assigned to

the intervention group (29 practices) or control group (30 practices). Practices in the control group received the IPE intervention after the study had been completed. Data were collected six weeks and six months after patient visits.

The fifth study (Thompson 2000a) undertook a group RCT to examine the effectiveness of a one-year intervention to improve identification and management of domestic violence in primary care clinics in the United States. The intervention, for teams of physicians, nurse practitioners, physician assistants, registered nurses, practical nurses, and medical assistants, consisted of two half-day IPE sessions, a bimonthly newsletter, clinic educational rounds, system support (posters, cue cards, questionnaires), and feedback of results. Five primary care clinics were randomly assigned to receive the intervention (two clinics) or to the control group (three clinics). Data were collected at baseline, 9-10 month, and 21-23 month points.

The sixth study (Young 2005) was a CBA study that evaluated effects of a consumer-led innovation to improve the competence of mental health practitioners working in community mental health provider organisations in the United States. The practitioner intervention for psychiatrists, nurses, therapists, case managers, residential staff, mental health workers, and administrative support involved six educational components held over a one-year period that included presentations, discussions, small groups, and role-playing techniques, as well as three or four full-day detailing visits to sites. An additional 16 hours was also spent with staff at the sites. The intervention was developed and delivered by two people

who are consumers of mental health services. The innovation also involved a consumer-focused intervention. The study was conducted at five organisations in two states; one organisation in each state received the intervention (total of 269 mental health practitioners, 151 in intervention groups and 118 in control groups). Data were collected at baseline and one year.

### Risk of bias in included studies

Of the six studies, we have rated one study as high quality, and the remaining five studies are rated as moderate quality (see Table 1 and Table 2). For the four RCTs, concealment of allocation was done in two studies and not clear in two studies; blinded or objective assessment of primary outcomes was done in all studies; and baseline measurement was done in all studies. Follow up of professionals, reliable primary outcome measures, and protection against contamination were done in three studies and not clear in one study (one study had two not clears and a second study had one not clear). For the two CBA studies, both had baseline measurements, blinded assessment of primary outcomes, protection against contamination, and reliable primary outcome measures. One study was not clear and one study did not adequately follow-up of professionals. Characteristics of study and control providers were reported and similar in one study and not similar in the second study. One of the CBA studies contained a self-selection process for experimental and control groups, and the other CBA study selected experimental groups by convenience and enthusiasm.

**Table 1. Quality assessment of included studies (RCTs)**

RCT	Conceal allocation	Prof follow-up	Patient follow-up	Blind assessment	Baseline measurement	Reliable outcome	Contamination protection	Overall quality
Brown	Done	Done	N/A	Done	Done	Not clear	Not clear	Moderate
Campbell	Not clear	Not clear	N/A	Done	Done	Done	Done	Moderate
Thompson a	Done	Done	N/A	Done	Done	Done	Done	High
Thompson b	Not clear	Done	N/A	Done	Done	Done	Done	Moderate



**Table 2. Quality Assessment of included studies (CBA designs)**

CBA Designs	Baseline Measurement	Characteristics	Blind Assessment	Contamination protection	reliable outcome	Prof. follow-up	Patient follow-up	Overall quality
Morey	Done	Done	Done	Done	Done	Not clear	N/A	Moderate
Young	Done	Not Done	Done	Done	Done	Not done	N/A	Moderate

Results from five of the studies were based on small sample sizes. Of these five studies, one study had 69 individually randomised practitioners and four studies had a range of 5 to 12 clusters (emergency departments (two studies), community mental health provider organizations, primary care practices). The small sample sizes limit the sensitivity in detecting an effective intervention. The sixth study had a larger size sample with 59 primary care practices. In addition, there was not always a balanced number of control and experimental groups: the study by [Morey 2002](#) had six experimental groups and three control groups, and the studies by [Thompson 2000a](#) and [Young 2005](#) had two intervention and three control groups.

### Effects of interventions

In the study by [Brown 1999](#), the communication skills training program did not improve patient satisfaction scores. Based on an average of 81 responses for each of the 69 participating clinicians, the mean score on the Art of Medicine survey improved more in the control group (0.072 (95% CI, -0.010 to 0.154)) than in the intervention group (0.030 [CI, -0.060 to 0.120]). This improvement, however, was not significant.

The results in [Campbell 2001](#) indicated that the emergency departments which received the intervention to improve responses to battered women recorded significantly higher levels on all components of the “culture of the emergency department” system-change indicator (e.g. appropriate protocols, materials such as posters, brochures, medical record intervention checklists and referral information available to staff, and staff training) ( $F = 5.72, P = 0.04$ ) and higher levels of patient satisfaction ( $F = 15.43, P < 0.001$ ) than the emergency departments in the control group. There were no significant differences in the identification rates of domestic violence victims ( $F = 0.411, P = 0.52$ ) in the medical records of the experimental and control groups. In this study, it was unclear whether there were unit of analysis errors for the identification rates outcome. The differences in this comparison were not significant, though, and would remain non-significant even if an adjustment for unit of analysis errors was possible.

In [Morey 2002](#), evaluation of the effectiveness of an interprofessional teamwork training program on collaborative behaviour in emergency departments, results showed a statistically significant improvement in quality of observed team behaviours between the experimental and control groups following training ( $P = 0.012$ ).

The clinical error rate significantly decreased, from 30.9% to 4.4% in the intervention group ( $P = 0.039$ ).

In [Thompson 2000](#), the evaluation of the effectiveness of an IPE and clinical practice guideline intervention reported no differences between the intervention and control groups in relation to the recognition of depressive symptoms. The outcome of depressed patients at 6 weeks or 6 months after the assessment did not significantly improve.

In the study by [Thompson 2000a](#), documented asking about domestic violence was increased by 14.3%, with a 3.9-fold relative increase at 9 months in intervention clinics compared to controls. Overall case finding increased by 30% (OR 1.3), but this was not statistically significant. Recorded quality of domestic violence patient assistance did not change.

In the study by [Young 2005](#), mental health practitioners in the intervention group, in comparison to practitioners in the control group, reported significantly higher scores in relation to the following competencies: teamwork ( $R = 0.28, P = 0.003$ ); holistic approaches ( $R = 0.17, P = 0.06$ ); education about care ( $R = 0.22, P = 0.03$ ); rehabilitation methods ( $R = 0.25, P = 0.007$ ); and overall competency ( $R = 0.21, P = 0.02$ ).

## DISCUSSION

This IPE review update located six eligible studies, an improvement from our previous review that found no studies that met the inclusion criteria ([Zwarenstein 2000](#)). Four of the studies reported positive outcomes in the following areas: culture of emergency department and patient satisfaction ([Campbell 2001](#)); collaborative team behaviour and reduction of clinical error rates for emergency department teams ([Morey 2002](#)); management of care delivered to domestic violence victims ([Thompson 2000a](#)); and mental health practitioner competencies related to the delivery of patient care ([Young 2005](#)). Three of the studies also reported that the gains attributed to IPE were sustained over time: eight months ([Morey 2002](#)); 18 months ([Campbell 2001](#)); and 21 months ([Thompson 2000a](#)).

Two studies reported that the IPE interventions had no impact on either healthcare processes or patient health care or outcomes;

Brown 1999 reported that patient satisfaction mean scores improved more in the control group than in the intervention group, while Thompson 2000 reported that there were no differences between the intervention and control groups in relation to the recognition or treatment of patients with depression. In addition, two studies (Campbell 2001; Thompson 2000a) reported a mixed set of outcomes. As well as reporting positive outcomes in relation to changes in professional practice and patient satisfaction, Campbell 2001 found no differences in the identification rates of victims of domestic violence between their intervention and control groups. Thompson 2000a found that documented asking about domestic violence significantly increased, yet the increase in case finding was not significant.

Although overall the results indicate some positive outcomes related to IPE, a clearer understanding of the IPE itself, as well as its effectiveness, remains unclear at this time due to the heterogeneity amongst the six studies as well as their methodological limitations.

The studies were heterogeneous in relation to the objectives and format of the educational intervention, the existence of other interventions in addition to the education, and the clinical areas and settings. The interprofessional education component in these studies ranged from four hours to multi-day programs over a one-year period. The rates of participation also varied; for example, Campbell 2001 noted that only one experimental hospital sent a complete team to the two-day training. (In this study, a small number (17) of participants participated in the education component and were expected to make changes in their departments, yet data was collected from the entire department.) Young 2005 reported that the percentage of clinicians who participated in each intervention component varied among sites, with most clinicians in the intervention group participating in at least one component. In the study by Brown 1999, the emphasis was on communication between clinicians and patients, whereas other studies (e.g. Morey 2002 and Thompson 2000a) explicitly focused on interprofessional team work in the context of particular settings (emergency department, primary care) and healthcare goals (error rates, domestic violence). These few examples are some indication of the existing heterogeneity and why it is difficult to summarise and identify key elements of successful IPE.

Four of the studies (Campbell 2001; Morey 2002; Thompson 2000a; Young 2005) contained multi-faceted interventions, of which the interprofessional education was only one component. The other interventions included team restructuring, tools such as posters, cue cards and questionnaires, measurement and feedback, and consumer-directed interventions. In these studies, the authors commented on the importance of system change and the time and resources required to facilitate it (Campbell 2001), as well as the need for leadership supportive of teamwork at various organisational levels (Morey 2002). The lack of more rigorous methodological designs, as well as additional qualitative data, limits our understanding of how the IPE affected change, including its role

in relation to other components of the intervention. The lack of positive outcomes might not be attributable to the lack of IPE effectiveness, but to the nature of the particular healthcare issue; for example, Brown 1999 notes that the program might have a greater impact in relation to the care of 'more difficult' patients rather than on routine patient visits. Thompson 2000 comments that the pragmatic evidence base of the CPG for treating representative depressed patients in primary care is weak. Better research designs incorporating quantitative and qualitative data collection strategies would further address our understanding of how IPE leads to changes in practice behaviours and processes, and its most valuable applications.

Methodologically, the studies all shared a common key limitation. All six studies compared the effects of the IPE interventions with control groups which received no educational intervention. As a result, it is difficult to assess the effects of the interprofessional learning compared to the predominant uniprofessional education model. In addition, most of the included studies involved small samples (individual healthcare professionals or clusters), which limited their ability to provide a convincing level of generalisable evidence for the effects of the IPE interventions.

Given the small number of studies and their heterogeneity, it is difficult to conclude whether any of these IPE approaches are better than others, and it is still unclear what are the defining and instrumental elements of IPE. It is recommended that future randomised controlled studies have a clearer and explicit focus on IPE, better randomisation procedures and allocation concealment, larger sample sizes, and more appropriate control groups. Given that IPE occurs in groups of more than one provider, future trials should have cluster randomized designs, and we urge researchers to be thoughtful about and avoid unit of analysis errors. In addition, an evaluation of the impact of IPE on resources (i.e. cost-benefit analysis) is also needed. The feasibility of such interventions also needs to be considered, given the challenges described in these studies of securing health professionals' commitment and attendance.

Although this review located only six eligible IPE studies whose heterogeneity limits possible conclusions, it marks an improvement from our first review which found no studies that met the inclusion criteria (Zwarenstein 2000). In the absence of this type of evidence, the findings from other IPE reviews, which have adopted broader methodological and outcome criteria, provide some insight into the impact of IPE on changing learners' attitudes, improving their knowledge of collaboration, enhancing their collaborative behaviour and improving the delivery of patient care (Barr 2005; Cooper 2001; Hammick 2007; Reeves 2001). Nevertheless, the future development of this type of rigorous IPE evidence appears to be underway; an example is a multi-method RCT of an IPE intervention involving general and internal medicine departments within five hospitals which aims to gather qualitative data on interprofessional interactions and communication and quanti-

rative data on patient satisfaction, readmission rates, patient length of stay, and waiting times (SCRIPT 2007).

## AUTHORS' CONCLUSIONS

### Implications for practice

While our first IPE review found no eligible studies, this update located six studies. Although these studies reported a range of positive outcomes, the small number of studies, combined with heterogeneity of IPE interventions, means it is not possible to draw generalisable inferences about the effects of IPE. Despite marking a step forward in beginning to establish an evidence base for IPE, more rigorous IPE research (those employing RCTs, CBA, or ITS designs) is needed to demonstrate evidence of the impact of this type of intervention on professional practice or healthcare outcomes or both.

### Implications for research

Despite a growth of IPE studies in the past few years, most of

this research does not employ rigorous designs. Future randomised controlled studies explicitly focused on IPE with rigorous randomisation procedures and allocation concealment, larger sample sizes, and more appropriate control groups, would improve the evidence base of IPE. A focus on understanding the use of IPE in relation to resources is also needed. These studies should also include data collection strategies that provide insight into how IPE affects changes in healthcare processes and patient outcomes as research to date has not sufficiently addressed this critical issue.

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\* Indicates the major publication for the study

## CHARACTERISTICS OF STUDIES

### Characteristics of included studies [ordered by study ID]

#### Brown 1999

Methods	RCT where clinicians were randomly assigned to attend immediate (intervention) or later sessions of the program (control group).
Participants	Physicians, nurse practitioners, physician assistants, optometrists.
Interventions	Two physicians gave a communication skills training program consisting of a four-hour interactive workshop, two hours of subsequent homework, and a four-hour follow-up workshop.
Outcomes	Patient satisfaction; self-reported ratings of communication skills.
Notes	Mean scores of patient satisfaction increased more in the control group than the intervention group, although this change was not statistically significant. The study authors state that longer and more intensive training, performance incentives, ongoing feedback, and possibly practice restructuring may be needed to improve general patient satisfaction. Study Quality: Moderate

#### *Risk of bias*

Item	Authors' judgement	Description
Allocation concealment?	Unclear	D - Not used

#### Campbell 2001

Methods	RCT with baseline (pre-test), immediate (9-12 months), and long term (18-24 months) post assessments. Hospitals randomly assigned to experimental and control groups.
Participants	Emergency department teams (physicians, nurses, social workers, administrators) and local domestic violence advocates.
Interventions	Two-day information and team planning intervention
Outcomes	Rates of reported domestic violence, patient satisfaction, audit of clinical documentation
Notes	Only one hospital sent a complete team as requested; two hospitals did not send a physician; social worker sent from five of six hospitals. Limited institutional support for IPE noted as a possibility for poor outcomes in this study. Study Quality: Moderate

#### *Risk of bias*

**Campbell 2001** (Continued)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

**Morey 2002**

Methods	CBA study with data gathered eight months after the intervention. Six emergency departments received the intervention, while three emergency departments acted as the control group.	
Participants	Physicians, nurses, technicians, and clerks based in nine teaching and community hospital emergency departments.	
Interventions	Eight-hour intervention delivered to groups of physicians, nurses, technicians and clerks involving lectures, discussion of videotaped segments of teamwork and clinical vignettes and interactive teamwork exercises.	
Outcomes	Collaborative behaviour, clinical error rates	
Notes	Also gathered survey data which indicated no change in attitudes for participants following the delivery of the IPE intervention. Study Quality: Moderate	

*Risk of bias*

Item	Authors' judgement	Description
Allocation concealment?	Unclear	D - Not used

**Thompson 2000**

Methods	RCT involving 59 primary care practices who were randomly assigned to an intervention group (29 practices) or a control group (30 practices).	
Participants	Physician and nursing teams from the participating primary care practices.	
Interventions	Four-hour seminar delivered to the primary healthcare teams. The seminars included videotapes, small group discussion of cases, and role play.	
Outcomes	Recognition and treatment of patient depression.	
Notes	While actual number of physicians is reported (n=152), actual number of nurses is not recorded. Qualitative data relating to participants' views of the intervention were also gathered. Study Quality: High	



**Thompson 2000** (Continued)

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	D - Not used

**Thompson 2000a**

Methods	RCT involving five clinics who were randomly assigned to two intervention groups and three control groups. Follow-up data were gathered at 9-10 months and 21-23 months.	
Participants	Primary care practice teams; physicians, nurse practitioners, physician assistants, registered nurses, licensed practical nurses, medical assistants.	
Interventions	Two half-day training sessions based on Precede/Proceed model for behaviour change; three extra training sessions for opinion leaders, newsletter, four additional educational sessions, system support (e.g. posters in waiting areas, cue cards for providers).	
Outcomes	Provider knowledge, attitudes and beliefs; rates of asking; case finding; quality of assistance.	
Notes	Unvalidated survey and qualitative data on provider views of the intervention were gathered. Study Quality: Moderate	

*Risk of bias*

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

**Young 2005**

Methods	CBA study. Two mental health provider organisations received the intervention, while three acted as the control group.	
Participants	Psychiatrists, mental health nurses, therapists, case managers	
Interventions	Six educational components delivered over one year involving presentations, small group discussions, role play and 3-4 day detailing visits. 16 hours of follow-up discussions to monitor progress	
Outcomes	Practitioner professional competencies	

Young 2005 (Continued)

Notes	Semi-structured interviews were gathered to qualitatively explore the effects of the intervention in more detail. Study quality: Moderate	
<b><i>Risk of bias</i></b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	D - Not used

### Characteristics of excluded studies *[ordered by study ID]*

Antunez 2003	Post-intervention study design.
Barrett 2001	Description of IPE intervention that reports no outcomes.
Barton 2006	Not an IPE intervention. One group pre-/post-test study design.
Bashir 2000	Not an IPE intervention.
Belardi 2004	Not an IPE intervention.
Bell 2000	Not an IPE intervention.
Bellamy 2006	One group pre-/post-test study design.
Benjamin 1999	Not an IPE intervention.
Bluespruce 2001	One group pre-/post-test study design.
Boyle 2004	One group pre-/post-test study design.
Buck 1999	Post-intervention study design.
Burns 2003	Not an IPE intervention.
Buxton 2004	Not an IPE intervention.
Carew 2001	Post-intervention study design.
Cobia 1995	Before and after study with no controls.
Coggrave 2001	Not an IPE intervention.
Connolly 1995	Post-intervention study with no controls.
Cooper 2005	A CBA study which gathered self-report data related to attitudes and knowledge change.
Corso 2006	One group post-intervention study design.
Crutcher 2004	A clinical controlled trial of an IPE intervention. Reports outcomes related to self-reported knowledge change.
Dalton 1999	Not an IPE intervention.
DeVita 2005	One group post-intervention study design.

(Continued)

Dienst 1981	Controlled before and after study. Failed to meet comparison group criteria.
Dobson 2002	One group pre-/post-test study design
Falconer 1993	Post-intervention study with control group. Failed to meet comparison group criteria.
Fields 2005	Not an IPE intervention.
Hanson 2005	Not an IPE intervention.
Harmon 1998	Five-year longitudinal study with no controls.
Hayward 1996	Before and after study with no controls.
Hook 2003	One group post-intervention study design.
Hope 2005	One group pre-/post-intervention study design.
Horbar 2001	Not an IPE intervention.
Hughes 2000	Descriptive study.
James 2005	One group pre-/post-intervention study design.
Jones 2006	Not an IPE intervention.
Jordan-Marsh 2004	One group pre-/post-test study with follow-up data collection points.
Ketola 2000	Not an IPE intervention.
Landon 2004	Not an IPE intervention.
Lawrence 2002	Not an IPE intervention.
Lia-Hoagberg 1997	Before and after study with no controls.
Llewellyn-Jones 1999	Not an IPE intervention.
McBride 2000	Not an IPE intervention.
Nash 1993	Before and after study with no controls.
O'Boyle 1995	Before and after study with no controls.
Ouslander 2001	Not an IPE intervention.

(Continued)

Phillips 2002	Not an IPE intervention.
Price 2005	Not an IPE intervention.
Rogowski 2001	Not an IPE intervention.
Rubenstein 1999	Not an IPE intervention.
Ryan 2002	Not an IPE intervention.
Smarr 2003	Not an IPE intervention.
Smith 2005	One group pre-/post-intervention study design.
Taylor 2002	Not an IPE intervention.
Trummer 2006	No control group.
Tschopp 2005	One group pre-/post-intervention study design.
Umble 2003	Not an IPE intervention.
Unutzer 2001	Not an IPE intervention.
Ward 2004	Not an IPE intervention.
Wells 2000	Not an IPE intervention.

## DATA AND ANALYSES

This review has no analyses.

## FEEDBACK

### Lack of Evidence

#### Summary

Received 20/04/2003 13:47:02

I am assuming this excellent work is a follow up from earlier published material from 1999 (J. Int. Care 13 (4)417-4). What I cannot understand is why, therefore is IPE still 'flavour of the month'? We wouldn't push ideas forward without adequate evidence of effectiveness first! Isn't anyone else out there brave enough to concur with the authors? I certify that I have no affiliations with or involvement in any organisation or entity with a direct financial interest in the subject matter of my criticisms.

#### Reply

Thank you for your positive comment. The article to which you refer is indeed a print version of this Cochrane review, and we will note that in the review. We would like to stress that the 'absence of evidence of effect is not evidence of absence of effect' (Cochrane Reviewers' Handbook 4.1.5, section 9.7). We therefore suggest that interprofessional education (IPE) interventions ought to be implemented widely, but ONLY in the context of rigorous evaluations, ideally randomised controlled trials of their effects. This is not as difficult as it might at first seem, and we would encourage those who are interested enough in IPE to want to subject it to reliable test to contact us or other groups of researchers with randomised controlled trial experience for advice and help.

Merrick Zwarenstein [on behalf of the reviewers.]

The most recent update to this review is published in Issue 1, 208. The update now has 6 studies. However, it still remains very difficult to draw conclusions about the effectiveness of this intervention and we continue to require further research in the area.

Alain Mayhew [on behalf of the authors and the editorial staff and team]

#### Contributors

Jane Warner, Practice Nurse

## WHAT'S NEW

Last assessed as up-to-date: 11 November 2007.

12 November 2008	Amended	Minor changes
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## HISTORY

Protocol first published: Issue 3, 2000

Review first published: Issue 1, 2001

29 July 2008	Amended	Converted to new review format.
12 November 2007	New citation required and conclusions have changed	Substantive amendment

## CONTRIBUTIONS OF AUTHORS

There was a joint effort to conceiving, designing, co-ordinating and collecting data for the review. SR, JG and MZ analysed and interpreted the data and wrote the review, with input from HB, DF, MH and IK. MZ is guarantor for the review.

## DECLARATIONS OF INTEREST

None known.

## SOURCES OF SUPPORT

### Internal sources

- Li Ka Shing Knowledge Institute of St Michael's Hospital, Canada.
- Continuing Education and Professional Development, Faculty of Medicine, University of Toronto, Canada.
- Institute of Health Sciences, City University, UK.
- Centre for Community Care and Primary Health, University of Westminster, UK.

### External sources

- Canadian Institutes of Health Research, Canada.

## INDEX TERMS

### **Medical Subject Headings (MeSH)**

\*Interprofessional Relations; \*Patient Care Team; \*Professional Practice; Attitude of Health Personnel; Health Personnel [\*education];  
Randomized Controlled Trials as Topic; Treatment Outcome

### **MeSH check words**

Humans